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The European Anaesthesiology Congress

Abstracts Programme
Amsterdam, The Netherlands, June 11-14, 2011

Wolters Kluwer Health | Lippincott Williams & Wilkins

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Abstracts and Programme

EUROANAESTHESIA 2011

The European Anaesthesiology Congress

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EUROANAESTHESIA 2011

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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 Europe Foyer (level 0) of the Amsterdam RAI Convention Centre. 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 that the Best Abstract Prize Competition (BAPC), with session reference ESAPC1, takes place in E103, 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 Europe Foyer (level 0) 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) Abstract Presentation (AP) session for subcommittee 6 (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 (There may be omissions in the numbering due to withdrawn abstracts.)

ESA Best Abstract Prize Competition (BAPC)

BAPCPC1-1

The Australian and New Zealand registry of regional anaesthesia (AURORA) - results from our most recent 10,000 patients

Barrington M.J., Thomas R.D., Tay V.S.
St Vincent's Hospital, Melbourne, Department of Anaesthesiology, Melbourne, Australia

Background and Goal of Study: The Australian and New Zealand Registry of Regional Anaesthesia (AURORA) measures the effectiveness and safety of peripheral nerve blockade (PNB). Since the introduction of ultrasound (US)-guided PNB, clinical practice has evolved significantly, however case reports of serious complications raise safety concerns. In this report we inform the quality and safety of PNB performed on 10, 000 patients registered with AURORA.
Materials and Methods: The period of study was June 2008 to December 2010, with the study population comprising all patients receiving PNB from 14 hospitals in Australia, New Zealand and Malaysia. Data was recorded measuring the effectiveness of PNB and complications. All patients were systematically followed up for complications with outcome as previously defined.[1] We determined that a cohort of 10, 000 patients would accurately establish the incidence of complications. Data are presented as percentage (%) or mean ± SD and adverse events expressed as n/1000.
Results and Discussion: The patient population (n = 10, 112), age 58 ± 19 years, weight 80 ± 21 kg, females (49%), males (51%) received 12, 792 PNBs. Table 1 lists immediate and delayed complications.

Complication	n/1000
Wrong site block	0.16
Inadvertent vascular puncture	3.9
Unintentional paraesthesia	16
Local anaesthetic toxicity	0.47
Pneumothorax	2
Cardiac arrest	0.08
Late neurological deficits Brachial plexus/Femoral/Sciatic	0.3/1/0.4

[Table 1. Immediate and delayed complications]

AURORA has captured trends in the clinical practice and major complications of PNB including cardiac arrest, tension pneumothorax, wrong-site anesthesia and nerve injury.
Conclusion(s): Serious complications associated with PNB occur infrequently. However, these complications represent a significant variation in the quality of care and indicate that ongoing systematic monitoring of PNB is important.
References:
1. Barrington et. al.: Preliminary results of the Australasian Regional Anaesthesia Collaboration: a prospective audit of more than 7000 peripheral nerve and plexus blocks for neurologic and other complications. Reg Anesth Pain Med 2009; 34: 534-41.
Acknowledgements: Anaesthetists who contributed data to AURORA. This project has received funding from the Australian and New Zealand College of Anaesthetists.

BAPCPC1-2

Detection of dehydration by using volume kinetics

Hahn R.G., Zdolsek J., Li Y.
Faculty of Health Sciences, Linköping University, Department of Anaesthesiology, Linköping, Sweden

Background and Goal of Study: Patients admitted to surgery are often dehydrated which might require cardiac output monitoring (goal-directed fluid therapy) to be corrected. This study proposes that even modest dehydration can be detected by kinetic analysis based on the Hb dilution following an infusion of acetated Ringer's solution.
Materials and Methods: Forty experiments were performed in 10 male healthy volunteers with a mean age of 22 years. All 10 underwent 4 experiments in random order that were separated by at least two days. The four arms consisted of infusing either 5 ml/kg or 10 ml/kg of Ringer's over 15 min. For both volumes, the volunteer was either in the euhydrated or dehydrated state. Dehydration of 1.5-2.0 L (about 2% of the body weight) was induced by repeatedly injecting 5 mg of furosemide. Sixty minutes were then allowed between the last dose of furosemide and the infusion of Ringer's. The venous Hb concentration was measured every 5 min during the first 50 min and then at 60, 70, 90 105 and 120 min. The Hb series was analyzed for the volume of distribution and fluid clearance according to a one-volume fluid model (1). The results are given as the median and 25th-75th percentiles. Two-way ANOVA based on ln-transformed data was used for statistics; the tested predictors were the infused volume and the presence of dehydration.
Results and Discussion: The volume of distribution did not differ significantly between the 4 experiments, but the fluid clearance differed by a factor of 3 between the euhydrated and dehydrated state. The overall clearance during normohydration was 152 (95-218) ml/min as compared to 50 (35-66) in dehydration ($P < 0.001$). The half-life of the infused fluid also differed greatly depending on the hydration status. In euhydration the half-life was 23 (12-37) min and in dehydration 76 (57-101) min. There was no benefit from infusing 10 ml/kg instead of 5 ml/kg. Using a cut-off of 90 ml/min, the fluid clearance predicted the presence of dehydration by a sensitivity of 1.0 and a specificity of 0.9. The same sensitivy and specificty was obtained when using a cut-off point of 40 min for the half-life.
Conclusions: Dehydration of 2% of the body weight can be detected from the Hb response to infusion of a small volume of Ringer's solution.
References:
(1) Hahn RG. Volume kinetics of infusion fluids (review). Anesthesiology 2010; 113: 470-481.
Acknowledgement: The study was financed as part of an ESA grant.

BAPCPC1-3

CYP2D6 and CYP3A genotypes influence metabolism of *R*- and *S*-ondansetron

Stamer U.M., Lee E.-H., Kleine-Brueggeney M., Zhang L., Musshoff F., Stuber F.
University of Bern, Department of Anaesthesiology and Pain Medicine, Bern, Switzerland

Background: An influence of polymorphic CYP2D6 genetic variants on antiemetic efficacy of ondansetron has been suggested [1,2]. However, the role of CYP3A in ondansetron metabolism has been obscure up to date. In this study the hypothesis that genotype dependent CYP2D6 and CYP3A activity selectively influences plasma concentrations of ondansetron enantiomers was evaluated. Additionally, the effects of doubling the ondansetron dose on genotype dependent plasma concentrations was investigated exploratively.
Methods: After approval of the local ethics committee and written informed consent patients scheduled for major abdominal surgery received i.v. ondansetron 4 mg (group O-4) or 8 mg (group O-8) for prophylaxis of PONV. CYP2D6 dependent activity score representing no, decreased, normal or increased CYP2D6 enzyme activity and CYP3A low (CYP3A5*3/*3) or high expressor status (CYP3A5*1/*1 or *1/*3) were determined by real-time PCR. Plasma concentrations of *R*- and *S*-ondansetron were measured by liquid chromatography-tandem mass spectrometry. Areas under the time concentration curves (AUC) of *R*- and *S*-ondansetron concentrations were associated to CYP2D6 and CYP3A5 genotype dependent enzyme activity.
Results: Complete data of 141 subjects could be analyzed. Concentrations of *S*-ondansetron differed between CYP2D6 activity groups ($p=0.04$) with highest measures in patients with no CYP2D6 activity (mean (5/95% CI): 362.5 (238.3/486.7) h·ng/ml) and lowest concentrations in those with increased activity (149.6 (114.5/184.8) h·ng/ml) compared to subject displaying genotypes resulting in reduced or normal CYP2D6 activity (263.6 (228.8/298.8), 255.4 (228.2/282.7) h·ng/ml). AUC of *R*-ondansetron was two-times higher in CYP3A5 low expressors compared to high expressors: (281.5 (248.6/314.3) vs. 142.5 (92.4/192.7) h·ng/ml; $p=0.009$. Doubling the ondansetron dose only increased plasma concentrations in individuals with low CYP3A5 activity with no increase in individuals with high enzyme activities ($p < 0.001$).
Conclusions: Metabolism of ondansetron seems to be enantioselective. Genetically and environmentally determined CYP2D6 and CYP3A enzyme activity might have implications for antiemetic efficacy.
References:
1. Candiotti KA et al. Anesthesiology 2005;102:543
2. Janicki PK et al. Anesth Analg 2006;102:1127
Acknowledgements: The study was supported in part by the R. Sackler Research Foundation.

BAPCPC1-4

Norepinephrine impaires pulse pressure variation reliability in discerning fluid responders and non responders

Silvestri R., Franchi F., Falciani E., Romano S.M., Giomarelli P., Scolletta S.
University of Siena, Department of Anaesthesiology and Intensive Care, Siena, Italy

Background and Goal of Study: Norepinephrine (NE) infusion increases the arterial tone and the venous return through vasoconstriction. Thus, an im-

provement in cardiac output (CO) in preload dependant patients can be observed. The effects of NE on vascular tone may alter the reliability of the "fluid responsiveness dynamic indicators" which are usually beat-to-beat estimated with the pulse contour methods (PCM).
We examined the ability of pulse pressure variation (PPV) in discerning fluid responders and non responders in trauma brain injury (TBI) patients supported with NE infusion.
Materials and Methods: 24 TBI patients (18 male, mean age 54±22, weight 75±18 Kg) were prospectively enrolled. Inclusion criteria were: mechanical controlled ventilation (tidal volume ≥8ml/kg), absence of arrhythmias, absence of inotropes infusions, invasive arterial blood pressure monitoring, intracranial pressure monitoring. In all patients a cerebral perfusion pressure ≥70 mmHg was maintained with NE infusion.
After starting NE, patients were divided into two groups according to PPV values (baseline time): group 1 = PPV≤13% (unlikely responders to fluid load), and group 2 = PPV>13%.
When the NE dosage reached the value of 0.25 μg/kg/min (NEmax time), a fluid challenge of 5 ml/kg colloids was performed in the group 2 (likely responders to fluid load) to evaluate how many patients would have been responders (increase in CO ≥10%). CO was assessed by echocardiography and PPV was monitored by an uncalibrated PCM (MostCare, Vygon, Padova, Italy).
Results and Discussion: See data in Table.

Variables	Group 1 (n=17)			Group 2 (n=7)			
	Baseline	NEmax	p	Baseline	NEmax	After fluid load	p
NE dosage (μg/kg/min)	0.16 ±0.08	0.25 ±0.08	<0.05	0.14 ±0.09	0.25 ±0.08	0.16 ±0.08	<0.05
PPV%	8.5 ±2.6	5.6 ±2.2	<0.05	18.5 ±6.2	12 ±6.5	11.4 ±5.5	<0.05
Mean Arterial Pressure (mmHg)	78.5 ±10.3	87.3 ±8.2	<0.05	81.8 ±13.7	88.5 ±9.5	89.5 ±9.6	<0.05
Heart Rate	83 ±19.8	84 ±19.3	0.7	92 ±20	89 ±20	87 ±18.6	0.08
CO (l/min)	4.9 ±1.3	5.2 ±1.9	0.11	5.07 ±1.2	5.49 ±1.3	5.65 ±1.5	<0.05

[Table]

With respect to baseline time, CO didn't change significantly compared to NEmax time. Conversely, NEmax time was significantly associated with a reduction of PPV in both the groups, with a greater extent in the group 2. After the fluid challenge in group 2, PPV and CO did not show a further significantly change as only two patients were responders.
Conclusion(s): The ability of PPV in discerning fluid responders and non responders is affected by norepinephrine. PPV guided therapy cannot be considered reliable during medium-high dose vasopressors therapy.

BAPCPC1-5

Mild hypothermia induced cardioprotection against ischemia/reperfusion injury mediated by nitric oxide in rat isolated heart model

Mochizuki T., Yu S., Katoh T., Aoki K., Sato S.
Hamamatsu University School of Medicine, Department of Emergency Medicine, Hamamatsu, Japan

Introduction: Hypothermia is a promising cardioprotective treatment for cardiac arrest. Previously, deep hypothermia of 32°C induced during ischemia and reperfusion exhibited a cardioprotective effect in a cardiomyocyte model of ischemia/reperfusion (I/R) injury [1]. However, it remains unknown whether mild hypothermia used in the clinical setting, or late induction exhibit cardioprotective effects. We hypothesized that mild 34°C hypothermia immediately after reperfusion would be cardioprotective in a rat isolated heart model. We also investigated whether the cardioprotective effect was mediated by nitric oxide (NO).
Methods: Male SD rats were anesthetized by diethyl ether followed by thoracotomy. After isolation, the heart was perfused at a constant pressure of 70 cm H2O, 37°C. Hemodynamic variables, coronary flow (CF), and perfusion temperatures were measured at baseline (control), immediately before 30 min global ischemia, immediately after reperfusion (reperfusion period), 10 min and 180 min after reperfusion. Rats were randomly divided into
a) control,
b) 34°C hypothermia induced by cooling of perfusate during the 30 min global ischemia and consecutive hypothermia period (ischemia group),
c) 34°C hypothermia induced during the reperfusion period (reperfusion group),
d) 34°C hypothermia induced during the reperfusion period with 400 mM L-NAME (reperfusion/L-NAME group).
The %LV infarct size was assessed by TTC staining. Results are expressed as mean±SD. Data were compared by two way repeated measured of ANOVA followed by Tukey-Kramer post hoc test. $P < 0.05$ was considered as significance.
Results: Hypothermia reduced the %LV infarct size when induced:
1) during global ischemia; from 51.9±19.7% (control) to 11.9±6.3% (ischemia, $p < 0.001$), or
2) after reperfusion (23.5±10.5%; $p=0.002$). L-NAME reversed the reduction of infarct size to 42.5±10.6% ($p>0.5$).
Temperatures of perfusate reached 34°C within 5 min after the start of cooling in all cases except for the control group.
Conclusions: Hypothermia exhibited a cardioprotective effect even when hypothermia was induced during the reperfusion period in the whole organ model. This suggests that inducing hypothermia of 34°C as quick as possible, even if induction of hypothermia is late by after cardiac arrest, contribute to the cardioprotective effect of mild hypothermia. The cardioprotective effect of mild hypothermia from I/R injury was mediated by NO.
References:
1) Am J Physiol Heart Circ Physiol 2010

BAPCPC1-6

The ubiquitin ligase Nedd4-2 is a potent regulator of the voltage-gated sodium channel Nav1.7 and is implicated in neuropathic pain

Laedermann C., Cachemaille M., Abriel H., Decosterd I.
University Hospital Center and University of Lausanne, Department of Anaesthesiology, Lausanne, Switzerland

Background and Goal of Study: Neuropathic pain (NP) occurs after a lesion of the nervous system and is associated with nervous system hyperexcitability. Peripheral nerve activity is mainly carried by voltage-gated sodium channels (VGSC), with Nav1.7 isoform being important for nociception. Ubiquitin ligases from the Nedd4 family are proteins that downregulate the expression of many membrane proteins such as VGSC. We hypothesized that Nedd4-2 is decreased in NP, leading to an increase of functional Nav1.7 at the membrane of nociceptors, in turn responsible for the hypersensitivity observed in NP.
Materials and Methods: We used the spared nerve injury (SNI) as an animal model of NP. Allodynia after SNI was assessed with Von Frey filament. Subcellular fractionation of dorsal root ganglia (DRG) allowing the separation of membrane and cytosol enriched fraction was performed to study the targeting of Nav1.7 after SNI. Nedd4-2 expression after SNI was investigated using both immunohistochemistry and westerblotting. *In vitro* whole cell patch clamp on HEK293 transiently transfected with Nav1.7 alone, or Nav1.7 and Nedd4-2 was used to record sodium currents (INa), where the peak current of INa reflects the quantity of functional Nav1.7 expressed at the membrane. Nav1.7 currents were also recorded in DRG cells in culture.
We used an adeno-associated virus intrathecally injected to exogenously overexpress Nedd4-2 in the DRG. T-test was used to compare SNI to Sham groups with GraphPadPrism software.
Results and Discussion: The subcellular fractionation of DRG showed that Nav1.7 was only increased in the membrane enriched fractions. Nedd4-2 was decreased in DRG after SNI in immunohistochemistry (40%, $p=0.0045$) and westernbloting (50%, $p=0.0078$). Co-transfection of Nav1.7 with Nedd4-2 reduced Nav1.7 current amplitude by ~80% ($p=0.0023$) confirming that Nedd4-2 downregulates Nav1.7 at the membrane.
Viral overexpression of Nedd4-2 in nociceptors decreased both the mechanical allodynia and Nav1.7 current (43%, $p=0.027$) in dissociated nociceptors observed after SNI, indicating that Nedd4-2 is sufficient for counteracting full development of allodynia.
Conclusion(s): Our observations pave the way for new avenues in therapeutics against neuropathic pain. We could decrease NP behaviour and restore normal level of excitability by acting on regulatory mechanisms such as the ubiquitin ligase pathway instead of directly targeting VGSC.
Acknowledgements: Supported by ESA and Synapsis Foundation

Best Abstracts - Runner-up Session 1

BAPCAP1-1

Maternal motor block during the second stage of labor and labor outcome: A comparison between programmed intermittent epidural bolus (PIEB) and continuous epidural infusion (CEI) analgesia

Stirparo S., Camorcia M., Farcomeni A., Capogna G.
Città di Roma Hospital, Department of Anaesthesiology and Intensive Care, Roma, Italy

Background and Goal of Study: PIEB resulted in reduced total local anesthetic dose and fewer additional boluses when compared to CEI[1].We evaluated whether PIEB may decrease the incidence of motor block (MB) at full cervical dilatation and of instrumental delivery when compared with CEI.
Materials and Methods: Nulliparous term women with spontaneous labor and cervical dilation < 4 cm, were admitted to this study. Epidural analgesia was initiated and maintained with levobupivacaine (L) 0.0625% + sufentanil 0.5 μg/mL. After 20 mL loading dose (LD), patients were randomized to receive PIEB (10 mL every hour starting 60 min after the LD) or CEI (10 mL/h, starting immediately after the LD). Breakthrough pain was treated by PCEA with L 0.125%. MB was assessed by the Bromage-Breen[2] scale (end point = occurrence of any motor block in either lower limb). Total L dose and hourly VAPS were noted. A sample of 70 subjects in each group guaranteed a power of at least 80% for a χ_2 test of association between both technique and MB, and technique and instrumental delivery (significance level 5%). Statistics were performed by Fisher exact, χ_2, Wilcoxon, Mann-Whitney tests and logistic regression where appropriate.
Results: We studied 145 subjects (PIEB =75; CEI =70). No differences in labor analgesia and duration of labor were observed. MB was reported in 37% in the CEI group and in 2.7% in the PIEB group (P< 0.001), and it was more frequent at full cervical dilatation in the CEI group (P< 0.001). The OR for MB was 21.17 (95%CI 4.9-129.3). MB occurred earlier in patients who received CEI (P< 0.001) with a HR of 7.83 (95%CI 1.99-30.81 P=0.0032). The incidence of instrumental delivery was 20% for the CEI group and 6.7% for the PIEB group (P=0.03). The longer the labor, the more the risk of instrumental delivery increased (P< 0.001, OR: 4.85, CI95%: 1.97-11.85). MB at full cervical dilatation significantly increased the risk of instrumental delivery (P=0.0019, OR: 230.26, CI 95%: 7.48-888.72). There was no difference in the cesarean section rate (21% CEI vs 17% PIEB). Total L dose was 36.9 mg (30.5-44.2) in the CEI group and 31.2 mg (25.0-37.5) in the PIEB group (P< 0.001).
Conclusions: PIEB resulted in less MB during labor and at full cervical dilatation and was also associated with a lower incidence of operative delivery when compared with CEI while providing equivalent labor analgesia.
References:
1. Wong CA et al. Anesth Analg 2006.
2. Breen TW et al. *Anesth Analg* 1993.

BAPCAP1-2

Efficacy and safety of caudal clonidine for pediatric anaesthesia: A quantitative systematic review of randomised controlled trials

Schnabel A., Poepping D.M., Kranke P., Pogatzki-Zahn E.M., Zahn P.K.
University Hospital of Muenster, Department of Anaesthesiology and Intensive Care, Muenster, Germany

Background and Goal of Study: Caudal anaesthesia provides safe and effective perioperative analgesia for children undergoing surgery. To prolong neuroaxial analgesia, additives are used and clonidine is one of the most popular additives for caudal anaesthesia worldwide. Aim of the present quantitative systematic review was to assess the efficacy and safety of the combined use of clonidine and local anaesthetics in comparison to caudal local anaesthetics alone.
Materials and Methods: All randomised controlled trials investigating caudally administered clonidine in addition to local anaesthetics in comparison to local anaesthetics alone were included in this review. The systematic search, data extraction, critical appraisal and pooled analysis were performed according to the PRISMA statement. Relative risk (RR), mean difference (MD) and the consecutive 95% confidence intervals (CI) were calculated using the Revman® as statistical software.
Results and Discussion: Twenty randomised controlled trials (published between 1994-2010) including 993 patients met the inclusion criteria. There was a longer duration of postoperative analgesia in children receiving clonidine in addition to local anaesthetic (MD: 3.72 hours; 95% CI: 2.61 - 4.84; P < 0.00001). A subgroup analysis investigating the influence of the most common used clonidine doses (1μg/kg, 2μg/kg) in addition to long lasting local anaesthetics showed a slightly longer analgesic effect in trials administering 1μg/kg clonidine in addition to long lasting local anaesthetics. Furthermore, there was a lower number of patients requiring rescue analgesics in the clonidine group (RR: 0.72; 95% CI: 0.57 - 0.90; P = 0.003). The pooled data analysis showed a lower RR for PONV in children receiving clonidine in addition to local anaesthetics (RR: 0.80; 95% CI: 0.56 - 1.12; P=0.19). The incidence of complications (e.g. respiratory depression) remained very low and was not different to caudal local anaesthetics alone.
Conclusion(s): There is considerable evidence that caudally administered clonidine in addition to local anaesthetics provides extended analgesia (around 4 hours) with a decreased incidence for analgesic rescue requirement and little adverse effects compared to caudal local anaesthetics alone. However, these results were limited by clinical heterogeneity due to different clonidine doses and the use of various types and doses of local anaesthetics.

BAPCAP1-3

The type of anaesthesia performed at the time of open radical prostatectomy for unconfined prostate carcinoma does not seem to influence cancer related-outcome in a follow-up of more than 10 years

Wuethrich P.Y., Burkhard F.C.
University Hospital Bern, Department of Anaesthesiology and Pain Medicine, Berne, Switzerland

Background and Goal of Study: Recently published studies have suggested that the anaesthetic technique performed during oncological surgery impacts disease recurrence in prostate cancer. The objective of this study was to assess if, depending on the type of anaesthesia, a difference in disease progression and survival could be determined in a selected patients' population at high risk of cancer progression after open retropubic radical prostatectomy (RRP).
Materials and Methods: A consecutive series of 148 patients (65 patients with general anesthesia combined with epidural analgesia and 83 with general anesthesia with postoperative ketorolac-morphine analgesia) who underwent RRP between January 1994 and December 2000 were reviewed. Mean follow-up was 10.4 years (SD ± 4). Only patients with non-organ confined prostate cancer (pathological T3/4) were included. Baseline anaesthesiological and surgical data did not differ significantly between the two groups except the amount of fentanyl used (0.4mg ±0.2 vs 0.7mg ±0.2, P< 0.001). Biochemical recurrence-free (BCR), cancer-specific, and overall survival were estimated using the Kaplan-Meier technique. The multivariate Cox-proportional-hazards regression model included all relevant variables.
Results and Discussion: Kaplan-Meier survival estimates for BCR-free survival, cancer-specific survival and overall survival did not differ significantly between the 2 groups (Log-rank P=0.95, P=0.92 and P=0.84). In multivariate analysis preoperative PSA (HR 1.01, 95% CI 1.00-1.02, P< 0.0001), specimen Gleason scores >7 (HR 0.42, 95% CI 0.25-0.70, P=0.001), nodal stage (HR 0.61, 95% CI 0.39-0.94, P=0.02) and transfusion rate (HR 0.48, 95% CI 0.28-0.83, P=0.008) were associated with higher risk of biochemical recurrence. Significant negative predictors for cancer-specific survival were specimen Gleason scores 7 and > 7 (HR 0.33, 95%CI 0.04-0.26, P=0.001 and HR 0.39, 95% CI 0.18-0.85, P=0.04) and nodal state (HR 0.38, 95% CI 0.15-0.96, P=0.04). Significant predictors of negative outcome for overall survival were specimen Gleason scores 7 and > 7 (HR 0.18, 95% CI 0.07-0.49, P< 0.001 and HR 0.49, 95% CI 0.25-0.97, P=0.026) and nodal state (HR 0.47, 95% CI 0.23-0.95, P=0.0.37).
Conclusion(s): The hypothesis that general anaesthesia with epidural analgesia reduces the risk of cancer progression and/or improves survival in patients after RRP for prostate cancer could not be substantiated in this long term follow-up of more than 10 years.

BAPCAP1-4

Source localisation of contact heat evoked potentials (CHEP) indicates different effects of propofol and remifentanil on cerebral processing of painful stimuli

Untergehrer G., Jordan D., Kochs E.F., Schneider G.
Universität Witten/Herdecke, Department of Anaesthesiology and Pain Medicine, Wuppertal, Germany

Background and Goal of Study: Cerebral processing of painful stimuli is investigated by EEG and imaging techniques. For contact heat evoked potentials (CHEP) specific brain areas have been identified [1]. Based on Low

Resolution Brain Electro-magnetic Tomography (LORETA) source localization, the present study analyses effects of subanaesthetic concentrations of propofol and remifentanil on these areas.
Materials and Methods: Approved by the university's ethics committee, 30 healthy male volunteers participated in the study. Standard monitoring parameters and 32 channel electroencephalogram (EEG) were recorded. For CHEP, heat pain was applied at the individual pain threshold by a CHEP stimulator (CHEPS Medoc, Israel). At baseline, CHEP were recorded without drug. Then, for each 15 subjects, CHEP were recorded under either propofol (0.5 μg/ml) or remifentanil (0.05 μg/kg/min). Cerebral activity of CHEP was analysed by LORETA power estimation (0.5-30 Hz EEG bandwidth, 350-500ms post-stimulus) in the frontal and somatosensory cortices and the limbic system. Drug induced changes were analysed with the Wilcoxon two-sample test ($p < 0.05$).
Results and Discussion: Estimated LORETA power of specific cerebral regions is affected differently by propofol and remifentanil. For propofol, LORETA power decreases in the limbic system, somatosensory and mainly frontal cortex. For remifentanil, no effects are detected in the frontal cortex. Power decreases in the somatosensory cortex and significantly in the limbic system.
Conclusion(s): Previous analysis of CHEP showed similar antinociceptive effects of propofol and remifentanil [2, 3]. The current results indicate differentiated drug specific mechanisms of analgesic effects. For propofol, the distinctive decrease of cerebral power in the frontal cortex suggests analgesic effects caused by reduced conscious pain processing. In contrast, remifentanil does not seem to influence the conscious processing of pain, but the pain perception itself. Strong effects in the limbic system are in accordance with the role of μ-agonists in mediating opioid analgesia [4].
References:
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BAPCAP1-5

Effects of intravascular volume replacement on lung function and damage in nonseptic experimental lung injury

Güldner A., Silva P.L., Uhlig C., Pelosi P., Rocco P., Gama de Abreu M.
University of Dresden, Department of Anaesthesiology and Intensive Care, Dresden, Germany

Background and Goal of Study: Intravascular volume replacement may be necessary during acute lung injury (ALI). We compared the effects of Ringer's acetate (RA), gelafundin (GEL), and hydroxyethyl starch (HES), on lung function and damage in experimental ALI.
Materials and Methods: ALI was induced by lung saline lavage followed by ventilator induced lung injury in 30 anesthetized pigs (28.4-42.8 kg). Protective ventilation (V_T=6ml/kg, PEEP=16cmH_2O) was initiated and »25% of the estimated blood volume was drawn. The intravascular volume was partially replaced with either RA, GEL or HES (n=10/group, random assignment) to achieve »80% of the intrathoracic blood volume (ITBV) measured before blood drainage. Gas exchange, hemodynamic variables and lung mechanics were measured during 4 hours of protective mechanical ventilation. Lung histological damage, pro-inflammatory lung response and wet-to-dry (W/D) ratio were assessed post-mortem.
Results and Discussion: The two-hit model resulted in severe hypoxemia (PaO2/FiO2 = 61 ± 23 mmHg). Following blood drainage, the amount of fluid needed to achieve the target ITBV was higher in RA (2250±764 ml) than GEL (704±159 ml) and HES (837±82 ml) groups ($p < 0.05$). Gas exchange and hemodynamic variables did not differ among groups but lung elastance was lower with HES and GEL than RA. The diffuse alveolar damage was lower in ventral areas with GEL ($p < 0.05$) and showed a trend toward decreased values with HES compared to RA. In ventral areas, the colloids reduced the gene expression of IL-1b compared to the crystalloid. In dorsal areas, the gene expression of IL-8 was reduced with GEL ($p < 0.05$) and showed a trend toward lower levels with HES, compared to RA. Both colloids resulted in lower W/D ratios compared to the crystalloid (GEL: 6.5±0.5, HES: 6.5±0.7, RA: 7.9±1.0, respectively; $p < 0.05$).
Conclusion(s): In this non-septic model of ALI, intravascular volume replacement with Ringer's acetate worsens lung elastance, histological damage, the pro-inflammatory lung response and edema compared to gelatin and hydroxyethyl starch solutions.

BAPCAP1-6

Comparison of three different tests for screening delirium in critically ill patients

Kavlak E., Dilek A., Ulger F., Arik A.C., Karakaya D., Azar H.
Ondokuz Mayis University, School of Medicine, Department of Anaesthesiology and Intensive Care, Samsun, Turkey

Background and Goal of Study: Delirium is accepted as a common sign of acute brain dysfunction in intensive care unit (ICU) patients. An ideal delirium screening test must be performed rapidly and accurately at the bedside by nurses and staff in ICU.
In this study we aimed to compare the "The Diagnostic and Statistical Manual of Mental Disorders" (DSM-IV), which is accepted as an international criteria for diagnosing delirium, with the "Confusion Assessment Method for the Intensive Care Unit" (CAM-ICU), "Intensive Care Delirium Screening Checklist" (ICDSC) and Nursing Delirium Screening Scale" (Nu-DESC) in critically ill patients.
Materials and Methods: After ethical committee approval, 70 patients who stayed in ICU for more than 48 hours and who had Richmond Sedation-Agitation Scale (RASS) ≥ -3 were included into this study in a double-blinded manner. RASS and CAM-ICU values were assessed by a resident. These patients were also assessed by another resident with ICDSC and by an ICU nurse with Nu-DESC.
A consulting psychiatrist also evaluated each patient for diagnosis of delirium according to DSM-IV criteria. These four assessments were performed once for each patient, in the same period. Using the DSM-IV, as a gold standard for delirium, the sensitivity and specificity of each test were calculated.
Results: According to DSM-IV criteria, delirium was identified in 12 patients. Male patients experienced statistically higher delirium rate (88.3%) than female patients (16.7%). The sensitivity, specificity and predictive values of tests are shown in Table 1. APACHE II scores and length of stay in ICU were longer in delirious patients ($p < 0.05$). SOFA scores were similar between delirious and non-delirious patients.

	Sensitivity (%)	Specificity (%)	PPV (%)	NPV (%)	Kappa
CAM-ICU	58.33	96.55	77.78	91.80	0.609
ICDSC	75.00	96.55	81.82	94.92	0.740
Nu-DESC	58.33	100.00	100.00	92.06	0.699

[Table 1]

Conclusions: Our study showed that the ICDSC is the most sensitive and the Nu-DESC is the most specific test for screening delirium. It was also shown that, the Nu-DESC, which is designed for different clinical usages, can also be implemented successfully in the intensive care units by the intensive care nurses as well as CAM-ICU and ICDSC, which are accepted as the standard criteria for delirium diagnosis in intensive care units.

Best Abstracts - Runner-up Session 2

BAPCAP2-1

Does preoperative aspirin improve outcomes in cardiac surgery patients?

Sun J., Cao L., Liu H., Sun W., Silvestry S., Diehl J.
Thomas Jefferson University, Department of Anaesthesiology, Philadelphia, United States

Background and Goal of Study: The effects of preoperative aspirin on major cardiocerebral and renal outcomes and mortality remain uncertain.

Materials and Methods: A multicenter/retrospective cohort study was performed on consecutive patients (n= 4256) receiving cardiac surgery (most were for CABG or/and valve surgery) in two university medical centers in the United States from 2001 to 2009. The patients excluded were those with preoperative anticoagulants, ADP inhibitors, Gp IIbIIIa inhibitors, antiplatelets or unknown aspirin use. Primary outcomes included 30-day mortality, renal failure and a composite outcome - major adverse cardiocerebral events (MACE) that included permanent or transient stroke, coma, perioperative myocardial infarction (MI), heart block and cardiac arrest.

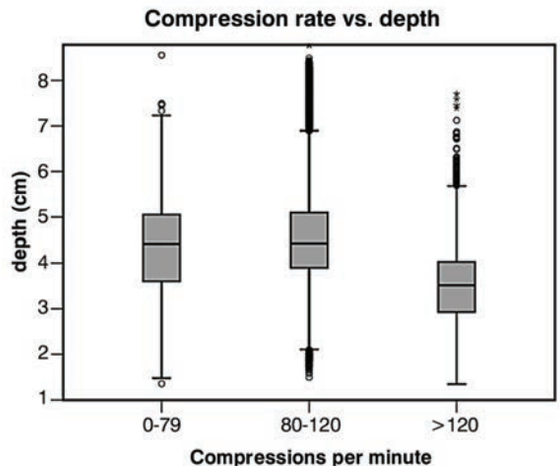
Results and Discussion: Of all patients, 2868 patients met the inclusion criteria and were divided into two groups: those taking (n=1923) or not taking (n=945) aspirin within 5 days preceding surgery. The groups did not differ significantly in baseline parameters including body mass index, smoking, congestive heart failure and intra-operative cross-clamping time. Patients in the aspirin group had significantly more with history of hypertension, diabetes, peripheral arterial disease, previous MI, angina, cerebrovascular disease, chronic lung disease, older age and male gender; also were associated with more preoperative using beta-blockers and rennin-angiotensin system inhibitors, and more left main and multiple coronary artery disease, but spent less time in bypass perfusion. With propensity scores adjusted and multivariate logistic regression, however, the results of this study showed that preoperative use of aspirin significantly reduced the incidence of MACE (8.7% incidence in the aspirin group vs. 10.8% in the non-aspirin group, adjusted odds ratio [OR]: 0.662, 95% confidence interval [CI]: 0.482-0.909, P=0.011), postoperative renal failure (3.7% vs. 7.1%, OR 0.384, 95% CI 0.254-0.579, P< 0.001), and 30-day mortality (3.5% vs. 6.5%, OR 0.611, 95% CI 0.391-0.956, P=0.031) in the patients undergoing cardiac surgery.
However, 30-day readmission and intensive care unit stay did not show a significant difference between two groups.
Conclusion(s): The results of this study showed that preoperative therapy of aspirin significantly reduced major cardiocerebral complications, renal failure and 30-day mortality in patients undergoing cardiac surgery.

BAPCAP2-2

Excessive chest compression rate is associated with insufficient compression depth in out-of-hospital cardiac arrest

Kalmar A.F., De Smet J.M., Annaert E.L., De Regge M., Calle P.A., Monsieurs K.G.
Ghent University Hospital, Emergency Department, Gent, Belgium and University Medical Centre Groningen, Department of Anaesthesiology, Groningen, Netherlands

Background and Goal of Study: In the latest Consensus on Science and Treatment Recommendations on Cardiopulmonary Resuscitation (ref), the relationship between compression rate and compression depth is considered to be a knowledge gap. In order to characterize this relationship, we performed an observational study in pre-hospital cardiac arrest patients.
Materials and Methods: In patients undergoing out-of-hospital cardiopulmonary resuscitation by health care professionals, chest compression rate and depth were recorded using an accelerometer (E-series monitor-defibrillator, Zoll, USA). The monitor provided real-time corrective feedback for compression rates < 80/min and for depth < 4 cm. Compression depth was analyzed for rates < 80/min, 80-120/min and >120/min. A difference in compression depth ≥5 mm was considered potentially clinically significant.
Results and Discussion: Thirty-one consecutive patients were analyzed (50375 compressions, on average 1625 per patient). Of all compressions 2% were < 80/min, 63% between 80-120/min and 35% >120/min. Mean compression depth for rates 80-120/min was 4.5 cm (SD=1) compared to 3.5 cm (SD=1) for compressions >120/min (P< 0.001; see Figure). In 20 out of 31 (64%) patients a statistically significant lower depth was observed for rates >120/min compared to rates 80-120/min, in 10 out of 31 (32%) this difference was also clinically significant. There was no difference between the mean depth of compressions < 80/min and the mean depth of compressions 80-120/min.



[Compression rate vs. depth]

Conclusion: Compression rates >120/min were associated with a lower compression depth. The observation that compression depth is lower with increased compression rates underscores the importance on feedback of rate and depth during CPR.
References:
Nolan JP et al. Executive Summary 2010 International Consensus on Cardiopulmonary Resuscitation and Emergency Cardiovascular Care Science With Treatment Recommendations. Resuscitation 2010; 81S: e1-e25.

BAPCAP2-3

Dexmedetomidine depresses glutamate release in rat cerebral cortex nerve terminals through suppression of Ca^{2+} influx and mitogen-activated protein kinase signaling cascade

Lu C.-W., Chen I.-Y., Lin T.-Y., Wang S.-J.
Far Eastern Memorial Hospital, Department of Anaesthesiology, Taipei, Taiwan, Republic of China

Background and Goal of Study: Dexmedetomidine is a highly selective α2A-adrenergic receptor agonist, which has been widely used for sedation in the intensive care unit and operating room. Dexmedetomidine has been found to be neuroprotective in recent studies and the exact mechanisms haven't been fully verified. Considering the fact that glutamate is the principle excitatory neurotransmitter in the brain and excessive glutamatergic synaptic transmission can cause neuronal excitotoxicity, we hypothesized that dexmedetomidine may exhibit its neuroprotective effect through inhibiting glutamate release
Materials and Methods: Isolated nerve terminals (synaptosomes) purified from Sprague-Dawley rat cerebral cortex were used to examine the effect of dexmedetomidine on glutamate release evoked by 4-aminopyridine (4-AP). The attribution of different α2 receptor subtypes on the dexmedetomidine-mediated glutamate release was also determined by different subtype antagonists. The effects of dexmedetomidine on the Synaptosomal membrane potential and Ca^{2+} influx were also examined by $DiSC_3(5)$ and Fura-2, respectively. Finally, Western blotting was used to investigate the downstream signaling pathway.
Results and Discussion: Results showed that dexmedetomidine exhibited a dose-dependent inhibition of 4-AP-evoked release of glutamate. The effect of dexmedetomidine on the evoked glutamate release was abolished by α2A adrenergic receptor antagonist, BRL44408, but was insensitive to α2B antagonist, ARC239. In addition, this inhibition was prevented by chelating the intrasynaptosomal Ca^{2+} ions and by the vesicular transporter inhibitor. Dexmedetomidine decreased depolarization-induced increase in intrasynaptosomal Ca^{2+}, whereas it did not alter the resting synaptosomal membrane potential or 4-AP-mediated depolarization. Moreover, the inhibitory effect of dexmedetomidine on evoked glutamate release was prevented by the mitogen-activated protein kinase (MAPK) inhibitors PD98059 and U0126. Western blotting showed that dexmedetomidine significantly decreased the 4-AP-induced phosphorylation of MAPK, and this effect was blocked by PD98059.
Conclusion(s): Dexmedetomidine inhibits glutamate release from rat cortical synaptosomes through the suppression of presynaptic voltage-dependent Ca^{2+} entry and MAPK signaling cascade. This may delineate the mechanism of neuroprotective effect provided by dexmedetomidine in neuropathological conditions associated with excessive glutamate release.

BAPCAP2-4

Genetic associations of chronic wound pain after surgery

Gin T., Meng Z., Liu X., Cheng C., Chan M.
Chinese University of Hong Kong, Department of Anaesthesia and Intensive Care, Shatin, Hong Kong

Background and Goal of Study: Chronic postoperative wound pain is a major clinical problem. Depending on the type of surgery, between 10 and 40% patients develop persistent pain even after the surgical wound has apparently healed.
Although the causes are largely unclear, inheritable factors may be associated with this chronic pain. The purpose of this study is to identify the association of single nucleotide polymorphisms (SNPs) with chronic wound pain after major abdominal surgery.
Materials and Methods: The study was approved by the Clinical Research Ethics Committee. Patients undergoing open abdominal surgery gave written consent. Using the modified brief pain inventory, we recorded the severity of post-surgical wound pain at 6 months after surgery. Venous blood was collected for genotyping using TaqMan assays.
The association between SNPs or haplotypes with chronic postoperative wound pain was tested with a multivariate regression model. A *P* value < 0.05

was considered statistically significant.
Results and Discussion: Of 228 patients who completed the follow-up interviews, 91 patients (39.9%) reported persistent wound pain. Twenty patients (8.8%) had pain score > 5 (0= least and 10 = worst possible pain). We observed a lower rate of chronic wound pain in patients carrying minor allele for GTP cyclohydrolase 1 (GCH1), catechol-O-methyl transferase 1 (COMT1) and βarrestin2 genes (Table 1).
Further scanning of SNPs and analysis of haplotypes or linkage disequilibrium in these genes (regions) may help to identify functional genetic polymorphisms and other candidate genes that may contribute to the development of persistent pain after surgery.
Conclusions: Chronic wound pain after surgery is associated with some genetic polymorphisms.

SNP	Wild type (n)	Minor allele (n)	Odds ratio (95%CI)	P value
COMT gene rs4680 [G/A]	58/128	31/100	0.54 (0.31-0.94)	0.03
βarrestin2 gene rs1045280 [T/C]	61/137	28/91	0.55 (0.32-0.97)	0.04
GCH1 gene rs8007201 [A/G]	41/89	44/128	0.61 (0.35-1.07)	0.08
GCH1 gene rs4411417 [T/C]	46/95	42/130	0.51 (0.30-0.88)	0.02
GCH1 gene rs8007267 [C/T]	71/169	15/53	0.55 (0.28-1.07)	0.08

[Table 1]

BAPCAP2-5

Succesfully implementation of a programme to reduce allogenic blood transfusion in total knee arthroplasty

Morales M., Asbert R., Bernal J.
Hospital Universitari Mutua Terrassa, Department of Anaesthesiology and Pain Medicine, Terrassa, Spain

Background and Goal of Study: Total Knee Arthroplasty(TKA) is a procedure associated with important blood loss. The optimum strategy for reducing Allogenic Blood Transfusion(ABT) is not established. Preoperative Haemoglobin(Hb) value is the most important predictive factor for ABT. We conducted a non-randomized prospective controlled study for reducing transfusional index. We compared transfusional rate and volume and stay in the hospital as a quality programme developed in three steps.
Materials and Methods: Between January 2008-September 2010, 736 consecutive patients operated of a primary TKA were distributed in three groups: Control Group(CG) before implementation of the programme; Treatment Group(TG) patients were distributed in four subgroups with regard to their preoperative Hb value and received preoperative treatment (A:Hb>15g/dl, no treatment; B:Hb 13-15g/dl received 200mg iv iron one week before surgery; C:Hb 11-12.9g/dl received 200mg iv iron + erythropoietin (rhEPO) 40,000 UI sc two weeks and 200mg iv iron one week before surgery and D:Hb< 11g/dl received 200mg iv iron+rhEPO 40,000UIsc three weeks and two weeks before surgery.
All patients received 200mg iv iron after surgery. Tranexamic Group(ATG) patients were treated like TG and we added 2 doses of Tranexamic Acid 10mg/kg iv before and 3 hours after tourniquete release. All patients had a postoperative blood reinfusion system. ABT was performed if Hb value was ≤8.5 g/dl. We recorded the need of ABT and number of units. Also demographic data, duration of hospital stay, Hb and haematocrit preoperative values before and after assigned treatment and in the postoperative days 1,2,3.
Results and Discussion: 736 consecutive patients were included. 127 patients in the CG, 438 patients in the TG and 171 in the ATG.
Patients were similar in demographic data, type of prosthetic implant and length of surgery. Transfusional rate was 18.1% in CG, 10,73% in TG and 7.6% in ATG ($p< 0.05$). Transfusional volume was 0.35±0.84units/patient in CG, 0.21±0.67u/p in TG and 0.16±0.59u/p in ATG ($p=0.0634$).
Length of stay was 9.31± 4.02 days in CG, 7.45±2.9 days in TG and 6.58±2.96 days in ATG ($p< 0.05$). No adverse effects were recorded.
Conclusion(s): The progressive implementation of a programme to reduce allogenic blood transfusion with iron iv, rhEPO and tranexamic acid has diminished the transfusional rate in 45.6%, the transfusional volume in 45.7% and the duration of hospital stay in 2,7days in our patients.

BAPCAP2-6

Sevoflurane-induced preconditioning in the isolated heart is abolished in Ecto-5'-nucleotidase- and A_{2B}-adenosine receptor knockout mice

Damm M., Stehr S.N., Huebler A., Panousis P., Koch T., Deussen A.
University Hospital Carl Gustav Carus, Department of Anaesthesiology and Intensive Care, Dresden, Germany

Background and Goal of Study: Ecto-5'-nucleotidase (CD73) and A_{2B}-adenosine receptors (A2B-AR) are involved in both ischemic preconditioning and anaesthetic-induced preconditioning [1; 2]. This study focused on sevoflurane (sevo) -induced preconditioning in CD73 (CD73-KO) and A2B-AR (A2BAR-KO) knockout mice.
Materials and Methods: Experiments were performed with isolated hearts from 12 (6-wk-old) male C57BL/6 (wild type = WT), 12 (6-wk-old) male CD73-KO and 12 (6-wk-old) male A2BAR-KO mice. In all three groups six control hearts were matched to six hearts subjected to 15 min of 2.8 vol. % sevo. Infarction was induced by 60 min of left coronary artery occlusion followed by 30 min reperfusion. Ventricular pressure, $+dP/dt_{max}$, 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 by microspheres and propidium iodide staining. Data analysis was performed using Two-Way-ANOVA and post-hoc analysis by Bonferroni.
Results and Discussion: Infarct size in the WT-control group was 67.3 ± 2.3 % of AAR. Control hearts from CD73-KO (55.3 ± 2.3 % of AAR) and A2BAR-KO (66.2 ± 1.8 % of AAR) showed similar infarct sizes. Application of sevo in WT reduced infarction significantly (33.6 ± 2.1 % vs. 67.3 ± 2.3 % of AAR; with sevo vs. without sevo; n=6 each; $p \leq 0.01$). Sevo-induced preconditioning failed in CD73-KO (52.3 ± 3.6 % vs. 55.3 ± 2.3 % of AAR; CD73-KO with sevo vs. CD73-KO without sevo; n=6 each) and in A2BAR-KO (70.3 ± 1.7 % vs. 66.2 ± 1.8 % of AAR; A2BAR-KO with sevo vs. A2BAR-KO without sevo; n=6 each).
Conclusion(s): These data underlines the major role of CD73 and A2B-AR in sevo-induced preconditioning in the isolated mouse heart.
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Acknowledgements: CD73-KO and A2BAR-KO were kindly provided by Prof. Triantafyllos Chavakis and Dr. David Köhler. This study was supported by the ESA research grant.

Evidence-based Practice and Quality Improvement

1AP1-1

Esmolol vs epidural anesthesia in bariatric surgery: Pain control and postoperative outcome

Casalino S., Fabozzi M., Millo P., Cena A., Angellotti A., Albani A.
Ospedale Regionale di Aosta U. Parini, Department of Anaesthesiology, Aosta, Italy

Background and Aims: In the last 20 years several scientific works have shown anesthetic sparing effects of beta-blockers. Epidural anesthesia is effective in the treatment of the postoperative pain after bariatric surgery but it could be technically difficult in the obese patient and it could expose to the risk of epidural hematoma. We have hypothesized that the perioperative pain could be treated by intraoperative infusion of esmolol.
Materials and Methods: From 2008 to 2010 we have submitted to bariatric surgery 100 next patients: 68 patients treated by preoperative epidural anesthesia and 32 treated by intraoperative i.v. esmolol. The primary outcome was the intensity of postoperative pain; the secondary outcomes were: the presence of nausea and vomiting (PONV) and the resumption of the peristalsis. The statistical study was performed by SPSS software (version 12.0, SPSS Inc.; Chicago, [Il]).
Results and Discussion: The two groups were homogeneous as demografic data, clinical preoperative parameters, comorbidity. The results are shown in table 1.

	ESMOLOL n=32	EPIDURAL n=68	P
MALE	10 (31%)	21 (30,9)	NS
FEMALE	22 (69%)	47 (69,1%)	NS
AGE	43,65 (±9,26)	41,99 (±8,31)	NS
BMI	48,87 (±9,12)	45,45 (±6,52)	0.067
END OF OPERATION -- >EXTUBATION min	62,92 (±45,99)	86,34 (±55,83)	0.049
OPERATION TIME	202 (±69)	219 (±48)	NS
DELTA pCO2 pre-post extubation %	+14,6% (±12,8%)	+17,3% (±14,8%)	NS
VAS at 3rd hour (range 0-4)	0,39 (±0,62)	0,55 (±0,72)	NS
VAS at 6th hour	0,29 (±0,46)	0,45 (±0,63)	NS
VAS at 1st p.o. day	0,17 (±0,46)	0,54 (±0.68)	0.01
resumption of peristalsis	3.00 (±0,73)	4,72 (±1,46)	0.001
PONV 1st p.o. day	3 (9,3%)	9 (13,2%)	NS

[Table 1]

Conclusions: The continuous i.v. infusion of esmolol is effective and safe. The pain at 3rd and 6th hour are equal in the two groups but surprisingly lower at 1st p.o. day in the group treated by esmolol. The PONV is equal in the two groups but the resumption of the peristalsis is less than 1.5 days in esmolol group. Further prospective randomized studies are necessary to confirm our data, which, however, remain encouraging.

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1AP1-2

Efficacy of several neuromuscular monitoring modes at the P6 acupuncture point in preventing postoperative nausea and vomiting

Kim K.S., Lee H.J., Shim J.C.
Hanyang University Hospital, Department of Anaesthesiology and Pain Medicine, Seoul, Korea, Republic of

Background and Goal of Study: The primary purpose of this study was to test the efficacy of several neuromuscular monitoring modes at the P6 acupuncture point in preventing postoperative nausea and vomiting (PONV).
Materials and Methods: In this prospective, double-blind, randomized, placebo-controlled trial, 264 women undergoing laparoscopic hysterectomy were evaluated for PONV. Neuromuscular blockade was monitored by acceleromyography with 1 Hz single twitch (ST) over the ulnar nerve (n = 54, control), and ST (n = 52), train-of-four (TOF) (n = 53), double-burst stimulation (DBS) (n = 53), or tetanus (n = 52) over the median nerve.
Results and Discussion: The incidence of PONV (P = 0.022), the number of requests for patient-controlled analgesia (PCA) (P = 0.009), and total PCA volume (P = 0.042) 6 h after tetanic stimulation were significantly reduced the in the treatment group compared to the control group. Overall, patients in the tetanus group were more satisfied with their management of PONV compared to patients in the control group.
Conclusion(s): Tetanic stimulation applied to the P6 acupuncture point can reduce PONV after laparoscopic hysterectomy compared to ST stimulation of the ulnar nerve, resulting in a greater degree of patient satisfaction. Neither ST, TOF, nor DBS stimulation applied to the P6 acupuncture point significantly affected PONV.

1AP1-3

Determinants of mortality in femoral neck fractures treated surgically

Garcia T., Rebelo H., Oliveira R., Barbosa M., Dias J., Tavares J.
Hospital São João; Faculdade de Medicina da Universidade do Porto, Department of Anaesthesiology, Porto, Portugal

Background and Goal of Study: Hip fractures have a high 30 days postoperative mortality. The aim of the study was to determine predictors of mortality in the population with Femoral Neck Fractures (FNF) submitted to surgical treatment.
Materials and Methods: Retrospective study of patients admitted for surgical treatment of FNF between Jan 2007 and Jun 2008. Patient characteristics, anesthesia, surgical technique, complications and length of stay in hospital (LOSH) were evaluated. Cardiac disease includes heart failure, valvular disease, ischemic heart disease, and arrhythmia. Pulmonary disease includes obstructive and restrictive affections. Statistic associations performed with Chi-square or Fisher's exact test.
Results and Discussion: 298 patients were reviewed and 284 met the inclusion criteria.
The variables found to be independent predictors of mortality were: age > 85 years (67% vs 39%; p=0,031), cardiac disease (87% vs 42%; p< 0,01), chronic renal failure (53% vs 14%; p= 0.001), more than 3 co-morbidities (60% vs 29%; p= 0.02), ASA physical status III/IV (73% vs 46%; p=0.02), intraoperative blood transfusion (53% vs 26%; p=0.032), arthroplasty as surgical technique compared to osteosynthesis (60% vs 28%; p=0.017) and postoperative complications (53% vs 12%; p< 0.001).
There was no statistically significant association between mortality and: gender (p=0.574), anemia -Hb< 10 g dl/L- (20% vs 11%; p=0,232), time to surgery >=3 days (60% vs 36%; p=0.062), regional anesthesia as anesthesic technique compared to general anesthesia (73% vs 81%; p= 0.506), remain co-morbidities: [arterial hypertension (60% vs 51%; p=0,494), respiratory disease (33% vs 18%; p= 0.173), stroke (27% vs 25%; p=0.767), diabetes mellitus (33% vs 26%; p=0,552), domiciliary anticoagulation therapy (7% vs 16%; p=0.479)], ICU admission (7% vs 2%; p=0.319) and LOSH > 14 days (47% vs 30%; p=0.248).
Conclusion: According to our results, the predictors of mortality in femoral neck fractures treated surgically are: cardiac disease, chronic renal failure, ASA physical status III/IV, intraoperative blood products, arthroplasty and postoperative complications.

References:

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1AP1-4

Is there any difference in outcome between ASA III-IV and ASA I-II patients in ambulatory surgery? A retrospective review

Gaspar S., Dias S., Lemos P.
Hospital Central do Funchal, Department of Anaesthesiology, Funchal, Portugal

Background and Goal of Study: The rapid recovery of patients and an efficient time management are the goals of ambulatory surgery, making patient selection key in the success of ambulatory surgery centres (ASC). Traditionally, ASA I-II are the most appropriate patients, nevertheless, due to constraints in national healthcare services programs, pressure has been done in order to change selection criteria policy to allow sicker patients (ASA III-IV) to undergo more extensive surgery.
The authors intend to verify if there is any difference in outcome between ASA I-II and ASA III-IV patients in an ambulatory surgery program.
Materials and Methods: A retrospective review was conducted using the database of the ASC, between May 2006 and December 2009.
The statistical analysis was made using the Stata 10.0 software. The averages and standard-deviations were calculated for continuous variables and frequencies for qualitative variables. The Chi-square test was used to compare the two groups.
Results and Discussion: The sample had a total of 4672 patients, with 89,6% in group 1 (ASA I-II) and 10,4% in group 2 (ASA III-IV). Out of the total sample, 38 patients (0,8%) were admitted to the hospital and 56 (2,0%) used a health service in the first 24hours after surgery, with no statistical differences between the groups.
Group 2 had a lower incidence of functional limitations 24hours after surgery than group 1, and this difference is statistically significant (p< 0,01).
There is also a statistically significant difference (p< 0,001) between the types of anaesthesia used in both groups, group 1 with 77,7% of general anaesthesias and group 2 with 49,3% of sedation and regional anaesthesia.
A statistically significant difference was also observed in terms of surgical specialty (p< 0,01), gynecology and orthopedics more present in group 1 and general and vascular surgeries in group 2.
Conclusion(s): The authors conclude that ASA III-IV patients have identical morbidity as ASA I-II patients, supporting the safety of the patient selection protocol of the ASC.
Nevertheless, ASA III-IV patients have fewer functional limitations post-operatively and a greater number of sedations and regional anaesthesia, raising the question if they are not being subjected to less complex surgeries and using less aggressive anaesthetic techniques, thereby explaining their better outcome. Further studies to support these results will be needed.

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1AP1-5

Confirmation of tracheal tube placement and tracheal tube removal practice following unsuccessful resuscitation

Reddy H.P, Rassam S.S., Hodzjic I., Chethan D.B., Hall J.E.
University Hospital of Wales, Department of Anaesthesiology and Intensive Care, Cardiff, United Kingdom

Background and Goal of Study: Clinical confirmation of correct endoracheal (ETT) position during and following a cardiopulmonary resuscitation attempt can be misleading. The last Confidential Enquiry into Maternal and Child Health (CEMACH) highlighted the limitations of current methods of confirmation. The Association of Anaesthetists of Great Britain and Ireland (AAGBI) recommend using capnography to confirm the ETT position and this is now the minimum safe standard across the UK.
However, there may not be sufficient carbon dioxide delivered to the lungs during a cardiac arrest which renders this technique fallible. There are no clear guidelines regarding the confirmation of correct ETT placement and its removal after an unsuccessful attempt at resuscitation.
Materials and Methods: A questionnaire was sent to anaesthetists of all grades working in Wales. The questionnaire was anonymous and asked the following questions:

1. What devices are available in your department to confirm ETT intubation and what is the anaesthetists' preference.
2. Anaesthetists' attitude towards ETT removal after an unsuccessful resuscitation.
3. Whether or not anaesthetists felt there was a need for guidelines regarding airway management after failed resuscitation.

Results and Discussion: Replies were received from 345 of 571 posted questionnaires (60% response rate). The methods used to confrim correct ETT placement were:
93% direct laryngoscopy and auscultation

- 61% capnography
- 4% colorimteric carbon dixide detectors
- 2% impedance respirometry
- 9% used other methods such as misting of the tube and chest movement.
- Regarding ETT removal following unsuccessful resuscitation, 50% would remove ETT, 30% would leave it in situ and the remainder were unsure of what to do. However, of those respondents who would extubate the patient, only 37% confirmed ETT position prior to removal. Almost 50% said they would like formal guidelines on the subject, 15% were unsure and 35% thought they wouldn't be necessary.

Conclusion(s):
There was no consensus view on extubation practice, following unsuccessful resuscitation

1. We recommend confirming ETT position prior to extubating, this was not done universally
2. 50% felt there was a need for guidelines regarding extubation post resuscitation
3. Documentation about airway management during a resuscitation was extremely poor.

References:
CEMACH report 2003 - 2005 AAGBI minimum safe monitoring standards

1AP1-6

Outcome and quality of life after hepatectomy

Veiga D.M., Luís C., Parente D., Fernandes V., Botelho M., Abelha FJ.
Hospital São João, Department of Anaesthesiology, Porto, Portugal

Background and Goal of Study: Hepatectomy is commonly performed in malignant or benign hepatic diseases and for living donor. Most studies are limited to study mortality and morbidity rates, costs and length of hospital stay (LOS). The aim of the present study was to evaluate outcome and quality of life after hepatectomy and to study its determinants.
Materials and Methods: This prospective study was carried in a Post-Anaesthesia Care Unit (PACU) during a period of 10 months. Thirty five patients were submitted to hepatectomy and were enrolled in this study. Demographic and peri-operative characteristics were evaluated for associations with mortality. At admission and six months after discharge, patients were contacted to complete a Short Form-36 questionnaire (SF-36) and to have their dependency in Activities of Daily Living (ADL) evaluated using Katz and Lawton scales. Patient's characteristics and postoperative follow-up data were compared using Mann-Whitney U test and Fisher's exact test. Patient preoperative characteristics were evaluated for associations with mortality using bynary and multiple logistic regression analyses.
Results and Discussion: The mortality rate was 5% at six months. Univariate analysis identified intra-operative amount of erythrocytes administrated, dyslipidemia and Revised Cardiac Index (RCRI) as determinants for mortality. The multiple logistic regression analyses identified the amount of erythrocytes administrated as an independent risk determinant for mortality at six months. At admission 42% considered that their health in general was worse than one year before and six months after discharge 8% stated the same opinion.Six months after PACU discharge patients had lower SF-36 scores for physical function comparing with admission scores. At this time patients were more dependent in instrumental ADL (26% were dependent in at least one activity versus 0% before surgery, p=0.022).
Conclusion(s): This study identified intra-operative amount of erythrocytes administrated, dyslipidemia and RCRI as risk factors for mortality 6 months after hepatectomy. Survivors who have undergone hepatectomy perceive an improved quality of life although they are more dependent in instrumental ADL tasks and have worse scores in the physical function of the SF-36 .
References:
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1AP1-8

Postoperative cognitive dysfunction after cardiopulmonary bypass demonstrated by psychometric testing - is it really common complication?

Kačar M.B., Kačar S.M., Đorić V.V., Majdevac S.M., Zagoričnik M.R., Čemerlić-Ađić N.L.
Institute for Cardiovasculare Deseases of Vojvodina, Department of Anaesthesiology, Sremska Kamenica, Novi Sad, Serbia

Background and Goal of Study: Postoperative cognitive dysfunction (POCD) after cardiac surgery is a common complication with an unclear pathophysiology leading to significant morbidity. Goal of study was to examine the causes of cognitive impairment after cardiopulmonary bypass.
Materials and Methods: 84 consecutive, unselected patients undergoing CABG and/or valve procedures using CPB entered the study.Exclusion criteria included:recent stroke, high -grade carotid stenosis,chronic renal failure, hepatic insufficiency,aortic arch procedures, psychiatric desease.All pts were administered a validated neurocognitive battery preoperatively, postoperatively prior to discharge and 3 months after operation. C-reactive protein (CRP) is also quantified from serum preoperatively, 6h after operation and on discharge. Impact of hemodynamicaly stability, hypo- and normothermia, postoperative drainage, age, time of CPB on POCD was assessed.
Results and Discussion: The incidence of early POCD was 17,9% (15 of 84). Mini Mental State Examination on discharge was significantly impaired in this group compared with preoperative level (P = 0,023). Visual memory test failed to detect this cognitive impairment.But, 21,3%pts (18 of 84) showed cognitive improvement on discharge compared with preoperative level(p=0,034). Baseline patient characteristics and key perioperative data were similar between patients who developed early POCD compared with those who did not develop POCD (P=0,372) . Pts with POCD had significantly elevated CRP at 6h time point and on discharge compared with preoperative level (50,44± 7,3 vs.4,75±1,18; p< 0,01 and 148,47±5,32 vs. 4,75±2,18;p < 0,001).To demonstrate statistical significance we used Scheffe-, t-test and ANOVA
In previous studies found correlation beween POCD and inflammatory stress. We dont know wether POCD is transient phenomenon, because data of psichometric tests after 3 months are lacking (research continues, we will have complete data for 3-6 months). Only difference between group with and without POCD found in higher inflammatory stress, which would suggest correlation between perioperative infalmmatory stress and POCD.Exept that, in a number of patients there was a improvement of cognitive function,wich could be explaned by repeating the test.
Conclusion(s): Inflammatory stress is associated with POCD post CPB. But, why some pts develop higher stress level leading to POCD is currently unknown.

1AP2-1

National perioperative hypothermia survey - routine perioperative temperature management by anaesthetists

Rajan J.N.
London Deanry Barnet and Chase Farm NHS Trust, Department of Anaesthesiology, London, United Kingdom

Background and Goal of Study: Perioperative hypothermia is a major contributing factor to mortality and morbidity in surgical patients. The National

Institute of Clinical Excellence (NICE) published guidelines on Inadvertent Perioperative Hypothermia in 2008. Knowledge and implementation of the guidelines by anaesthetists nationally, was assessed.

Materials and Methods: A snapshot survey of 95 acute hospitals (with both accident and emergency and anaesthetic departments) across England was conducted during May. A total of 95 anaesthetists on call for general theaters were surveyed anonymously, to assess both knowledge and implementation of the guidelines. Standardised, open ended, unsuggestive proforma questions were used. Anaesthetists were asked for their routine and not their best practice. Awareness of risk factors for hypothermia stated in the NICE guidelines was assessed.

Results and Discussion: Temperature was routinely monitored preoperatively, perioperatively and at regular intervals postoperatively in 60%, 68% and 18% of cases respectively. Temperature was routinely monitored at 30 minute intervals intraoperatively by 48% of anaesthetists. Hypothermia was correctly defined by 48% of anaesthetists. Nasopharngeal probes were used to measure temperature in all cases. Where active warming of patients was instituted, forced air warmers were used in 96% of cases, fluid warmers in 24% and warming mattresses in 6%. Training in measurement and warming devices was received in 4%of cases. NICE defined risk factors for hypothermia were identified in 5% of cases.

Our snapshot survery showed introperative management of hypothermia is significantly better than pre and post operative management. Active warming is rarely performed in the pre or post operative phases. Forced air warming is and nasopharyngeal probes are the commonest form of warming and temperature measurement respectively. Identification of risk factors by anesthetists was poor. Only 20% of anaesthetists considered hypothermia a critical incident.

Conclusion: Greater awareness of the assessment and management of hypothermia is required amongst trainees. Reaudit against the NICE guidelines is planned in a year to reassess standards, following liaison with the General Association of Trainees to promote awareness of the guidelines amongst anaesthetists.

References:

1. The management of inadvertent peri-operative hypothermia in adults: NICE Full Guideline, April 2008.2.

Acknowledgements: Chase Farm Hospital

1AP2-2

Implementation of NICE guidance on prevention of perioperative hypothermia: Small changes can make a difference

Lavies N., Strong A., Rybinkina I.
Western Sussex Hospitals NHS Trust, Department of Anaesthesiology, Worthing, United Kingdom

Introduction: The National Institute for Clinical Excellence (NICE) guideline on Inadvertent Perioperative Hypothermia was published in April 2008. Some of the recommendations were difficult to achieve but most were simple and required little extra expense. We therefore decided to audit patients' pre and postoperative temperatures before and after instituting as many of the recommendations as we practicably could.

Methods: 100 elective consecutive elective major orthopedic patients had their temperatures recorded as they arrived in the theatre suite and again when they arrived in recovery. Their age, ASA grading and whether a Bair Hugger hot air blanket was used in theatre was also recorded. Temperature was masured in the external auditory meatus using a Genius2 device. We then over the next 12 months implemented the following measures: making sure the patients remained adequately clothed on the ward until required in theatre, at least 2 blankets on the bed, always infusing warmed IV fluids, and always using a Bair Hugger hot air blanket. A further 100 consecutive patients were then audited. Ethical approval was waived because it was an audit of current practice.

Results: 1st audit: 91 patients were included. Preop mean temp was 36.1 (range 34.7-37.3) and mean postop was 35.4, a fall of 0.67 degrees C. ($p < 0.001$ Students paired t test). 36 patients had a preop temp. of < 36 (39%) and 74 patients had a postop temp of < 36 (81%) of whom 20 had a postop temp of < 35 (22%).2nd audit: 98 patients were included. Mean preop temp was 36.4 (range 35-37.5) and mean postop was 35.9, a fall of 0.44 degrees C. ($p < 0.001$ Students paired t test). 17 patients had a preop temp < 36 (17%) and 52 patients had a postop temp < 36 (53%) of whom only 4 had a temp < 35 (4%).

Discussion: By re-auditing a similar group of patients, we were able to show a small but significant reduction in temperature fall before and after surgery, following implementation of measures recommended by NICE.

Equally important was a culture change in the ward and theatre staff towards keeping patients warm. However we still fall short of the target set by the Patient Safety First Campaign which is 95% of patients arriving in theatre with a temp >36.0.

References:

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2.NICE and warm (Editorial) British Journal of Anaesthesia 2008; 101:293
3.www.patientsafetyfirst.nhs.uk

1AP2-3

Audit on venous thromboembolism prophylaxis in day surgical patients

Vijayakumar M., Sparrow R., Janakiraman C.
University Hospital of Wales, Department of Anaesthesiology and Intensive Care, Cardiff, United Kingdom

Background and Goal of Study: Venous thromboembolism(VTE) is often termed the ‚silent killer' as it kills an estimated 25000 people every year and contributes to 10% of in-hospital mortality[1]. Despite this, nearly 71% of patients at risk do not receive thromboprophylaxis[2]. In addition,the treatment of non-fatal VTE & its long term morbidity is associated with considerable cost to health services[1]. According to the NICE guidelines, every patient should be individually risk assessed for VTE and managed accordingly. Our aim was to see how many patients in our day surgery unit were risk assessed for VTE and received prophylaxis based on risk factors. We also looked into the method of thrombo-prophylaxis used (mechanical / pharmacological).

Materials and Methods: We prospectively collected data over a period of one week from all patients passing through the recovery of our day surgical unit obtaining information from both patients and their notes. We collected data on demographics, type/duration of surgery, risk assessment for VTE and the choice of thromboprophylaxis.

Results and Discussion: A total of 81 patients (47 males and 34 females) were included in the audit. The mean (range) age, BMI and duration of procedure were 49(18-86) years, 27 (16-42) and 46(5-204) minutes respectively.The surgical specialties included ENT(32/81), Urology(22/81),Gynae(9/81) and others(18/81). Only two patients out of 81(2.4%) were formally risk assessed for VTE. 56(69%) patients had at least one risk factor for VTE. Out of these 56 patients with at least one risk factor for VTE, 30(54%) patients had mechanical thromboprophylaxis and only 3(5%) patients had both mechanical and pharmacological prophylaxis.

Risk Factors for thrombo-embolism		Mechanical thromboprophylaxis	Pharmacological thromboprophylaxis
None	25/81 (31%)	17/25(68%)	N/A
One or more	56/81 (69%)	30/56(54%)	3/56 (5%)

[Table 1:]

Conclusion(s): Vast majority of patients are not risk assessed and it is unclear whose responsibility it is to risk assess and prescribe thromboprophylaxis. A proposal has been made to include risk assessment forms in the notes of all patients to ensure everyone is risk assessed & prescribed appropriate thromboprophylaxis preoperatively.This process has already started and we plan to reaudit in six months time.

References:

1.Nice clinical guideline 92 - Venous thromboembolism: reducing the risk.
2.Rashid ST et al.Venous thromboprophylaxis in UK medical inpatients. Journal of the Royal Society of Medicine 98 (11): 507-12.

1AP2-4

Low-dose droperidol for the prevention of PONV: Systematic review of randomised trials

Schaub I., Lysakowski C., Elia N., Tramèr M.R.
Clinique Sainte Anne Saint Remi, Department of Anaesthesiology, Brussels, Belgium

Background and Goal of Study: Very low doses of droperidol may prevent postoperative nausea and vomiting (PONV). Dose-responsiveness remains unclear.

Materials and Methods: We performed a systematic search (databases, bibliographies, to 10.2010) for full reports of randomised comparisons of single shot, IV, low-dose droperidol ($\leq$1 mg or $\leq$15 μg/kg) with placebo, for the prevention of PONV in adults undergoing general anaesthesia. We estimated risk ratios (RR) with 95% confidence intervals (CI) of early (to 6 hours) and late (to 48 hours) PONV symptoms, and adverse effects. We compared aggregated data of predefined dose-ranges using Cochrane statistics to search for dose-responsiveness.

Results and Discussion: We included 24 studies (2917 patients, 1505 received droperidol), published between 1984 and 2008. Droperidol regimens varied between 0.25 and 1 mg. Compared with placebo, droperidol prevented early nausea (RR 0.45 [95% CI 0.35-0.58]), late nausea (RR 0.81 [0.75-0.87]), early vomiting (RR 0.65 [0.57 to 0.74]) and late vomiting (RR 0.73 [0.66 to 0.81]). For none of these endpoints, there was any evidence of dose responsiveness. With droperidol, the risk of restlessness was significantly increased, independent of the dose (RR 3.61 [1.90 to 6.87]). The risk of headache was decreased with doses ≥0.7 mg (RR 0.35 [0.18 to 0.69]). Two episodes of extrapyramidal symptoms were reported, both with droperidol. The risk of sedation, and the times to awakening, orientation or home readiness were not increased.
Conclusion(s): Prophylactic IV single-dose droperidol, 0.25 to 1 mg, prevents PONV symptoms independent of the dose but increases the risk of postoperative restlessness. The risk of headache is decreased with doses ≥0.7 mg.

1AP2-5

Does the number of attempts necessary correlate with the infection risk after central venous line insertion?

Kaufmann T., Rossi M., Guido S., Konrad C.
Luzerner Kantonsspital, Department of Anaesthesiology, Luzern, Switzerland

Background and Goal of Study: Every additional attempt to insert a central venous catheter is associated by more pain, costs and perhaps a higher risk of infection. Also the process in the OR-theatre can be delayed.
Materials and Methods: Data was prospectively collected over 10 months in the central OR-theatre and in the medical ICU. Every catheter tip was investigated for colonisation. The statistical analyses were done with the software R version 2.10.1. All catheters were inserted using a full barrier protection using sterile drapes, gloves, mask and overcoat. The skin was disinfected with reference to institutional standards. Standard and coated catheters were inserted according to clinical necessity. Number of attempts was defined as number of needle passes through the skin. Definition of infection: Muicrobiological culture with > 15 KBE and fever (> 38°C), pain or redness at puncture.
Results and Discussion: 97 catheters (853 catheter days) were investigated. 6 catheter tips showed an infection (7.03/1'000 (CI: 2.59-15.25) catheter days, 6.19% (CI:2.59-15.25) catheter), Anaesthesia: 5.65/1'000 (CI:1.54-14.4) catheter days, ICU: 13.8/1'000 (CI:1.67-48.93) catheter days.
Absolutely no correlation was found for patient factors (BMI, diabetes), or duration of catheter days. Also a red puncture or clinical signs like less pain had no predictive value. Also the count of trials didn't correlate with the infection rate. The anova analysis for number of attempts showed significance for the team, selection of insertion site and for coated catheters. 35% of the variance is explained by the team. No significance could be shown for the operator's experience.
The experience had no influence neither on the probability of an infection nor of number of attempts.

	Df	sum of square	P-Value
coated catheter	2	3.82	<0.001
selection of insertion site	4	2.09	0.005
Team	16	8.42	<0.001
Residuals	67	8.65	

[Anova of the best model]

Conclusion(s): The incidence of central venous catheter infection is low and statistically neither with patient factors nor with the number of attempts correlated in this sample. Also not significance is the experience of the operator. It can be speculated that this study supports the importance of a full barrier protection policy.

1AP2-6

Intraoperative PaO_2 is not related to the development of surgical site infections

Carrasco Serrano E., Fernández Urbón A., Heredia M., Mata N., García Cuenca I., Tamayo E.
University of Valladolid, Department of Anaesthesiology, Valladolid, Spain

Background and Goal of Study: The potential clinical benefits of the perioperative use of high inspired oxygen fraction (FIO_2) for preventing surgical site infections (SSIs) have attracted great interest in recent years. Trials demonstrated that SSIs decreased significantly following colon surgery in patients who received 80% oxygen intraoperatively and for the first hours following surgery. In cardiac surgery, SSIs are serious complications associated with extended hospital stay, increased hospital costs, and higher mortality and morbidity rates.[3]
In contrast to the findings of Belda et al.[2], clinical trials by Pryor et al.[4] and, more recently, by Meyhoff et al.[5], found no difference in SSI risk when 80% oxygen rather than 30% oxygen was administered during abdominal surgery and for 2 hours postoperatively. Their findings suggested that perioperative hyperoxia was not effective in reducing SSIs. These reports add to the evidence base surrounding the potential role of high FIO2 in SSI prevention.
The rationale for administering high FIO_2 to prevent SSIs is to produce a high PaO_2 and thereby increase the $PsqO_2$ (tissue oxygen partial pressure), since oxidative killing by neutrophils is the primary defense against surgical pathogens. The risk of infection is thus inversely related to $PsqO_2$.[3] Our aim in this study was to analyze the relationship between PaO_2 values and SSIs.
Materials and Methods: We designed a prospective study that analyzed the data from 1,024 consecutive patients who underwent cardiac surgery with extracorporeal circulation at our institution from January 30, 2007 to June 30, 2009. The patients were categorized according to the presence or absence of SSIs. The SPSS software package (version 15) was used for statistical analysis. A $p < 0.05$ was considered significant.
Results and Discussion: SSIs developed after cardiac surgery in 54 (5.3%) patients, 28 (2.8%) superficial or deep incision SSIs and 26 (2.5%) organ/space SSIs. The intraoperative and postoperative PaO_2 values were not associated with an increased risk of SSI either by univariate or multivariate analysis. The 30-day mortality rate was similar in both groups: patients without SSIs, n = 72 (7.4%) vs. patients with SSIs, n = 4 (7.4%); (P = .11).
Conclusion(s): Tissue oxygenation improves much less than arterial oxygen in response to supplemental oxygen administration.The PaO_2 in adult cardiac surgery patients is not related to SSI rate.

1AP2-7

Effects of the increasing doses of dexmedetomidine on the post-anesthetic shivering

Akinci H.A., Kol I.O., Düger C., Kaygusuz K., Gürsoy S., Mimaroglu C.
Cumhuriyet University, Department of Anaesthesiology, Sivas, Turkey

Background and Goal of Study: In this study, we aimed to investigate the efficiency of the increasing doses of a severe selective alpha-2- adrenoceptore agonist dexmedetomidine in the inhibition of postoperative shivering and pain.
Materials and Methods: After the approval of Ethics Committee, 18-70 years old, 90 ASA I-II physical status patients, undergoing abdominal surgery were randomly divided into three groups. All patients were administered anesthesia induction with fentanyl 1μ/kg, rocuronium 0.5 mg kg^{-1}, thiopental 5-7 mg kg^{-1}. Desflurane 4-6%, O2-N2O 50-50% were applied during the maintenance. Intraoperative hemodynamic parameters and tympanic temperatures were recorded. While tapping the fascia, dexmedetomidine 0.6 μg kg^{-1} to Group D1, 0.8 μg kg^{-1} to Group D2 and 1 μg kg^{-1} to Group D3, were administered as i.v infusion in ten-minutes. RAMSEY sedation scores, shivering scores, verbal rating scales, tympanic temperatures and hemodynamic parameters were recorded in the recovery room.
Results and Discussion: After the application of dexmedetomidine and at postoperative period, hemodynamic parameters were lower in Group D3 compared with Group D1 and D2, ($p < 0.05$). Aldrete recovery scores were higher in Group D3 compared with Group D1 and D2 ($p < 0.05$). Group D2 were higher scores than Group D1 ($p < 0.05$). The shivering scores were lower in Group D3 when compared with Group D1 and D2 and also it was lower in group D2 than Group D1 ($p < 0.05$). Pain scores, when compared with Group D1 and D2, were lower in Group D3, and also lower in Group D2, compared with Group D1 ($p < 0.05$). RAMSEY sedation scores, compared with Group D1 and Group D2, were higher in Group D3 ($p < 0.05$).
Conclusion(s): It was concluded that dexmedetomidine 1 μg kg^{-1} decreases postoperative shivering more efficient than dexmedetomidine at 0.6 and 0.8 μg kg^{-1} doses. In addition, while postoperative recovery duration is extending with the increasing doses of dexmedetomidine, it also leads to deeper sedation.

1AP2-8

Implementation and preliminary validation of a new score to assess the risk for postoperative complications

Villa G., Chelazzi C., Vignale I., Margiacchi L., De Gaudio A.R.
University of Florence, Department of Anaesthesiology and Intensive Care, Florence, Italy

Background and Goal of Study: Postoperative complications (PoCs) are common and increase patients morbidity, mortality and costs. Postoperative

ICU admission may reduce PoCs incidence. To optimize allocation of limited resources, clinical scores to detect patients at high risk of PoCs are needed. Aim of the study was to implement and validate a new score to assess the risk for PoCs (the "Anesthesiological and Surgical Perioperative Risk Assessment", ASPRA score), in order to provide a reliable tool to discriminate patients who might benefit from postoperative ICU admission.

Materials and Methods: Risk factors for PoCs were identified on a systematic search on PubMed database. Key words were "postoperative complications" and "risk factors"; related MeSH terms were included. Considered papers were those in English, published from 1/1/2000 to date. A score between 0 and 3 has been given to each risk factor, depending on strength and independency of association to PoCs.To validate the score, a retrospective survey was done on all patients electively admitted to a general ICU for postoperative monitoring from 1/1/10 to 31/08/10. PoCs were registered and patients were divided in two groups, complicated and uncomplicated. ASPRA score was obtained for each patient summing the single scores of all risk factors for PoCs. To test the score, a ROC curve was done and the area under the curve (AUC) calculated. Based on the ROC analysis, sensitivity and specificity rates were calculated for each ASPRA score, as the capability of test to predict PoCs.

Results: On 176 patients included in the validation process, 122 had postoperative complications. Mean ASPRA score in the complicated and control groups were 7.5 and 5 respectively ($p < .001$). The AUC from ROC analysis was 0.77 ($p < .01$,see Fig.1). ASPRA score of 6 showed a sensitivity and specificity of 77.9% and 70.4% respectively in predicting PoCs.

Conclusion(s): At the preliminary validation, the new ASPRA score resulted moderately accurate in discriminating between postoperatively complicated and uncomplicated patients. Score's cutoff of 6 showed the best sensitivity/specificity in predicting postoperative complications. Further prospective investigations is required to validate the score on a larger patients population.

1AP2-9

Implementation of nausea and vomiting protocol in the ultrafast-track cardiac anaesthesia

Santos L., Flo A., Soler M., Monica R., Escudero A.
Germans Trias i Pujol, Department of Anaesthesiology and Pain Medicine, Badalona, Spain

Background: Postoperative nausea and vomiting (PONV) is an important cause of postoperative morbidity and can delay patient recovery. The aim of this study was to evaluate the efficacy of PONV prophylaxis according to risk factors in ultrafast-track cardiac anesthesia and its influence in fast-track recovery.

Methods: A three phases cohort study was designed (n=90 in each phase). A protocol of PONV prophylaxis according to Apfel risk score modified for cardiac anesthesia was designed (inhalatory anesthesia, female under 65, non-active smoker, PONV antecedents). During 1st phase the prophylaxis given was: 1 point no treatment; 2 points dexamethasone (DXM) 4mg in induction; 3 points DXM 4mg + haloperidol (HAL) 1mg in induction; 4 points DXM 4mg + HAL 1mg in induction + ondansetron 4mg at the end of the surgery. During the 2nd and 3rd phase prophylaxis was increased by one point. The anaesthetic protocol was: induction with sevoflurane 2%, fentanyl (2-4mcg/Kg) and rocuronium (0.6mg/Kg). Maintenance with sevoflurane and remifentanil (0.15-0.3mcg/Kg/min). At the end of extracorporeal circulation, morphine (0.1mg/Kg), dexketoprofen and metamizol were given. Local anesthetic perfusion was used as postoperative analgesia. All patients were extubated in the operating room. Incidence of PONV before (BOF) and after (AOF) oral feeding and the hours between extubation and oral feeding were evaluated. Data are presented as mean ±SD and percentages (X^2 test for qualitative and *t* student for quantitative data, $p < 0.05$).

Results: A total of 197 patients were enrolled (21 in 1st phase, 89 in 2nd phase and 87 in 3rd phase). The 1st phase was abandoned because of the high incidence of PONV. All groups were comparable regarding demographics, comorbidities, type of surgery, operation time and total amount of opioid doses. Table shows incidence of PONV. There was a statistically significant difference between 1st phase and 2nd and 3rd, but there were no significant differences between 2nd and 3rd phase.

	1st	2nd	3rd
BOF	38.1	10.1	6.9
AOF	33.3	13.5	13.8

[Table 1]

Hours from extubation to oral feeding were 6.4h in patients without PONV and 9.7h in patients with PONV ($p < 0.05$).

Conclusion: Prophylactic PONV treatment according to risk factors in ultrafast-track cardiac anesthesia decreases the incidence of PONV. Oral tolerance was earlier in patients without PONV facilitating fast-track recovery.

1AP3-1

Does the safe surgery check list delay the start of the theatres?

Vats A., Marbaniang M., Gupta P.
Leeds Teaching Hospitals NHS Trust, Department of Anaesthesiology, Leeds, United Kingdom

Safe surgery check list was introduced in the UK in February 2010 as a mandatory additional requirement as it has been shown to reduce surgical complications and mortality[1]. The check needs to be carried out before the start of the theatre and requires the presence of full theatre team i.e. surgeon, anaesthetist, theatre assistant, scrub nurses etc. The team goes through a structured questionnaire which may take upto 5 minutes. We assessed the impact of introduction of this checklist at theatre start time i.e. theatre efficiency, at a tertiary level hospital.

The first patient for the morning session can only be called to the theatre after the check list is completed. The time the first patient was called to theatre, before and after the introduction of the check lists i.e January 2009 and May 2010 was compared. Data was collected for 23 theatres (631 sessions) and was categorised in five groups (plastics, ENT/ophthalmics, major general surgery, gynaecology and other theatres). An independent person extracted this data from the theatre electronic tracking system. The data from each group was then collated and analysed using ‚IBM SPSS Statistics 17' software. Table 1 shows the results for these five groups. Our null hypothesis was that the introduction of check lists had no impact on the theatre start time i.e. time first patient was called for.

Specialty (number of operating theatres)	Mean theatre start time (standard deviation, number of sessions)		Difference in mean theatre start times (2010 - 2009)
	Jan 2009	May 2010	
Plastics (5)	08:00:00 (00:25:46,61)	07:53:45 (00:25:57,48)	-00:06:53
ENT/Opthalmic (7)	08:40:46 (00:13:33,92	08:40:54 (00:14:00,55)	00:00:27
Major General surgery (3)*	08:26:52 (00:23:54,59)	08:20:14 (00:17:22,50)	-00:06:38
Gynaecology (3)	08:30:16 (00:17:38,59)	08:28:39 (00:16:49,46)	-00:01:37
Others (5)**	08:21:36 (00:29:20,86)	08:28:57 (00:24:01,75)	00:07:21

All times are in hh:mm:ss - 24 hour clock format. Negative values indicate earlier start.
*Upper Gastrointestinal/Colo-rectal surgery.
**Thoracic/Urology/Vascular

[Table 1. Theatre start times for different groups]

The results suggest that the lists started earlier in plastics, major general surgery and gynaecology (range 1.5 minutes to 7 minutes approx.) and late in ENT, opthalmics and other theatres (range 30 seconds to 7 minutes approx.). Null hypothesis was accepted as the differences were not found to be significant in any group (p value > 0.05).

Our study is the first study which clearly demonstrates that safe surgical check lists do not have any significant impact on theatre start time i.e. theatre efficiency and productivity.

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1AP3-2

Burnout syndrome in Spanish anesthesiologists

García C.A., Soler E., Bermejo S., Corcoy M., Arroyo R., Vallès J.
Hospital del Mar-Esperança (Parc de Salut Mar), Department of Anaesthesiology, Barcelona, Spain

Background and Goal of Study: Burnout (BO) syndrome was described by Maslach in 1981 as an individual's abnormal response to chronic emotional stress characterized by three components: emotional tiredness/exhaustion (E), depersonalisation (D) and low personal realization (PR); it have had little research in anesthetic population.

The largest publication about BO in anesthesia (1) shows high levels of E, D and low levels of PR in 20, 20 and 36% of respondents respectively.

The aim of this study was to assess levels of BO between spanish anesthesiologists and to identify risk factors.
Materials and Methods: The instrument used to assess the BO was the Maslach Burnout Inventory (MBI). This questionnaire presents statements on feelings and thoughts in regard to the study subject's interest in work; is comprised of 22 items that measure E, D and PR. Respondents categorise their response to each question using a standard 7-point response format with anchored points *never* to *every day*. We attached the MBI to an Internet schedule application used by 10 anesthesia departments in Spain. BO was defined as scores that were high for E (≥27), high for D (≥10) and/or low for PR (≤33). Relationship between "burnout" and age, gender, organizational tasks, years practicing anesthesia, on call hours per month, kind of work schedule (regular/changeable) were assessed. T-test, χ^2 and logistic regression were used for statistics.
Results and Discussion: 224 questionnaires were filled out (62.5% males, 37.5% females). Mean age was 40.1 years ± 9.8.

	Mean (DE)	High (%)	Average (%)	Low (%)
Exhaustion	18.7(9,2)	51 (22,8%)	43 (19,2%)	130 (58,0%)
Depersonalisation	7,7 (4,6)	71 (31,7%)	56 (25,0%)	97 (43,3%)
Personal Realization	31,2 (6,9)	29 (12,9%)	47 (21,0%)	148 (66,1%)

[Burnout]

71.4% of respondents showed high scores in at least one of the three components.
No association between studied variables and E or D was found.
Male sex (OR 2.32; CI 1.3-4.2) and staff grade/fellow without organizational tasks (OR 2.8;CI 1.1-6.6) were identified as risk factors for low personal realization.
Conclusion(s): Male and staff/fellow without organizational tasks present, respectively, 2 and 3-fold risk of low PR. Greater rates of high depersonalisation and low personal realization compared with previous publications were found. It's the largest study about BO prevalence among anesthesiologists in Spain.
References:
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1AP3-3

Experience of an interdisciplinary anaesthesiology and nursing team in a gastrointestinal endoscopy unit

Ubré M., Martínez Palli G., Blasi A., Rivas E., Borrat X., Pujol R.
Hospital Clinic/Universitat de Barcelona, Department of Anaesthesiology and Intensive Care, Barcelona, Spain

Introduction and Aim: Demand of sedation and monitored anaesthesia care has dramatically increased in recent years in gastrointestinal endoscopy (GIE) units. Anaesthesia professional-delivered sedation has important economical implications and departments of Anaesthesia have limited resources becoming frequently saturated. Since then, to develop new anaesthesia provider models may be mandatory. In the present study we describe the experience in the GIE Unit of our institution where we have consolidated a new model of an anaesthesia care team.
Methods: This descriptive study analysed the activity performed by a team of anaesthesiologists and nurse anaesthetists over a 1 year period (2009) in a digestive endoscopy unit. Anaesthesia technique was performed by the registered nurse under the supervision and responsibility of the anaesthesiologist who was involved in 2 or 3 procedures simultaneously (1anaesthesiologist: 2nurses + 1anaesthesiologist: 3nurses, 5 procedures at the same time). All procedures were performed under deep sedation with continuous intravenous perfusion of remifentanil and propofol (target-controlled infusion system) following the standard protocol of the unit. Monitoring included: EKG, non invasive arterial pressure, pulse oximetry and respiratory rate by impedance. The day before to the procedure, telephonic preanaesthesia assessment was performed in all patients.
Results: A total of 5805 endoscopic procedures were performed under sedation in 5432 patients (2879 F[53%]/ 2553 M[47%], 59±16 yrs.[range 18-96]. Twenty-four per cent of patients were ASA III or IV class. Both, simple (upper GIE and colonoscopies, 73%) and advanced endoscopic procedures (endoscopy ultrasound, endoscopic retrograde cholangiopancreatography, and others, 27%) were included. Anaesthesia-related mortality did not occur. None of the patients required neither endotracheal intubation nor any resuscitation maneuver. The most common complication was mild respiratory depression requiring jaw thrust maneuver or insertion of oropharyngeal airway (4.8%). Mask ventilation was necessary in 12 patients (0.14%). Five patients (0.08%) showed hypotension or bradycardia that required pharmacological treatment. In 5 patients (0.08%) the procedure had to be finished early due to oversedation.
Conclusion: Deep sedation by an anaesthesia care team with anaesthesiologists and nurse anaesthetists is clinically safe and efficacious for all patients undergoing endoscopic procedures.

1AP3-4

Delirium after hepatectomy

Veiga D.M., Luís C., Fernandes V., Santos P., Botelho M., Abelha F.
Hospital São João, Department of Anaesthesiology, Porto, Portugal

Background and Goal of Study: Postoperative delirium (POD) is associated with adverse outcomes such as higher hospital length of stay, morbidity and mortality. The surgical critically ill patients have a high risk of delirium.
The aim of this study was to evaluate the incidence of delirium after hepatectomy and to study its determinants.
Materials and Methods: Prospective study during a period of 10 months; thirty four patients were submitted to hepatectomy and were admitted in the Post-Anesthesia Care Unit (PACU) and were enrolled in the study.
Patients' demographic, intra and postoperative data were recorded. All patients were assessed for delirium using Intensive Care Delirium Screening Checklist (ICDSC) during PACU stay. At PACU admission and 6 months after discharge the Short Form-36 (SF-36) was applied.
Non parametrics tests, Chi square or Fischer's exact test were used to compare groups; univariate analysis with multiple regression binary logistic with odds ratio (OD) and its 95% Confidence Interval (95%CI) were used to assess risk factors.
Results and Discussion: Five patients (15%) developed POD. Patients who developed POD stayed longer in the PACU (median duration of PACU stay of 68 versus 20 hours, p=0.033) but mortality rates were similar 6 months after PACU discharge (40% versus 17%, p = 0, 262).
At admission, patients who developed delirium had similar scores in all SF-36 but physical pain. Six months after PACU discharge scores were similar for all SF-36 domains.
Conclusion(s): Patients with postoperative delirium stayed longer in the UCPA but did not influenced mortality or quality of life six months after surgery.

1AP3-5

Cost implications of replacing soda lime with Amsorb® in clinical practice

Ahmed O., Sangineni K., Mannion S.
SIVUH, South Infirmary Victoria University Hospital, Department of Anaesthesiology, Cork, Ireland

Background and Goal of Study: Dessicated soda lime produces toxic compounds by interacting with volatile agents. Amsorb®, a novel CO_2 absorber avoids these drawbacks but is more expensive per unit weight. This cost may be offset by lower sevoflurane use, less product used and cheaper waste disposal.
In a prospective cross-over study, we investigated the cost of replacing soda lime with Amsorb®, with regard to these three outcomes.
Materials and Methods: The study was conducted in 4 operating theatres over two 4-week periods, one for each product.
Sevoflurane consumption (bottles), amount of absorbent used (kg) and amount of waste disposal (kg) was measured.
Soda lime was changed weekly and Amsorb® once the colour change happened. Both were changed if inspired CO_2 occurred. Low flows (< 2L/min) were encouraged with Amsorb®.The number of patients having GA was noted. As toxic by-products are linked to side effects, the incidence of PONV and headache in the PACU was recorded. A survey of anaesthesiologists involved was conducted at the end of the study.
Results and Discussion: Our main findings are presented in Table 1.

	Soda lime	Amsorb®
Number of GAs	231 patients	236 patients
Sevoflurane bottles (250mls) and cost	35 bottles €3839.85 (€109.71/bottle)	26 bottles €2852.46 (€109.71/bottle)
Product used and cost	34 canisters €505.24 (€14.86/canister)	14 canisters €296.38 (€21.17/canister)
Waste and cost	34 kilograms €30.6 (€0.9/kg*)	14 kilograms €2.1 (€0.15/kg ^)
Total cost (4 weeks)	€4375.69	€3150.94

(healthcare waste & ^ domestic waste)*

[Table 1]

Amsorb® was more expensive per unit than soda lime, but overall cost was less.

Savings from lower sevoflurane use may be because lower flows were used but exact flows were not measured so as to replicate normal clinical practice.
As the colour change of dessicated Amsorb® is more reliable than soda lime, canister changes were limited to as required compared with recommendations to change soda lime on fixed days.
As Amsorb® is inert it is disposed in domestic waste.
Although Amsorb® does not produce toxic by-products such as formaldehyde, there was no difference in the number of patients with headache (4 & 7) and PONV (13 & 14) with Amsorb® and soda lime, respectively. However these endpoints were not the primary outcome of this study.
All anaesthesiologist surveyed reported that Amsorb® was safe to use, easy to dispose of and required less canister changes.
Conclusion: In a prospective cross-over study we demonstrated Amsorb® to be a suitable cost efficient alternative to soda lime in everyday clinical practice.

1AP3-6

General anaesthesia versus peripheral neuronal blockade in multi-sequential orthopedic surgery: Patients' experience

Ungureanu R., Mirea L., Manoleli A., Raileanu C., Grintescu I.
Clinical Emergency Hospital of Bucharest, Department of Anaesthesiology and Intensive Care, Bucharest, Romania

Background and Goal of Study: Continuing controversy exist with regards to the superiority of loco-regional anaesthesia over general anaesthesia for orthopedic surgery. However, patient satisfaction, an important outcome measurement to improve our anaesthesia care, may influence the decision. In our prospective study, we investigated the patient's preferred method of anaesthesia: general (GA) or peripheral neuronal blockade (PNB) after they experience both types of anaesthesia for orthopedic interventions.
Materials and Methods: Over two years, we have studied patients who recevied both types of anaesthesia for multi-sequential orthopedic interventions (balanced general anaesthesia and upper or lower limb peripheral neuronal blocade with intraoperative light sedation). All the patients fullfield a qestionnaire wich included: preoperative anxiety, postoperative pain (early, late), postoperative nausea and vomiting, early oral nutrition, early mobilization, postoperative mental confusion, drug related adverse effects, quality of perioperative care, intraoperative discomfort, choice of future aneaesthesia in case of a new surgery, overall satisfaction. The results were statistically analyzed.
Results and Discussion: From the 154 patients included, 15 patients (10%) had more than two anaesthesia. We performed 102 upper limb neuronal blockade and 67 inferior limb blocks. We found no difference between GA and PNB for the level of preoperative anxiety (higher for the first intervention no matter of type of anaesthesia), quality of perioperative care, drug related adverse effects, overall good level of satisfaction. PNB was superior for postoperative pain control, postoperative nausea and vomiting, resuming early oral nutrition, postoperative mental confusion ($p < 0.05$). GA was superior in case of intraoperative discomfort ($p < 0,05$). In case of new orthopedic intervention, 77% (119) of patients will choose PNB instead of GA.
Conclusion(s): Although both types of anaesthesia provide excellent patient satisfaction, patients with multiple orthopedic interventions prefer peripheral neuronal blockade. Factors predictive for this choice are the experience of better pain control, less postoperative nausea/vomiting and dizziness, early mobilization and nutrition
References:
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1AP3-7

An audit of NICE VTE prophylaxis guideline (2010) implementation in day case, short stay and overnight stay surgical patients in New Cross Hospital, Wolverhampton

Waraich K.N., Ahuja M.
University of Birmingham, College of Medical and Dental Sciences, Birmingham, United Kingdom

Aim: This audit evaluates current practice of VTE prophylaxis in short term surgical patients at New Cross hospital and judges its success against national targets
Background: Venous thromboembolism (VTE) is a common complication of surgery which can be life threatening. Venographic studies have given evidence that the incidence of deep vein thrombosis (DVT) is raised in surgical patients who are not given prophylaxis. Pulmonary embolism is another serious manifestation of VTE which is known for its non-specific nature, and can be responsible for 28% of hospital mortality.
Method: Manual data collection was performed prospectively in a set time period between October and November 2010. Proforma were designed to enable efficient recording of variables such as VTE risk factors, Autar scale, ASA Grade and details of prophylaxis type.
The patient sample was reduced to 94 from 100 after application of exclusion criteria. The total number of patients assessed to be at-risk was 67. The remaining patient sample was not excluded because secondary analysis was to be done. Exclusion criteria include patients undergoing local anaesthetic procedures only, patients below 18 years and those with a diagnosis of VTE, among others.
Patients were identified as at-risk upon fulfillment of one or more of the NICE criteria . Definitions of standards being met ‚completely', ‚partially' and ‚not at all' were formulated for the purpose of this audit. Day case patients eligible for VTE prophylaxis constituted the majority of the sample (47), followed by short (15) and overnight stay (5).
Standard: In discussion with the Consultant Anaesthetist, the standard of NICE Guideline implementation was determined at 80%.
Results: Overall, it was found that standards were 'completely' met in 13% cases, 'partially' met in 15% and 'not met' in 72% patients. When split by surgical admission type,we found that 85% of at-risk day case patients did not receive any prophylaxis. In contrast, practice amongst short stay patients revealed the lowest non-compliance with NICE guidance, at 27%. Best practice was seen in short stay patients with nearly half of those at increased risk of VTE (47%) having received 'complete' prophylaxis.
Conclusion: Overall, current practice does not meet the standards set in this audit-only 28% of patients at increased risk received a form of prophylaxis. Guidance was worst followed among day case patients. Conversely, practice was closest to set standards of 80% in short stay patients.

1AP3-8

Efficacy of protocol implementation based on intravenous iron treatment in gastrointestinal cancer surgery

Hernández Cera C., Cantero C., Rivas Ferreira E., Martínez-Pallí G., Pereira A., Balust J.
Hospital Clinic Barcelona, Department of Anaesthesiology, Barcelona, Spain

Background: Intravenous iron therapy (ivFe) to correct iron deficiency anaemia frequently present in gastrointestinal (GI) cancer patients has been proposed as an alternative to oral iron treatment, in order to minimise transfusion requirements during surgery. Recently, at our Institution, we have implemented a new protocol of ivFe treatment in patients undergoing GI cancer surgery. The goal of the study was to compare blood transfusion requirements between patients who received ivFe, according to our protocol, and those who did not before GI cancer surgery.
Materials and Methods: We retrospectively studied all patients with GI cancer submitted to laparoscopic resection during a 6-month-period. Based on our protocol (administration of 1000mg ivFe (Ferinject®) if Haemoglobin (Hb) levels < 11g/dL at the time of anaesthetic preoperative assessment), we defined 3 groups: non-anaemia group [non-A] (Hb≥11g/dL), anaemia-ivFe [A-ivFe] (patients who received ivFe with Hb< 11g/dL) and anaemia-non-ivFe [A-non-ivFe] (patients with Hb< 11g/dL who did not adhere to the protocol). Demographic data, cancer location, Hb levels at preoperative assessment day, at hospital admission for surgery and at discharge, and red blood cell's (RBC) transfusion requirements from 30 days before to 15 days after surgery were analysed.
Results: In total, 154 patients were included (89M/65F, 65±16 yrs). Main data are shown in the table. Anaemic patients who did no receive ivFe required more RBC transfusion than non-A or A-ivFe group patients. The two last groups requiered similar RBC transfusion even though initial levels of Hb were higher in non-A patients.

Group	non-A (n=96)	A-ivFe (n=24)	A-non-ivFe (n=34)
Procedure			
Gastrectomy, n(%)	10 (10)	2 (8)	7 (21)
Right colectomy, n(%)	24 (25)	14 (58)	14 (41)
Left colectomy, n(%)	37 (38)	1 (4)	9 (26)
Rectum resection, n(%)	25 (26)	7 (29)	4 (12)
Hb at initial assessment (g/dL)	13.4±1.5 ₸	9.1±1.0	9.7±0.9
Hb at admission(g/dL)	12.7±1.5 ₸	11.3±1.8* ₸	9.7±1.7
Hb at discharge(g/dL)	11.2±1.5* ₸	10.4±1.5	9.9±1.1
RBC transfusion (units)	0.4±1.22 ₸	0.5±1.06 ₸	2.35±3.1

[Table1]

*Mean±SD; *: p< 0.05: different to initial assessment, ₸, p< 0.001: different to A-non-ivFe*

Conclusions: The results obtained strongly demonstrate that ivFe treatment decreases RBC transfusion requirements in patients undergoing GI cancer surgery.

1AP3-9

Evidence-based nutritional support guideline results in better ICU nutrition

Zurnic S.S., Briedis N.
Institute for Digestive Surgery, Department of Anaesthesiology and Intensive Care, Belgrade, Serbia

Background and Goal of Study: Numerous studies promote earlier feeding and introduce an evidence-based nutritional support guideline in Intensive Care Unit (ICU) patients. But, the use of this guideline did not improve clinical outcomes, and none of the guidelines result in higher rate of complications, even life threatening ones.
The aim of study was to investigate feeding complications (infectious and non-infectious) during two observed periods.
Materials and Methods: A prospective observational study was performed during two time periods: the year before (Group I; n=156) and second year (Group II; n= 172) after implementation of guidelines. All surgical patients admitted in ICU during the study period time, who have been fed (parenterally or enterally), were included.
Results and Discussion: A total of 328 patients were included. There were no significant differences between the groups with regard to age, gender, nutritional status on admission, APACHE II and SAPS scores. Enteral nutritional support was preferred: 98 patients during the first year, and 114 patients after that were enterally fed. Implementation of guidelines result in statistically significant reduce in complications, as: metabolic (4% vs. 23%), regurgitation (3% vs. 7%), pulmonary aspiration (5% vs. 9%), diarrhea (11% vs. 26%) and feeding tube displacement(2% vs. 5%). With close monitoring by a nutrition team, all nutritional parameters improved at the end of nutritional support: prealbumin 153 g/l ($p< 0,05$), albumin 32g/l ($p< 0,01$) and total protein 61g/l ($p< 0,01$).
Conclusion(s): Nutritional support can lead to serious complications, many of which are life threatening. Early recognition of the signs and symptoms of complications and knowledge of the available therapy options are essential to proper management.
References:
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1AP4-1

IL-2 as a prognostic indicator in colorectal cancer

Terradillos E., Duque P, Ledesma B., Garutti I., Vara E.
HGUGM, Department of Anaesthesiology and Intensive Care, Madrid, Spain

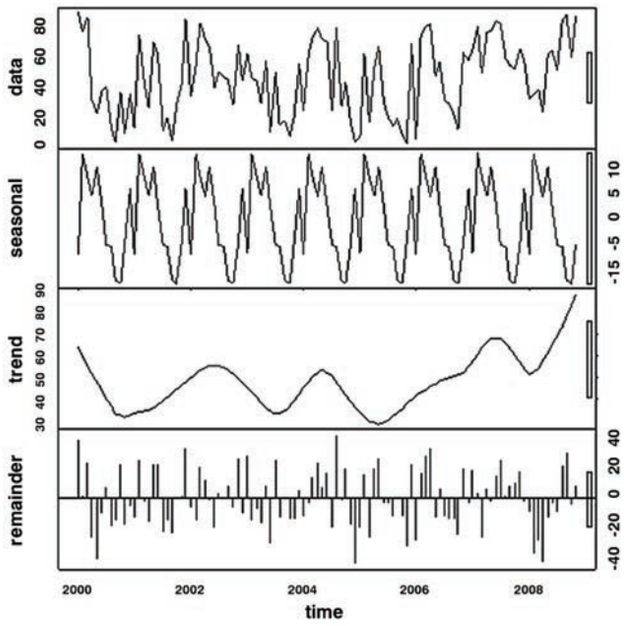
Background and Goal of Study: It is now clear that inflammation and cancer initiation are linked. Circulating levels of pro-inflammatory cytokines might be associated with short-term outcome in oncologic patients. IL-2 is a Th1 derived cytokine that induces proliferation and activation of both CD4+ and CD8+ lymphocytes.Different approaches have been proposed to lessen the inflammatory response following colorectal cancer surgery as laparoscopic technique and epidural anesthesia.The aim of this study is to investigate the potential of circulating IL-2 as a prognostic indicator in colorectal cancer. Second objective is to compare IL-2 levels after open surgery with general anesthesia, open surgery with epidural anesthesia and laparoscopic colorectal surgery.
Materials and Methods: Sixty patients were included in this observational, prospective study, twenty in each group. Levels of IL-2 were measured before surgical incision (TO) and on the first (T1), fourth (T4), twenty-fourth (T24) and forty-eight (T48) postoperative hours. Medical history, intraoperative data, postoperative progression, ICU and hospital length of stay, in-hospital and 1-year mortality of all patients were collected.
Results and Discussion: High basal IL-2 plasma levels are significantly associated with higher incidence of postoperative respiratory and infectious complications ($p< 0.01$), longer ICU and hospital length of stay and higher in-hospital mortality ($p< 0.05$).IL-2 levels are significantly higher in the control group than in the epidural and laparoscopic groups at all times postoperatively, T1, T4, T24 y T48 ($p< 0.01$). At T4, IL-2 levels in the epidural group were significantly higher than in laparoscopic group ($p< 0.01$).
Conclusion(s): High preoperative serum IL-2 levels may reflect the activation of the systemic immune response that is associated with poorer outcome.
The absence of an increase on IL-2 plasma levels postoperatively in the laparoscopic group and to a lesser extent, in the epidural group might reflect an attenuated inflammatory response following colorectal cancer surgery.

1AP4-2

Statistical methods can supply strategic and operative decisions in the OR-management

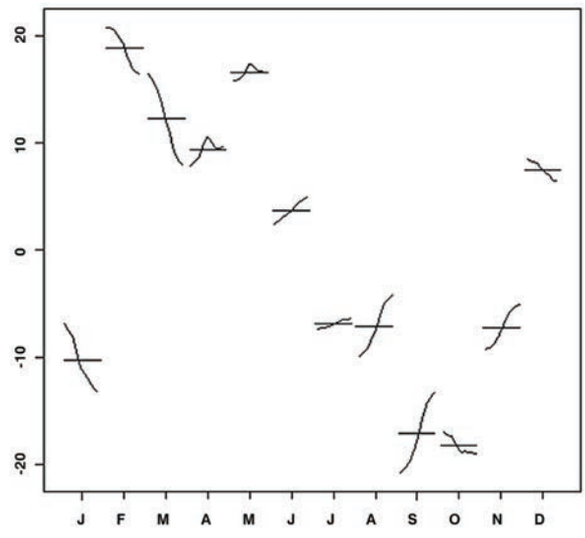
Kaufmann T., Schüpfer G., Konrad C.
Luzerner Kantonsspital, Department of Anaesthesiology, Luzern, Switzerland

Background and Goal of Study: Based on historic data it is often difficult to determine a trend. Seasonal variations are implicitly well known, but difficult to model. Therefore seasonal variations can obscure a trend or show a trend although there is absolutely no trend.
Time series analysis are well established but until now not often used to supply decision finding.
Materials and Methods: Historical data of a Swiss general hospital were used. The hospital is a referral and teaching hospital. The number of surgical procedures in the central operating theatre was counted over more than six years. To correct the effect of public holidays the data was cleared manually



[Decomposition by Loess]

The second diagram shows the average of each month and the trend within the month.



[Monthplot]

Results and Discussion: Between 1.1.2000 and 31.10.2008 88'009 interventions were done in one of the eight central operating theatres.
The data ware aggregated per month and separated by the loess algorithm (STL: A Seasonal-Trend Decomposition Procedure Based on Loess).
The first diagram shows the time series, the seasonal decomposition, the trend and the error.
Conclusion(s): The decomposition by Loess algorithm allows us to detect trends which are occurred by seasonal variations. This information can be an advantage for strategic decisions. Operative decisions are supported by seasonal levels for each month and trends within. So the required resources can be determined by month and adjusted for these effects.

1AP4-3

Perioperative mortality of surgical patients: Record of patients and evaluation of risk factors in the period 2005-9

Gil Bona J., Sabaté Pes A., Rodríguez Zazo A., Abadía Álvarez B., Guerrero Pardos L.M., Miguelena Bovallida J.M.
IDIBELL. Bellvitge University Hospital, Department of Anaesthesiology, Hospitalet de Llobregat, Spain

Background and Goal of Study: Analyze the factors that determine the intraoperative mortality, perioperative, and in the first week, of surgical patients in based on the analysis of all operative deaths
Materials and Methods: We performed a cross-sectional study over surgical death patients, for a four years (2005-09) period. 809 death patients in total over 82412 procedures made were enrolled in this study.
Pre, intra and postoperative data were analysed. We considered four periods of analysis at the time of death: The intraoperative, the first 48 postoperative hours, the first postoperative week, and after the first postoperative week.
To correlate different variables we used the chi square of Pearson and t-Student.
Results and Discussion:

DATA	INTRA-OPERATIVE DEATHS	DEATHS <48 HOURS	DEATHS 2-7 DAYS	DEATHS >7 DAYS
PRE-OPERATIVE				
associated dis.	3.7 +/- 1.8	3.6 +/- 2	3.7 +/- 2	3.6 +/- 1.8
cancer	0%	29%	36%	38% (p=0.00)
ASA>III	68%	38%	26%	18% (p<0.05)
charlson index>0	70%	52%	62%	65% (p=0.04)
Surgical Risk Scale >=8	91%	85%	78%	69% (p=0.00)
INTRA-OPERAT.				
urgent surgery	72%	84%	73%	67% (p=0.00)
intraop.complicat	100%	26%	6%	3% (p<0.05)

[Pre and intra-op. data according to time of death]

POST-OP. DATA	INTRA-OPERATIVE DEATHS	DEATHS <48 HOURS	DEATHS 2-7 DAYS	DEATHS >7 DAYS
Number of patient	53 (6.5%)	121 (14.95%)	237 (29.29%)	398 (49%) (p<0.05)
Hemodynam.disor.		38%	24%	19% (p=0.00)
Multi-org.failure		24%	21%	14% (p=0.01)
Re-operation		28%	19%	38%
Infection		5%	9%	24% (p<0.05)
Respirat.disorder		33%	45%	57% (p<0.05)
Neurol.disorder		11%	21%	27% (p=0.00)
Cause of death	Cardiac death and hemorrhagic shock	Cardiac death and hemorrhagic shock	Respiratory failure and sepsis	Respiratory failure and sepsis

[Post-operative data according to time of death]

Conclusion(s): Emergency surgery was a independent risk factor of mortality.
Patients who died in the first 48 postoperative hours had significantly higher pre-operative risk (ASA,Charlson index,Surgical Risk Scale).
Intra-operative complications rarely influenced the mortality after 48 hours from surgery.
Postoperative data were the main risk factors of mortality in surgical patients.
Postoperative hemodynamic disorders and multi-organic failure were significantly more frequent when patients died within the first 48 postoperative hours.
Highlighted as causes of death: Cardiac death and hemorrhagic shock when death happened in the operating room or in the first 48 postoperative hours, and respiratory failure and sepsis when death happened after 48 postoperative hours.

1AP4-4

Implementation of a structural perioperative diabetes management program in general surgery is associated with improved postoperative outcome

Vieveen J., Boer C., van der Kaaij J., Eekhoff E.M., Loer S.A., Stoecklein K.
VU University Medical Center, Department of Anaesthesiology, Amsterdam, Netherlands

Background: In cardiothoracic surgery, strict perioperative glucose management in patients with diabetes mellitus is associated with improved postoperative outcome. Here we investigated whether implementation of structural diabetes management is beneficial for glucose management and postoperative outcome in a general surgery population.
Materials and Methods: The medical records of patients with diabetes mellitus (DM) admitted for elective surgery in the control period (n=103) and the intervention period (n=122) were retrospectively evaluated. The intervention period was defined as implementation of structural glucose measurements and treatment of hyperglycemia with insulin in case of glucose levels exceeding 10 mmol/l. Glucose measurements were performed before surgery, during surgery, at the holding and the general ward. Outcome parameters were length of stay (LOS) and the occurrence of infections and cardiac, pulmonary and renal complications.
Results and Conclusion: There were no differences in age or type of diabetes mellitus between groups. Patients in the intervention group had a higher body mass index (30±5 kg/m^2 vs. 28±6 kg/m^2;P=0.02) and were more frequently insulin-independent (64% vs. 50%; P=0.02). Interestingly, perioperative glucose levels were not different between groups. However, the number of insulin gifts increased significantly in the intervention group from 0% to 15 % (preoperative; P=0.001), from 4% to 36% (intraoperative; P=0.003), from 12% to 50% (holding; P=0.001) and from 10% to 37% (ward; P=0.001). The increased administration of insulin was associated with a reduced LOS (8±11 days vs. 5±5 days; P=0.04) and a reduced number of postoperative infections (17% vs. 7%; P=0.03), cardiac complications (12% vs. 3%; P=0.006) and pulmonary complications (10% vs. 1%; P=0.006) in the control and intervention group, respectively.
Discussion: Implementation of a structural diabetes management program does not alter perioperative glucose levels despite the increased administration of insulin. However, the augmentation in insulin administration is associated with a reduced length of stay and postoperative complications. Our findings plead for structural perioperative glucose management in the general surgical population.

1AP4-5

Does xenon influence the duration of hospital stay?

Stuttmann R., Burchardt M., Blees A.
BG Kliniken Bergmannstrost Halle (Saale), Department of Anaesthesiology and Intensive Care, Halle (Saale), Germany

Background and Goal of Study: Xenon, a noble gas with anesthetic properties, has become more interesting for the clinical neurosurgery use after some brain protective effects were discovered. Animal experiments could show an improved hypoxia tolerance in the brain and better neurological outcome [1]. The aim of this study was to analyze retrospectively the clinical outcome of neurosurgery patients after using xenon anesthesia. We expected this group of patients benefits more from the use of xenon than other.
Materials and Methods: In a retrospective examination we studied 120 patients with n=60 in the control group (TCI with propofol) and n=60 in den xenon group (Xe). For the data collecting of both groups we used the patient documents. Each TCI patient was matched to a Xe patient with the criteria: identical sex and diagnosis (glioblastoma, astrocytoma, menigeoma, metastasis), age +/- 5 years. If there were more than one match-pair we drawn a matching TCI patient. Study measurements were the transit time between end of operation and arrival in recovery room (RR) as criteria for over all recovery and complications, postoperative duration of stay at the RR, ICU/IMC and of total postoperative hospital stay.

Results and Discussion: The TCI group was similar to the Xe group with regards to age, sex, diagnosis and time of surgery. All data are presented in Table 1. We considered all postoperative ICU/IMC stays as well as cases that were transferred second time to ICU/IMC. 13 patients (both groups) were transferred directly from the operating room to the ICU/IMC and 3 Xe patients were transferred directly from the RR to normal ward. No significant differences of transit time or duration of hospital stay were identified.

Group		Transit time (min)	RR (min)	ICU/IMC (d)	Total (d)
TCI	n	52	52	60	60
	mean	20,77	200,96	1,47	9,9
	S.D.	12,85	121,27	1,46	3,83
Xe	n	55	55	58	60
	mean	20,55	214,91	1,31	9,17
	S.D.	10,57	134,35	2,12	3,32

[Table 1: Transit time; duration of hospital stay]

Conclusion(s): We can see a trend in favor of xenon with respect to the total time of hospital stay (7,4% shorter; p=1,34) and ICU/IMC time (10,9% shorter; p=0,095). These results are pleasant, but also indicate the need for further research in the use of xenon for neurosurgery.

References:

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1AP4-6

Could multimodal analgesia reduce the surgical stress response in major neoplasic abdominal surgery?

Pavelescu D., Grintescu I., Mirea L., Cucereanu-Badica I.
The Emergency Hospital Floreasca, Bucharest, Department of Anaesthesiology and Intensive Care, Bucharest, Romania

Background and Goal of Study: Evaluate which pathway of the surgical stress response is more influenced by multimodal analgesia.

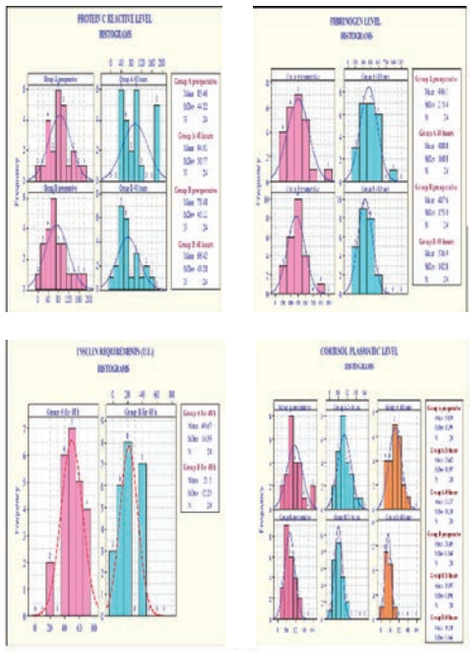
Materials and Methods: Prospective study of 48 patients scheduled for major neoplasic abdominal surgery, randomised in 2 groups:

Group A received standard postoperative analgesia (tramadol 100mg i.v.each 8 hours + paracetamol i.v. 1 g each 8 hours, according to VAS.

Group B received multimodal analgesia: thoracic epidural analgesia (ropivacaine 0,2% + sufentanyl o,5μg/ml) continuous via catheter + ketorolac i.v., 30 mg each 8 hours, starting 2 hours preoperatively, and then for 48 hours.

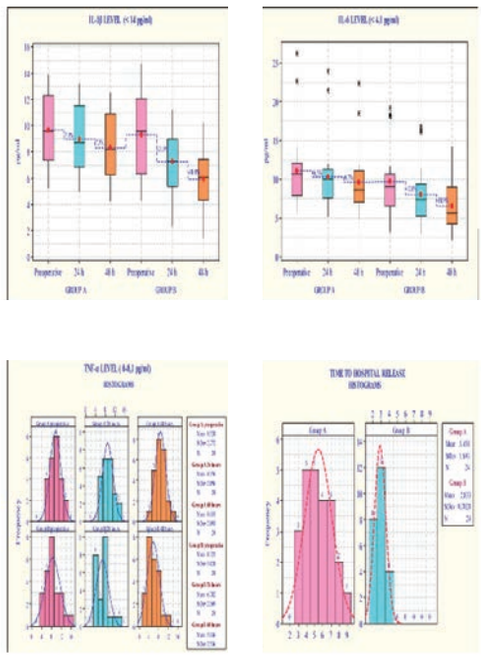
Inflammatory and endocrine response were analysed comparing the level of procalcitonin, protein C reactive, fibrinogen, IL-1, IL-6, TNF-α, the cortisol level and insulin consumption for 48 hours and also rhe time to discharge from hospital.

Results and Discussion: There is a significant decrease in cortisol level, insulin requirements and cytokines response in group B (p< 0,05).



[Grafic 1]

There is no significant difference between groups concerning CRP, procalcitonin and fibrinogen level. Time to discharge from hospital is significant lower in group B (p< 0,05).



[Grafic 2]

Conclusion(s): Multimodal analgesia seems beneficial in reduction of endocrine and cytokine response to surgical stress and also in time to hospital stay. The nespecific inflammatory response is less influenced and this may be due to other factors (surgical technique, age, tumor type).

1AP4-7

Audit evaluating the factors contributing to the incidence of pulmonary embolism in patients at a specialist orthopaedic centre

Gooneratne H., Shenoy S.
Royal National Orthopaedic Hospital, Department of Anaesthesiology, Stanmore, United Kingdom

Background and Goal of Study: An estimated 25,000 people die in the UK from venous thromboembolism (VTE) in hospital every year [1]. The incidence of a fatal pulmonary embolism (PE) following a joint replacement is 0.19% to 3.4%. In 2010 NICE issued new recommendations on assessing and reducing the risk of VTE in hospital in-patients. The aim of this audit was to evaluate the factors contributing to the occurance of pulmonary embolism in the orthopaedic patient population between 1/06/2007 to 9/07/ 2009.

Materials and Methods: All patients at our institution who had a positive CT pulmonary angiogram (CTPA) within the above time frame were evaluated. We assessed information regarding age, type of surgery, risk factors, the type of anticoagulation commenced. We assessed any peri-operative VTE prophylaxis taken.

Results and Discussion: There were 32 positive CTPA from 1/06/07 to 9/07/ 09, 3 cases were excluded as case notes were missing. Overall 29 cases were evaluated. 41% (12/29) of the PE occured in patients undergoing spinal surgery and 41% (12/29) in those undergoing lower limb surgery. Post operative days one to three had the highest incidence of PE. Pre-operative low molecular weight heparin (LMWH) was instituited in only one case. Presence of intra-operative thromobo-embolism deterent stockings (TEDS) was documented in 45% (13/29) of cases and calf compression devices present in 14% of cases (4/29). Post operative TEDS was documented in 75% (22/29) cases and calf compression device in 59% (17/29) cases.

Risk Factor	%
Age >60	41
Malignancy	31
Previous PE	14
BMI >30	34

[Percentage of patients with risk factors]

Conclusion(s): In our institution patients undergoing spinal and lower limb surgery were at highest risk of developing a post operative PE. In spinal surgery the risk of post operative bleeding needs to be balanced with the risk of post operative VTE. However simple mechanical prophylaxis should be instituted pre-operatively and continued post operatively in all cases. Following the NICE recommendations a risk assessment form has been implemented for VTE including guidance on prescribing thromboprophylaxis. A re-audit can be undertaken to look at compliance with guidelines and success in preventing episodes of VTE.

References:

1. www.nice.org.uk - venous thrombo embolism: reducing the risk

1AP4-8

Intra-operative safety checklist - no effects on postoperative morbidity and mortality in high-risk surgical patients

Hovaguimian F., Lübbeke A., Barea C., Hoffmeyer P., Clergue F., Walder B.
University Hospitals of Geneva, Department of Anaesthesiology, Geneva, Switzerland

Background: Implementation of an intra-operative checklist has been associated with lower death rates and complications in a heterogeneous population. High-risk surgical patients may get the highest benefit from this measure. The aim of this study was to assess the efficiency of an intra-operative checklist in high-risk surgical patients living in a high-income country.

Methods: Design: prospective cohort study of pre- (I) and post-implementation (II + III) periods (II: immediate, III: 9 months after implementation); duration: 3 x 3 months. Inclusion criteria: >16 years, ASA >2. Exclusion: low risk surgery, obstetrical/gynaecologic surgery, vital surgery. Main outcomes: unplanned returns to operating theatre (OT), unplanned admissions to intensive care unit (ICU), death, and overall complications within 30 days. Changes in outcomes through checklist implementation were evaluated by calculating absolute risk reduction (ARR) and 95% confidence intervals (CI).

Results: 609 patients were included before and 1110 after implementation (552 in period II, 558 in III). Demographics were not statistically different between the groups (age, sex, BMI, ASA, surgery). Sixty-four percent had a completed checklist in II and 63% in III. No wrong patient or wrong site operation was observed during these periods.

Unplanned return to OT was observed in 45 patients (7.4%) before and in 67 (6.0%) after implementation (ARR 1.4% (95% CI -1.2; 3.9)). Return related to surgical site infection was found in 18 (3.0%) before and in 18 (1.6%) after implementation (ARR 1.3% (95% CI -0.2; 2.9)). Unplanned admission to ICU was observed in 17 (2.8%) before and in 31 (2.8%) after implementation (ARR 0 (95% CI -1.5; 1.7)). Main reason for unplanned readmission to ICU was respiratory failure (1.5% before and 1.1% after implementation; ARR 0.4 (95% CI -0.7; 1.5)). In-hospital death occurred in 26 (4.3%) before and in 68 (6.1%) after implementation (ARR -1.9% (95% CI -4.0; 0.3)).The number of overall complications was 81 (13.3%) before and 146 (13.2%) after implementation (ARR 0.2 (95% CI -3.2; 3.5)).

Conclusion: Implementation of the intra-operative checklist was not associated with significant effects in high-risk surgical patients when living in a high-income country. However, a trend towards decreased unplanned returns to operating theatre for surgical site infection was observed.

1AP4-9

A survey of postoperative residual curarization and critical respiratory events in recovery room

Aytac I., Postaci A., Aytac B., Sacan O., Celik B., Dikmen B.
Ankara Numune Education and Research Hospital, Department of Anaesthesiology and Intensive Care, Ankara, Turkey

Background and Goal of Study: Contemporary anesthesia is considered safe because mortality related to anesthesia is decreased and there is an increased emphasis on expeditious recovery without morbidity.However postoperative residual curarization (PORC) following the use of neuromuscular blockers(NMBs) without neuromuscular monitoring remains a clinical problem although intermediate-acting NMBs are used.The aim of this study was to survey the PORC and critical respiratory events(CREs) in the recovery room.

Materials and Methods: In this study,415 patients(ASA I-III) who received general anesthesia with intermediate-acting NMBs were enrolled.Anesthetists were blinded to the study.Neuromuscular monitoring(TOF-Watch-S) was performed at arrival in the recovery room by assessing the fade in response to submaximally TOFstimulation of the ulnar nerve.A TOF< 0.7 and between 0.7-0.9 at arrival was classified as severe and mild-moderate PORC respectively.CREs was defined by airway requirement, SpO_2< 90%(severe hypoxemia) and 90-93%(mild-moderate hypoxemia) while receiving 3L/min nazal O_2, respiratory rate>20 breaths per minute,difficulty in breathing and swallowing,use of accessory muscles and reintubation requirement.

Results and Discussion: TOF less than 0.7 and 0.9 were observed in 61(14.7%) and 179(43.2%) patients, respectively. TOF< 0.9 was significantly higher patients in females, ASAIII, who underwent laparoscopic and abdominal surgery and who received supplement NMBs dose. Patients with TOF< 0.9 also significantly had an older avarage age, shorter duration of anesthesia and interval from last NMBA injection or antagonism of block to TOF recording(p< 0.05).This result may be associated with lowest mean dose of neostigmine (0.02mg/kg±0.01mg) in patients who receive reversal medication[272(66%)]. The incidence of PORC(TOF< 0.9) while receiving 3L/min nazal O_2 in patients with severe(SpO_2< 90%) and mild to moderate(SpO_2: 90-93%) hypoxemia was significantly higher than patients with SpO_2>93%;14/17(82.4%),60/96(62.5%) and 105/302(34.8%); respectively(p< 0.05).

Conclusion(s): PORC remains a clinical problem despite use of intermediate-acting NMBs. Older patients, female gender, ASA III, shorter surgery, short interval from the last NMB dose to TOF recording and early extubation after reversal of neuromuscular blockade may be at risk of PORC and CREs. The optimal antagonism of NMBs and objective neuromuscular monitoring needs to be performed to ensure patient safety.

1AP5-1

Impact of the preoperative anaesthesia clinic meeting on patient's preference for spinal versus general anaesthesia for lower limb joint arthroplasty

Murdoch J.A.C., Raghavan G., Phelan R., Shyam V.
Queen's University, Department of Anaesthesiology, Kingston, Canada

Background and Goal of Study: Patients can have preconceived opinions or fears regarding spinal anaesthesia.(1) The presurgical meeting with an anesthesiologist offers a chance to provide information for an informed anaesthetic choice and to allay anxieties. We hypothesized that meeting with the anesthesiologist would alter patients' anaesthesia preference in favour of spinal anaesthesia and reduce anxiety levels.

Materials and Methods: Following Research Ethics Board approval and informed consent, 62 patients undergoing elective hip or knee arthroplasty were recruited from the preoperative assessment clinic. In this prospective study, a questionnaire was administered before and immediately after the meeting with an anaesthesiologist, who had no knowledge of the study questions. The primary outcome was preference for general versus spinal anaesthesia while the secondary outcome was anxiety, measured using a modified Amsterdam Preoperative Anxiety and Information Scale (APAIS). Other secondary outcomes included reasons for change of anaesthetic preference and concerns for side effects. Chi square test and Fisher's exact test were used to analyze changes in anaesthetic preference and concerns for side effects; paired t tests were used to compare anxiety levels (p< 0.05).

Results and Discussion: 62 patients, (35 female, 27 male, mean age 67+/-SD 10) were recruited over a six week period. We observed a significant decrease in patients preferring general (48% to 18%, p< 0.01) and a significant increase in patients preferring spinal (39% to 74%, p< 0.01) anaesthesia before versus following the meeting with the anaesthesiologist.

The most frequent reason quoted for this change was "being more knowledgeable" with "safety" ranked second. Of those reporting the greatest concern for having spinal anaesthesia, the commonest reason (72%) was that of "hearing intraoperative sound". Regarding side effects, the most frequent concerns were "nerve damage" and "paralysis". All concerns regarding side effects and all anxiety measures were significantly reduced post meeting except anxiety directly associated with the anaesthetic. This was likely attributable to patient's anxiety scores for the anaesthetic already being low prior to the meeting.

Conclusions The anaesthetic preoperative interview significantly influences patients' choice in favour of spinal anaesthesia for major lower limb arthroplasty and reduces anxiety.

References:

(1)Sosis et al. J Clin Anesth 7(5):389-94, 1995.

1AP5-2

Are we looking after the needs of adolescent patients coming to theatre?

Barry M.A., Crowe S.
Adelaide Meath & National Children's Hospital, Department of Anaesthesiology and Intensive Care, Dublin, Ireland

Background and Goal of Study: Adolescents are a specific group requiring recreation, educational and support services directed at their age and

developmental stage. Adolescent perioperative care is delivered in both adult and pediatric hospitals. Adult hospitals may not cater directly for the particular emotional, psychological and physical needs of teenagers presenting for surgery.
However, children's hospitals frequently overlook this important patient population also. We wished to audit how adolescent patients admitted to our hospital for routine surgery perceived their care and what changes they would suggest to improve the quality of care delivery.
Materials and Methods: A prospective questionnaire based study carried out over a 12 month period in a secondary level children's hospital.
Results and Discussion: 722 patients completed the audit, with a mean age of 13 years (range 12-18). 62% of adolescents understood the procedure planned, with the majority receiving information from the admitting surgical team. Many (41%)patients had also sought information from other sources including the internet.
The consent form for surgery was signed by the teenagers parent or legal guardian in most cases (98.5%). A significant number (28%) felt that they had enough information and understanding to sign their own consent. The main complaint adolescents made about their perioperative care was the period of waiting on the ward before surgery. A substantial number (69%) of patients did not understand why they had been asked to fast before surgery.
Conclusion(s): Adolescent patients attending our institution have clear views on how their perioperative care is delivered and may make an important contribution to how our service may be improved in the future.
References:
Royal College of Paediatrics and Child Health, 2003. 'Bridging the Gaps: Health Care for Adolescents'. UK.
Acknowledgements: Our thanks to the staff of the Children's Theatre, AMNCH.

1AP5-3

Patients' perception of the role of anesthesiologists: A view from the general practitioners office

Kovacevic M., Goranovic T., Markic A., Jelisavac M., Pavicic A., Sakic-Zdravcevic K.
Clinical Hospital ‚Sveti Duh', Department of Anaesthesiology and Intensive Care, Zagreb, Croatia

Background and Goal of Study: Despite the significance of anaesthesiology as a medical specialty, there is inadequate public knowledge regarding this specialty in Croatia.
In this study we wanted to find out current patients' and other healthcare providers' opinions about anaesthetic procedures and the exact role of anaesthesiologists.
Materials and Methods: A self-administered structured questionnaire was designed, and validated. The questionnaire was delivered electronically via e-mail addresses to general practitioners (GP) during period from September to November 2010. Response rate was 62%.
Results and Discussion: According to the survey, 51.6% of patients discussed with their GPs about the upcoming surgery. Patients generally do not differentiate the anaesthetic procedure as a separate procedure to the surgical one, and consequently they rarely ask about it separately.
The top three patients' fears associated with anaesthesia were: the fear of not waking up from anaesthesia, the fear of pain after surgery and the fear of waking up during surgery.
48.3% of GPs believed that patients were not aware of the different types and techniques of anaesthesia.
52% of GPs responded that patients sometimes asked about the complications of the surgical procedure, and at the same time, they were not aware of potential anaesthetic complications.
74.1% of GPs believed that patients did not differ surgical from the anaesthetic procedure.
74.2% of GPs believed that patients were not aware that postoperative treatment in the intensive care unit was run by anaesthesiologists.
GPs were familiar with different anaesthetic techniques but most believed they needed more information about anaesthesiology and that more effort was needed to improve image of anaesthesiology as a profession among general population (93.5%).
Conclusion: Patients in Croatia have poor knowledge about anaesthesiologists and their roles. GPs are aware of the poor image of anaesthesiologists among general population.
These findings should motivate anaesthesiologists to enhance their image in general public. Anaesthesiologists should expose themselves more to their patients, potentially through the use of the media and internet.

1AP5-4

"Could your patient be pregnant?" Detection of early pregnancy in the preoperative patient - closing the audit cycle

Saha S., Reddi D., Wylie S.
Royal Free Hospital, Department of Anaesthesiology, London, United Kingdom

Background and Goal of Study: In April 2010 the National Patient Safety Agency (UK) issued an alert highlighting the deficit in preoperative pregnancy checking. They reported 42 unknown preoperative pregnancies, 3 resulting in post-operative abortions.
The alert recommends the following be in place by 28/10/10:
1. Pregnancy checking immediately pre-operatively.
2. Recording the check on pre-operative documentation.
3. Robust reporting of incidents where pregnancy checks have not happened and any associated actions that may come from this.
Goal: To audit performance of pregnancy documentation against the standards set by the NPSA.
Materials and Methods: The first audit was performed in April and May 2010 after which a form was introduced for patients to self-report pregnancy status and consent for a pregnancy test. The reaudit was carried out in October 2010. In each audit data from 100 female patients aged 16-50 having non-gynaecological surgery was collected. We looked at documentation of whether the patient had been asked if they were pregnant in preassessment, pregnancy testing, LMP, contraception and whether all of this was done less than 5 days preoperatively.
Results and Discussion: The results showed that 62% of women were asked if they were pregnant in the first audit and 78% in the second. Documentation of pregnancy testing was 3% in the first audit and 9% in the second, LMP 62% in the first, 76% in the second, contraception 15% in the first and 49% in the second. 47% had their pregnancy check >5days preoperatively in the first audit, 52% in the second.
Recommendations being introduced following the second audit include changing the anaesthetic chart to add a section to prompt the anaesthetist to ask about pregnancy. Others being considered include adding pregnancy status to the WHO surgical checklist as well as introducing a universal pregnancy testing policy; however the cost and ethical concerns for the latter will need further review.
A clear definition of what a makes an adequate preoperative pregnancy status check would help in assessment and achievement of standards as well as reducing interhospital variability.
Conclusion: Preoperative pregnancy checking should have 100% compliance and by those standards our current systems fall short. Further improvement is expected following implementation of the new recommendations.
References:
NPSA. Rapid response report. Checking pregnancy before surgery. NPSA/2010/RRR011. 28/4/2010.

1AP5-5

Patient Satisfaction Survey of the Enhanced Recovery Programme School for Colorectal Surgery at the Royal Berkshire NHS Foundation Trust

Burumdayal A.N., Mohabir A., Cherrill S., Worthington L., Middleton S.
Royal Berkshire NHS Foundation Trust, Department of Anaesthesiology, Reading, United Kingdom

Background: Enhanced Recovery Programmes (ERP) are now widely prevalent in the UK. Using a multidisciplinary team approach focusing on stress reduction and early return to function, ERP aim to help patients recover more quickly from surgery and reduce morbidity. This results in shorter hospital stays and savings in healthcare costs.An ERP in colorectal surgery has been running successfully at the Royal Berkshire NHS Foundation Trust (RBHFT) since 2006. A key element to the success of an ERP is thorough patient preparation and education. To help with this, an ‚ERP School' has been established at the RBHFT for colorectal surgery. The School is run weekly by the Clinical Nurse Specialists along with the Pain Team and Physiotherapists. Patients scheduled for elective colorectal surgery are invited to attend one or two weeks prior to their admission. The session lasts 1.5 hours and includes an in-depth discussion about what patients can expect peri and post-operatively, as well as a practical demonstration of stoma care. They receive written information about the ERP, benefits of regional anaesthesia and postoperative physiotherapy. The purpose of this survey was to evaluate the response to the School.
Methods: Between April and October 2010, all the patients who attended the School were asked to complete a feedback form prior to discharge.

Results and Discussion: 19 patients attended the School. 13 patients were discharged at 4 days and all completed feedback forms . 6 had delayed discharges. 85% of patients strongly agreed or agreed that the School was useful. Everyone felt the school provided relevant and understandable information. All patients and their family felt fully informed about their care. All 85% strongly agreed or agreed that the School had a positive impact on their hospital stay.
Clear information describing what will happen during their hospital stay and what their role is in their own recovery can facilitate patients' adherence to the care pathway and timely recovery. Despite small numbers, our survey shows that patients find this structured provision of information beneficial.
Conclusion: The School was well received by those who attended and should continue as part of the ERP. In addition to this, the ERP School are developing a DVD to reinforce the information provided at the School. Following on from this model we suggest that other specialities develop similar formats for patients undergoing major elective surgery.

1AP5-6

A survey of patient's anaesthetic concerns in the pre-assessment clinic

Denner A.M., Wee M.Y.K.
Poole Hospital NHS Foundation Trust, Department of Anaesthesiology, Poole, United Kingdom

Background and Goal of Study: The reported incidence of pre-operative anxiety amongst patients ranges from 10-80%. Patient anxiety is complex and multifactorial and may have physiological, psychological and economic sequelae. The aim of our study was to investigate the frequency and severity of these anxieties and determine whether the anaesthetic pre-assessment clinic consultation reduces anxiety levels.
Materials and Methods: We distributed 100 questionnaires to patients from a wide variety of surgical specialities at the pre-assessment clinic and asked them to score their anxiety for six specific items both pre and post clinic consultation. The six items were: post-operative pain, post-operative vomiting, post-operative nausea, not waking up after the operation, waking up during the operation and having a needle/"drip". We also gave patients the opportunity to express any other concerns they may have and asked them some supplementary questions.
Results and Discussion: A statistically significant reduction in anxiety scores was demonstrated in five of the six categories (pre compared with post clinic anxiety scores, $p < 0.001$). 87.5% of patients saw a nurse in the pre-assessment clinic. Only 10.2% of patients expressed a desire to see an anesthetist at the pre-assessment clinic.
The literature shows that anxiety may render patients vulnerable to an increased risk of post-operative nausea and vomiting and an increased perception of post-operative pain. This is turn may lead to delayed discharges and an increased rate of unexpected overnight stays (in day-case patients).
Conclusion(s): Our study has demonstrated that patient anxiety can be modified by the pre-assessment clinic consultation and that specially trained pre-assessment clinic nurses are effective in this role.

1AP5-7

Are parents adequately informed and satisfied accompanying their children to theatre?

Malik D., Ali P, Hames N., Atoia E.
University Hospitals of Leicester, Department of Anaesthesiology, Leicester, United Kingdom

Background: Parents invited to accompany their children to the anaesthetic room have no prior preparation or discussion about what is expected from them.The majority think that they are expected to come and that it is their given right.The escorting ward staff are inadequately informed of their own and parental role during the induction of anaesthesia, hence the poor communication with the child's parent.
Audit aims: Compliance with The Royal college of Anaesthetists and the Association of Anaesthetists of Great Britain and Ireland publication, 'Your Child's General Anaesthetic'. Were parents satisfied that their presence helped their child, aware that accompanying the child is the discretion of the most senior anaesthetist on that list and that they may be asked to leave anaesthetic room in an emergency?
Materials and Methods: Three independent auditors gathered information over a period of three months from 59 randomly selected parents of children between the age of 1and16 years, presenting for an emergency or an elective day case surgery. Parents were consented and assured of confidentiality while completing a 14 point questionnaire which was used to judge their responses in the recovery room and wards.
Results and Discussion: Forty two percent of children were 1-5 years old, 93% presented for an elective day case surgery.Thirty one percent of parents were accompanied to theatres by untrained staff.Fifteen percent of parents were unaware of their role in the peri-induction period while 15% were not keen on accompanying their children, out of those 3% felt under pressure to accompany their children.Seventy percent of children requested the company of their parents.Ninety four percent of parents felt that their presence helped their child. Emotions expressed by the accompanying parents ranged from pleasing, relieving to distressing, upsetting or worrying experience.Most (58%) of the parents were unaware that they may be asked to leave theatres in case of anaesthetic emergency. Only 63 % knew that it was senior anaesthetist's discretion to allow them to be in the anaesthetic room.
Conclusion: It is a stressful experience for parents to accompany their children into the anaesthetic room. Although in hindsight parents viewed it as a positive experience as it made them feel that they were present to help and support their children. The audit showed that parents need to be more informed and supported to fulfill this role.
References:
http://www.youranaesthetic.info/

1AP5-8

Fear of general anesthesia in laparoscopic cholecystectomy

Baraza A., Rodriguez-Perez A., Revilla T., Pulido R.
Dr Negrin University Hospital, Universtity Hospital, Research and Development Department, Las Palmas de Gran Canaria, Spain

Background and Goal of Study: Transcendence of the fear of anesthesia on the efficiency of postoperative care is still undetermined. We explored fear associated with anesthesia, and to establish which variables propitiate fear reactions.
Materials and Methods: A simple prospective design was used. The core variable was a repertory of fears associated with anesthesia, along with generic, socio-demographic and other factors.
The study was carried out in the Dr. Negrin University Hospital on patients who underwent laparoscopic cholecystectomy under intravenous anesthesia. The results were from only one group with only one measurement after the intervention (n=162). The fear of anesthesia scale (FAS) was used, created and validated by the investigative team, with Crombach alpha + 0.97). The FAS was given to the patients the day after the operation. Before carrying out this study, we obtained both ethics committee approval and informed consent of patients.
Results and Discussion: Age and anthropometric characteristics were not significant. Non-relevant factors were sex ($t_{(160)}=1.13$; $p=0.26$), and patient education level ($F_{(3, 157)}=0.74$; $p=0.52$).
Urban vs rural dwelling and family situation were also not significant. Employment status as a factor was not conclusive ($F_{(5,155)}=0.43$; $p=0.82$), and previous experience in surgery had no impact on fear ($t_{(160)}=0.10$; $p=0.92$). However, if there had been complications in a previous surgery, we found a marginally significant difference ($t_{(124)}=1.76$; $p=0.08$).
An upsetting memory of a previous experience was initially related to fear of anesthesia ($t_{(124)}=2.09$; $p=0.03$).
Finally, we analyzed if the hospitalization process within the last 3 years had an influence on fear of anesthesia. This information served equally well for our purposes, whether the experience of the patient had been acquired when admitted himself or accompanying a member of his family. The experience of having been admitted in a period of time relatively close to the operation constitutes a relevant factor in fear of anesthesia ($t_{(160)}=5.70$; $p=0.001$). The most representative fears of anesthesia were complications after surgery, pain after surgery and failure to awake after surgery.
Conclusion(s): We have described the most prevalent fears concerning anesthesia, and localized the indicators of a profile of fear of anesthesia in patients with previous experiences, when associated with complications, upsetting experiences or recent admission to the hospital.

1AP5-9

Surgical patient anxiety and satisfaction

Rodríguez A., Baraza A., Pulido R., Rodriguez T., Ojeda N.
Dr Negrin Hospital, Department of Anaesthesiology, Las Palmas de Gran Canaria, Spain

Background and Goal of Study: Anxiety to anesthesia is a confrontation with a threat. Our objectives are to establish whether anxiety experienced by patients decreases after surgery, and to determine whether these changes are related to personal characteristics and the relationship between postoperative anxiety and satisfaction with care received.

Materials and Methods: The study sample was 148 patients who underwent laparoscopic cholecystectomy under intravenous anesthesia. Inclusion criteria: adult, not cognitive impairment and diagnosed tumor. We obtained ethics committee approval and informed consent of patients.Semi-experimental design before/after using core variable patient anxiety with pre-and post-surgical measures.
Also, simple observations designed to record data relevant to health, sociodemographic factors that contribute to drawing a value profile of our results, an anxiety test (STAI) and questions that measure the degree of satisfaction with the process.
Results and Discussion: The analysis showed that anxiety was higher before the intervention. Specifically, we obtained significant differences in STAI (MPRE = 21.7, SD = 12.2 vs Mpost = 16.0, SD = 8.5, $t_{(104)}$= 4.86, p =. 001) and these were independent of other variables, except that sex and significant differences were found between men (M = 15.7, SD = 10.2) and women (M = 24.4, SD = 11.9, $F_{(1, 144)}$) = 16.34, p =. 001) in preoperative anxiety levels. The relationship of anxiety with satisfaction with the surgical processThe ANOVA showed a marginally significant interaction between anxiety and satisfaction $F_{(1, 81)}$ = 3.21, p =. 07.
While in both groups there are significant differences in the level of anxiety ($F_{(1, 81)}$ = 6.27, p =. 01) for the group that is least satisfied and ($F_{(1, 81)}$ = 19.3, p =. 01) for the group that is more satisfied], the proportion of variance explained in each case shows a moderately higher value in the second group (η2 =. 018) compared to the first (η2 = .010).
The relationship of anxiety with satisfaction in the treatment of pain Pearson correlations between experience of pain and anxiety were significant in both the preoperative ($r_{(146)}$ =. 25, p =. 01) and postoperative ($r_{(146)}$ =. 44, p =. 001). As patients experience more anxiety, they have a greater sense of pain.
Conclusion(s): Patient anxiety is related to satisfaction. We have also resolved doubts and minimized anxiety, which has a positive effect on the surgical process, and this will increase quality.

1AP6-1

Lung management during cardiopulmonary bypass: A systematic review of randomized trials

de Korte M., Lance M.D., Kranke P., Schreiber J.
MUMC+, Department of Anaesthesiology, Maastricht, Netherlands

Background and Goal of Study: During cardiopulmonary bypass (CPB) a variety of methods are used to minimize postoperative pulmonary complications and preserve pulmonary function. Various interventions are applied by anaesthesiologists, e.g. PEEP, CPAP, or recruitment manoeuvres, in order to achieve beneficial effects on the pulmonary status following CPB. To investigate the current evidence for potential beneficial effects of various manoeuvres ("lung management") following CPB, we performed a quantitative systematic review of the literature.
Materials and Methods: A systematic search of Medline, Biosys, Embase and the Cochrane Library (1966 - July 2010) was performed to identify randomised controlled trials (RCTs) that focused on lung management during cardiopulmonary bypass.
Without any language restrictions, a search with the following terms was performed: cardiopulmonary bypass, continuous positive airway pressure, CPAP, positive pressure ventilation, PEEP, vital capacity manoeuvre. Identified studies were then hand-searched for further relevant literature. Interventions that were compared in at least 3 trials were analysed using a fixed effect model.
Results and Discussion: Data from 15 RCT's were analysed (N=739 patients). Median Oxford score of the trials was 2 (Range 1-4). Use of CPAP 5 -10 mmHg (7 comparisons) during CPB resulted in a significant higher oxygenation index (PaO_2/FiO_2) immediately post CPB (p< 0.00001). It also resulted in lower $AaDO_2$ and a lower shunt fraction immediately post CPB (p=0.003 and p< 0.00001, respectively). 4 hours after weaning from CPB the $AaDO_2$ was not significantly improved compared to control. Positive pressure ventilation during CPB (2 comparisons), PEEP following CPB (2 comparisons) and vital capacity manoeuvre (6 comparisons with various techniques and endpoints), were not analysed.
Conclusion(s): Results from this systematic review imply that the use of CPAP during cardiopulmonary bypass may improve oxygenation and pulmonary gas exchange immediately after weaning from CPB and reduces the pulmonary shunt fraction. No significant benefit was found 4 hours after CPB. Other interventions were sparsely investigated. The documentation of clinically relevant (long term) outcomes, e.g. ventilator hours, ICU length of stay, was lacking, which supports the need for further trials in this field.

1AP6-2

Organoprotection during endoscopic cholecystectomy in conditions of total intravenous anesthesia

Ovezov A.M., Lobov M.A., Bragina S.V., Nad'kina E.D., Prokoshev P.V., Lugovoy A.V.
Moscow Regional Research Clinical Institute, Department of Anaesthesiology, Moscow, Russian Federation

Background and Goal of Study: The aim of study was to improve the quality of total intravenous anesthesia (TIVA) in endoscopic surgery through the use of organoprotection.
Materials and Methods: In randomized clinical, blinded, prospective, controlled study, we included 50 patients (ASAII-ASAIII, age - 17-79 years) who underwent laparoscopic cholecystectomy under TIVA (fentanyl, propofol). In the study group (group A, n = 25), we used Cytoflavin 20 ml (composition: Succinic acid 100 mg/ml, Nicotinamide 10 mg/ml, Inosine 20 mg/ml, Riboflavin 2 mg/ml). In the control group (group B, n = 25) used hepatoprotector Essentiale 20 ml, containing an equivalent dose of Riboflavin.
Both drugs were administered as a unknown for anesthesiologist solution of the same color and volume in all cases at the same rate. The induction and maintenance of TIVA was standard in all patients.
Monitoring: Harvard Standard, Entropy of the Electroencephalogram (IS-EEG), Electrodermal activity (EDA), Perfusion Index (PI), Heart Rate Variability (HRV).
The results obtained were fixed with a subsequent audit and calculate the frequency of critical incidents (FCI) and index of the frequency of critical incidents (IFCI). Statistical analysis was performed on 9 stages of anesthesia and surgery. Considered statistically significant value of p < 0,05.
Results and Discussion: Dosage of propofol and fentanyl was equal in both groups. Hemodynamic profile of anesthesia in all patients looked unidirectional, but there is a difference in the mean values of heart rate (higher by 13 - 18%, p < 0.05) and SpO2 (below 2.3%, p < 0.05) at different stages operation in Group B.
In the study group, BP and HR were more stable, which, along with data EDA, HRV and twofold excess PI (p < 0,05) by the end of the operation proves a better adaptation of the cardiovascular system to stress. FCI value in Group B was equal to 0,66 ± 0,11 on checkpoint, and in Group A - 0,36 ± 0,06; IFCI - 2,62 and 1,44 per hour, respectively (p = 0,028).
Characteristics of postanesthetic recovery period were significantly better in group A (see table).

Group	Awakening, min	Extubation, min	Orientation, min	10 points for Aldrete, min
A (M ± m)	5,33 ± 1,04	16,27 ± 2,12	17,46 ± 2,10	20,70 ± 2,04
B (M ± m)	12,45 ± 1,83	23,57 ± 2,54	24,95 ± 2,62	30,68 ± 2,96
p (U) =	0,0025	0,0069	0,0054	0,0016

[Characteristics of the period of postanesthetic re]

Conclusion(s): This study demonstrates that cytoflavin has combined cardio and cerebroprotective effect in endoscopic surgery under TIVA based on propofol.

1AP6-3

Peripheral perfusion during total intravenous or combined general anaesthesia

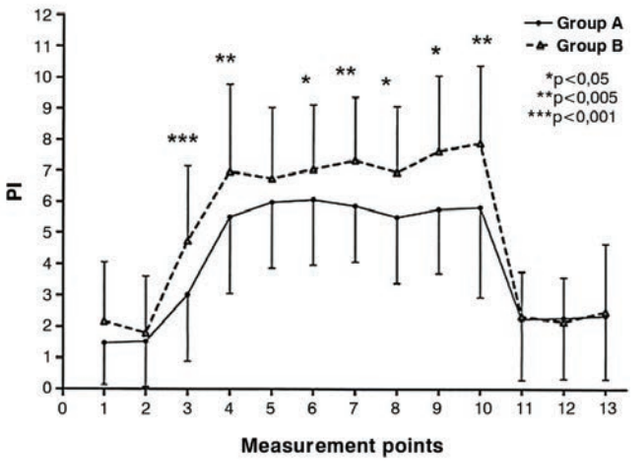
Fijałkowska A., Nestorowicz A., Kowalczyk M.
Medical University in Lublin, Department of Anaesthesiology and Intensive Care, Lublin, Poland

Background and Goal of Study: Peripheral perfusion may be compromised during anaesthesia. It was shown that peripheral perfusion index (PI) correlates well with end-tidal concentration of a volatile anaesthetic used [1, 2]. The aim of study was to assess the changes in PI values during propofol- or sevoflurane-maintained anaesthesia.
Materials and Methods: ASA I-II class women, scheduled for elective laparoscopic surgery were randomly assigned to two groups: A-combined, or B-intravenous anaesthesia. In group A anaesthesia was induced with thiopentone and suxamethonium and maintained with N_2O/O_2, sevoflurane, fentanyl and cis-atracurium.
In group B propofol and remifentanil were applied for induction and maintenance of anaesthesia using the TCI method, together with air/oxygen mixture and suxamethonium followed by cis-atracurium. During anaesthesia PI values were recorded (Radical-7, Massimo) at the following points: 1-before anaesthesia, 2-after opioid administration during induction, 3-after intubation, 4-skin

incision, and then (5-9) at 10-min intervals during maintenance,10-at the end of surgery, 11-eyes opening, 12-extubation, 13-before discharge from the theatre. The Mann-Whitney U test was used for statistical analysis.

Results: Group A consisted of 45 and group B - 43 patients. There were no significant differences between the two groups according to demographic data, time of surgery and anaesthesia.

In both groups anaesthesia resulted in an increase in PI, with significantly higher values recorded in group B compared to group A. Completion of anaesthesia caused a decrease in PI to the preoperative values (Fig. 1).



[Fig 1]

Conclusions: Peripheral perfusion improves during general anaesthesia. TCI with propofol results in better tissue blood flow compared to combined anaesthesia with sevoflurane.

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1AP6-4

Combined use of propofol, remifentanil, and rocuronium for rapid sequence intubation

Oh A.-Y., Song I.-A., Cho S.-J., Kim J.-H., Jeon Y.-T.
Seoul Nationl University Bundang Hospital, Department of Anaesthesiology and Pain Medicine, Seongnam-Si, Korea, Republic of

Background and Goal of Study: Rapid tracheal intubation may be accomplished with a large dose of rocuronium but the prolonged duration of action is a problem.

Successful tracheal intubation without muscle relaxant is reported with remifentanil 3-4 μg/kg but hypotension is a problem. We tried to find adequate dose of rocuronium for rapid tracheal intubation with combined use of induction dose of propofol and remifentanil.

Materials and Methods: ASA physical status Ⅰ-Ⅱ adult patients aged 18-65 yr were enrolled. After premedication with midazolam and glycopyrrolate, patients were induced with remifentanil 2 μg/kg, propofol 2 mg/kg, and predetermined dose of rocuronium.

Intubation was done at 60 s from the start of rocuronium injection. Intubation conditions were graded as excellent, good, poor and excellent or good level was regarded as clinically acceptable. The dose of rocuronium was determined by Dixon's up-and-down method. The first patient received 0.8 mg/kg of rocuronium. Heart rate and blood pressure (SAP, MAP, DAP) were recorded before induction, 30 s after propofol injection, and 1, 2, and 3 min after tracheal intubation.

Results and Discussion: The rocuronium dose for acceptable intubation conditions was 0.20 (0.05) mg/kg. ED50 and ED95 from probit analysis were 0.20 (95% CI: 0.14-0.25) mg/kg and 0.29 (95% CI: 0.24-0.62) mg/kg respectively.

Heart rate and blood pressure decreased significantly after propofol injection but no significant changes thereafter.

Conclusion(s): When combined with remifentanil 2 μg/kg and propofol 2 mg/kg, the rocuronium dose needed for acceptable intubation condition in 95% of patients was 0.3 mg/kg.

1AP6-5

Effectiveness of "saline flush test" in detecting misplaced subclavian catheter into the ipsilateral internal jugular vein: A preliminary report

Soyal O.B., Baytaş N., Akçaboy Z.N., Akçaboy Y., Yılmaz A.N., Göğüş N.
Ankara Numune Education and Research Hospital, Department of Anaesthesiology and Intensive Care, Ankara, Turkey

Background and Goal of Study: Aim of this study is to determine the sensitivity and specificity of previously reported "saline flush test" (SFT) [1,2] in showing the misplacement of subclavian vein (SCV) catheter to the ipsilateral internal jugular vein (IJV) in patients undergoing neurosurgery.

Materials and Methods: Patients scheduled for neurosurgery and to require subclavian vein catheterization were enrolled into this study. After insertion of the central venous catheter through the right SCV using seldinger technique, 10 ml of saline was injected from the distal port of the catheter while an independant observer put the palm of his hand on the patient's ipsilateral sternocleidomastoid muscle to experience wether a thrill is sensed during the injection or not. The thrill sensation was recorded as "positive" and a precursor of misplacement to the IJV. Confirmation was made by chest radiography for correct placement.

Results and Discussion: ASA II-III, 16-68 year old 83 patients were evaluated and only 1 patient (1,20%) had positive saline test and this was the only patient who had misplacement of the SCV catheter into the ipsilateral IJV which was also confirmed by the chest radiograph. The chest radiographs of the remaining 82 patients showed SCV catheter in the right place and had a negative saline flush test. Although more patients are needed to be observed , this test seems highly sensitive and specific for patients with misplaced SCV catheter into the ipsilateral IJV.

Conclusion(s): Misplacement of the SCV catheter to the IJV is a common error of placement with possible side effecs such as thromboflebitis, clot formation, impaired CVP measurement and catheter erosion. Early diagnosis is important and chest radiograph is stil the gold standard. SFT is a simple and costless test with no side effects but high sensitivity and specificity which can be a good alternative for diagnosing misplacement of SCV catheter into the ipsilateral IJV.

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1AP6-6

Surgical Pleth Index (SPI) guidance vs. standard practice during sevoflurane-sufentanil anaesthesia: A randomised controlled trial

Willms S., Ilies C., Bein B., Gruenewald M.
University Hospital Schleswig Holstein, Department of Anaesthesiology and Intensive Care, Kiel, Germany

Background and Goal of Study: Surgical Pleth Index (SPI), derived by finger plethysmography, was introduced to detect nociceptive stimulation and is dependent on analgesic drug concentration [1, 2]. The use of SPI reduced the number of unwanted intraoperative events and opiod consumption during guidance of total intravenous anaesthesia by remifentanil-propofol [3]. The impact of SPI guidance during a balanced anaesthesia setting using a volatile anaesthetic and intermittend opiod administration has not been studied. Therefore, the present prospective randomized controlled trial aimed to examine the impact of SPI guidance during a sevoflurane-sufentanil regimen.

Materials and Methods: Eighty-two patients of ASA physical status I and II, scheduled for either trauma surgery or gynaecological laparoscopic surgery were randomized into either SSI-guided analgesia group (SPI group) or standard practice group (control group). In both groups anaesthesia was induced with propofol and maintained by sevoflurane to keep bispectral index values between 40-50. SPI group patients received a sufentanil bolus (10μg) whenever SPI value was above 50 for more than 30 seconds, whereas in control group patients sufentanil was administered according to standard clinical practice (MAD > 90 mmHg, HR > 80/min, patient movement). Vital parameters, sufentanil consumption, number of unwanted intraoperative events and recovery times were recorded.

Results and Discussion: Sufentanil consumption did not significantly differ between groups (p=0.18) and was 5,84 ng/kg/min in the SPI group and 6,62 ng/kg/min in the control group. No significant difference in terms of hypotensive events (MAD < 65 mmHg, p=0.25), hypertensive events (MAD >

100 mmHg, p=0.13) and unwanted intraoperative events such as movement, coughing or unwanted spontaneous breathing (p=0.89) was recorded between groups. Recovery times (suture to extubation) were comparable with 6,6 min in the SPI group and 7,3 min in the control group (p=0.55).
Conclusion(s): SPI guided analgesia does not significantly improve haemodynamic stability, prevention of unwanted events or improve recovery times during a balanced anaesthesia regimen using sevoflurane and sufentanil.
References:
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1AP6-7

Acupuncture on Yintang point decreases preoperative anxiety

Acar H.V., Cuvas O., Ceyhan A., Dikmen B.
Ankara Training and Research Hospital, Department of Anaesthesiology and Intensive Care, Ankara, Turkey

Background and Goal of Study: Recent work has showed that acupuncture on Yintang point may be as useful as body acupuncture and/or ear acupuncture using multiple acupoints. Our aim was to investigate the effect of ear press needle on this point for preoperative anxiety.
Materials and Methods: After approval of Ethics Committe of hospital, 52 patients undergoing surgery under general or regional anesthesia were divided in two groups in this prospective, randomised, sham-controlled, and single-blinded study:
1 - Acupuncture group (Needling was performed on Yintang (EX HN-3) point which is located in the midpoint between two eyebrows at the root of the nose).
2 - Sham acupuncture group (Needling applied 2 cm lateral to lateral end of the right eyebrow).
Patients undergoing surgery under local anesthesia were excluded. STAI (State Trait Anxiety Index) questionnaire and BIS (Bispectral Index) measurement was used for anxiety assessment. In the preoperative waiting area, a disposable BIS sensor which was attached to a BIS VIEW monitor (Aspect Medical Systems, Inc, Newton, MA, USA) was placed on each patient's forehead following a baseline STAI questionnaire was completed.
Then, patients received ear press needles (0.22 x 1.5 mm, KINGLI press needle, CHINA) at the verum or sham acupoints described above. BIS values were recorded on each 2-min intervals. After 20 minutes of study period, needles were removed and a STAI scale was completed again. Groups were compared for STAI changes and BIS values as well as demographic parameters.
Results and Discussion: There was no significant difference in the demographic data of the groups. BIS values in the acupuncture group were significantly lower than in the sham group in all time intervals (p< 0,0042).
BIS values were lower than baseline in the study group along the study period (p< 0,0004) while no such effect has been observed in the sham group (p>0,0004).Mean values of state anxiety (STAI-S) were decreased after acupuncture in the study group (p=0,018), while no change has been observed in trait anxiety (STAI-T) (p=0,156). However, patients of sham group showed no change in both parameters (p=0,387 ve p=0,116).
Conclusion(s): Acupuncture with ear press needles on Yintang point reduces preoperative anxiety in surgical patients.
This method with its effectiveness and simplicity offers an valuable choice to pharmacological agents in the management of preoperative anxiety.

1AP6-8

NSAIDs in nose surgery: Yes or not?

Galletti C., Genovese A., De Salvo G., Cerrito L., Micalizzi S., Mazzeo G.
University Hospital Messina, Department of Anaesthesiology and Intensive Care, Messina, Italy

Background and Goal of Study: To assess that the local infiltration in nose-cheek mucosa of mepivacaine 1% plus adrenaline 1:200.000 used alone as analgesic therapy is satisfactory in nose surgery.
This randomized study compares the efficacy of the mepivacaine infiltration vs mepivacaine plus NSAIDs.
Materials and Methods: we examined 90 patients aged from 18 to 51 years, ASA I-II,divided in two groups: A (30 ptis) underwent to rhinoseptoplasty and B(60 pts)to septoplasty.Afterward groups A and B were randomized in subgroups:A1(15 pts), A2(15 pts), B1(30 pts) and B2(30 pts).
After the induction of general anesthesia all pts were treated with 40 mg of mepivacaine 1% infiltration in nose-cheek mucosa. Groups A1 and B1 received also the IV administration of 30mg ketorolac before the end of surgery. A VAS scale(0-10)was administered soon after the awakening and then 1, 3, 6,12 and 18 hours after the end of the surgical procedure.
Results and Discussion: They are reported in the tables below. For the inferential analysis we used the U Mann-Whitney test.

		Average	SD	p value
VAS awake	A1	0.41	0.12	
	A2	0.51	0.09	0.88
VAS 1 h	A1	2.47	0.22	
	A2	2.75	0.33	0.73
VAS 3 h	A1	3.33	0.29	
	A2	3.62	0.41	0.75
VAS 6 h	A1	2.40	0.29	
	A2	2.32	0.25	0.99
VAS 12 h	A1	1.40	0.12	
	A2	1.22	0.13	0.38
VAS 18 h	A1	0.81	0.09	
	A2	0.93	0.11	0.44

[Tab 1 - Group A]

		Average	SD	p value
VAS awake	B1	0.23	0.02	
	B2	0.33	0.03	0.91
VAS 1 h	B1	1.57	0.18	
	B2	1.65	0.21	0.77
VAS 3 h	B1	1.73	0.23	
	B2	1.84	0.25	0.82
VAS 6 h	B1	1.33	0.15	
	B2	1.39	0.17	0.64
VAS 12 h	B1	0.87	0.11	
	B2	0.92	0.13	0.76
VAS 18 h	B1	0.50	0.05	
	B2	0.54	0.06	0.92

[Tab 2 - Group B]

Only 2 pts in A2 group for VAS > 5 requested rescue pain therapy with ketorolac 30 mg iv. In both subgroups 1 and 2 of groups A and B VAS had p values >0.05.
Conclusion(s): The infiltration of mepivacaine 1% used alone for analgesia after septoplasty and rhinoseptoplasty demonstrates favorable pain relief after surgery, avoids the administration of intravenous NSAIDs and their side effects, and it could represent a savings in health care.

1AP6-9

Effect of an enhanced recovery programme on length of stay in gastric bypass surgery

Murray H.L., Dawes T., Nicholas C.R., Margarson M.P.
St Richard's Hospital, Department of Anaesthesiology, Chichester, United Kingdom

Background and Goal of Study: There are pressures to shorten hospital stay within the UK health service. Our regional bariatric surgical service has implemented a number of progressive changes to enhance recovery in a population of morbidly obese patients undergoing gastric bypass surgery.
Materials and Methods: Analysis was performed on prospectively collected data of all bariatric patients treated between Jan 2007 and Nov 2010 at our regional centre. Patient demographics, length of stay and procedural data were collected from anaesthetic charts, theatre records and the Hospital Information System, then collated on an anaesthetic database. Analysis of variance with Kruskal-Wallis test was performed to compare yearly data.

	2007	2008	2009	2010 (to date)
Total RYGB	148	214	362	283
Number Laparoscopic (%)	24(17%)	60(28%)	242(67%)	262(93%)
BMI (Median & Range)	58(36-82)	55(35-84)	52(36-103)	51(32-98)
% ASA 3 or 4	70%	62%	53%	53%
Average Duration of Stay in Days	5.0	4.2	3.7	2.9
Median Duration of Stay in Days (& Interquartile range)	5(4-6)	4(3-4)	3(3-4)	3(2-3)

[Yearly change in demographics and stay]

Results and Discussion: A total of 1,007 patients under went Gastric Bypass (RYGB) during the four-year period. Median BMI, procedure, ASA status and length of stay are presented in the table.
Lengths of stay are significantly reduced every year over this period. In part this is due to increased utilisation of laparoscopic surgery, no routine nasogastric tubes or wound drainage, shorter acting anaesthetic agents and the use of more co-analgesics to reduce morphine consumption. There has however also been a change in the population undergoing bypass surgery, who are slightly smaller and fitter but overall there was 70 patients with a BMI of >70 kg/m2.
Conclusion(s): Although there are confounding factors, in a population of very large NHS patients with significant co-morbidities, the implementation of enhanced recovery techniques has resulted in dramatic reductions in length of stay.

Ambulatory Anaesthesia

2AP1-1

Few effects of hypnosis on conscious sedation in patients undergoing colonoscopy - a randomized controlled trial

Cheseaux N., Forster A., Frossard J.-L., Dumonceau J.-M., Walder B.
Hôpitaux Universitaires de Genève, Department of Anaesthesiology, Genève, Switzerland

Background and Goal of Study: Discomfort during colonoscopy is associated with failure of intervention and with dissatisfaction of the patient and operator. The goal was to test efficacy of supplementary hypnosis on sedation use, satisfaction and adverse effects.
Materials and Methods: Patients between 18 and 80 years and ASA PS 1 and 3 were included. Patients with emergency procedure, psychiatric disease, drug and/or alcohol abuse, use of CNS drugs were excluded. Patients were randomly assigned to one of three treatments: conscious sedation with hypnosis (H), conscious sedation with structured attentive behavior (A), conscious sedation alone (C). Definition of H: the physician instructed the patients to fix a point, breathe deeply and concentrate on body sensation and then close their eyes. Self-generated imagery was used to help patients focus on a safe and pleasant experience. Definition of A: the physician used verbal messages, performed fast responses to patient's requests, encouragements, attentive listening and proposed awareness of self-control. Definition of C: patient-controlled-sedation with propofol (loading dose: 20 mg; bolus: 10 mg; lock out: 18 seconds). Comparative statistics were performed using Kruskall-Wallis ANOVA and Chi-square test. Data are presented as median and interquartile range [IQR].
Results and Discussion: Sixty-four patients were included; 23 in H, 21 in A, 20 in C. No differences were observed in the demographic data (ASA, sex, age and BMI). Median need for propofol (mg/kg/min) in H was 0.05 [0.03; 0.08], in A 0.06 [0.04; 0.07], in C 0.05 [0.02; 0.08] (p=0.8671). Four percent in H had obstructive upper airways during colonoscopy, 19% in A and 25% in C (p=0.1542). Median number of apnea and IQR were 0 in all groups (p=0.1702). Ninety-six percent in H were satisfied, 95 in A, 100 in C (p=0.9926). Median satisfaction score of gastroenterologist (max =100) in H was 100 [90; 100], in A 100 [80; 100], in C 100 [88; 100] (p=0.6977). Median exam time (min) in H was 33 [30; 41], in A 33 [30; 43], in C 35 [28; 45] (p=0.8896). Recovery room's median stay (min) in H was 27 [22; 35] in A 25 [21; 42], in C 27 [19; 42] (p=0.9788). Hundred percent of patients in H go back to their usual activity at day one, 81%in A, 75% in C (p=0.3492).
Conclusion(s): Supplementary hypnosis did not decrease sedation use; with the addition of hypnosis a trend of fewer respiratory adverse effects was observed.

2AP1-3

Conscious sedation with target-controlled infusion (TCI) of remifentanil associated with low doses of midazolam for in vitro fertilization (IVF): A suitable option?

Morue H., Engelman E., Salengros J.-C., Van Obbergh L., Barvais L.
Université Libre de Bruxelles, Department of Anaesthesiology, Bruxelles, Belgium

Background and Goal of Study: Among the wide diversity of techniques for analgesia in IVF, the ideal method should be safe (adequate pain relief with a minimal side effects), easy to administer, short acting, easily reversible and with no adverse effects on oocytes. This pilot prospective non-controlled study was undertaken to test the performance of the new protocol for IVF in our institution.
Materials and Methods: 79 patients were included in this protocol. Premedication consisted of the association of paracetamol (1g PO) and alprazolam (0.5 mg PO) 1h before surgery. After having placed a standard monitoring and supplementary O_2, a bolus of 0.05mg/kg of midazolam was given. Remifentanil TCI was adapted between 1 and 6 ng/ml to maintain a VAS < 3 without provoking O_2 desaturation. Demographic data, pain scores, side effects and patient's satisfaction were recorded at different times.
Results and Discussion: Although 25% of the patients experienced mild respiratory depression (respiratory rate < 8/min), only 8% experienced desaturation which did not respond to verbal stimulation and implied a decrease of the remifentanil. Nevertheless, no manual ventilation or airway instrumentation was needed. The mean remifentanil consumption was 180 μg with a mean target between 1.5 and 3.5 ng/ml. The pain scores remained low during the surgery and afterwards (mean VAS =2 (0-4) and VAS =2 (0-3) respectively). Concerning postoperative pain, a supplementary painkiller (butylhyoscine IV) was needed in 63% of the women but only 11% needed an extra bolus of 2mg IV piritramide. Mean recovery time was 35 min in the post-anaesthesia care unit (PACU) thanks to a low sedation level (OAAS =4 (4-5)) during surgery (mean duration time =14min). Nausea and vomiting were the most commonly reported complications with a respective frequency of 16 and 3% for the postoperative period.
At discharge, 75% of the patients were highly satisfied and 97% would accept this protocol for an eventual next IVF.
Conclusions: For IVF, the association of low doses of midazolam with TCI remifentanil was a good analgesia technique associated with few side effects and a high satisfaction rate. The principal side effect was nausea but our patient population was characterized by a high Apfel's score and no prophylaxis was given. The patients' low sedation allowed us to have a high turnover in OR and PACU. Awake remifentanil TCI between 1.5 and 6 ng/ml is a suitable analgesia technique for IVF.

2AP1-4

Clinical efficacy of the combination of propofol and ketamine versus propofol alone for deep sedation for colonoscopy

Amornyotin S., Chalayonnavin W., Kongphlay S.
Faculty of Medicine Siriraj Hospital, Mahidol University, Department of Anaesthesiology, Bangkok, Thailand

Background and Goal of Study: A combination of propofol and ketamine is usually used to achieve sedation and analgesia during colonoscopy. Few studies have compared their efficacy. The aim of this study was to compare and evaluate the clinical efficacy of the combination of propofol and ketamine versus propofol alone when each regimen is used as sedative agents for colonoscopy.
Materials and Methods: 194 patients who underwent colonoscopy in two years, were randomly assigned to PN and PK groups. 97 patients in group PN received propofol and normal saline and 97 patients in group PK received propofol and ketamine for deep sedation. All patients were premedicated with 0.02-0.03 mg/kg of midazolam. The primary outcome variable was the successfully completed colonoscopic procedure. The secondary outcome variables were patient tolerance, discomfort during insertion, patient and endoscopist satisfaction, hemodynamic responses, as well as complications during and immediately after procedure. Immediately after the procedure, the endoscopist was asked to rate tolerability for the patient, discomfort during insertion and satisfaction. As well, a blinded member of the research team evaluated the patient satisfaction, procedural pain, recovery time and recovery score.
Results and Discussion: All endoscopies were completely successfully. Mean total dose of propofol in group PK and PN was 6.98 (2.90) mg/hg/hr and 7.73 (3.45) mg/kg/hr, respectively (p=0.413). Mean total dose of ketamine in group PK was 1.49 (0.61) mg/hg/hr. There were no significant differences in patient tolerance, discomfort during insertion, patient and endoscopist satisfaction, hemodynamic responses, procedural pain, recovery time and recovery score. Overall, cardiovascular and respiratory adverse events were not significantly different between the two groups. These adverse events were transient and easily treated with no sequelae.

Conclusion(s): Deep sedation in both regimens provided effective and safe for colonoscopy. Adverse events were relatively high in both groups. However, these adverse events were mild and transient. No serious adverse events were observed.

2AP1-6

I'd rather sleep than feel no pain - patient controlled analgesia with remifentanil for the anaesthetic management of colonoscopies

Symonides M., Sowinski P., Chruscikowski M., Kosacki P., Kazalska D.
The Maria Sklodowska-Curie Memorial Cancer Center - Institute of Oncology, Department of Anaesthesiology and Intensive Care, Warsaw, Poland

Background: Colonoscopy is a common outpatient procedure often requiring anaesthesia/sedation. Pain is often reported as main complaint, and thus we designed a prospective observational trial of PCA remifentanil, but, aware that peri-procedural anxiety may be an issue we used the State Trait Anxiety Inventory (STAI) to limit the procedure by excluding those with the highest anxiety and analysing only those, who may benefit from an analgesic-only technique
Aim: To assess an analgesic-only technique for outpatient colonoscopies and to analyse the influence of anxiety on pt. assessment of anaesthetic approach
Materials and Methods: Under routine monitoring (ECG, SpO2 and NIBP) and oxygen 3 l/min suppl. PCA remifentanil (concentration 20 μg/ml) was administered in a 0.4 μg/kg bolus followed by PCA doses 0.2 μg/kg; lock-out 1 min; no background infusion, no anxyolytics. We noted HR, BP, SpO2, responsiveness acc. to Ramsay scale, pain acc. to 1-10 VAS scale, discomfort on a 0-3 scale and all side effects and complaints.
Results: Of 100 ASA I-II pts. (32 M, 68F) 9 were excluded due to STAI score of 70+, 3 - due to poor bowel preparation. Analysis incl. 88 pts (24M, 63F); aged 20-75 (median: 57); weight 50-115 kg (median 72) ; mean colonoscopy duration - 34 mins (range: 14-70). Remifentanil use: mean ind. dose 29 μg (range: 20-46); total dose - 31-756 μg (mean: 199 μg); mean no. of PCA impulses - 21and of effective PCA impulses - 7 (ranges 1-133 and 1-20, resp.). No significant BP, HR and RR changes were observed. 22 pts reported pain (2 of VAS 10) but refused change of technique defining pain as anxiety. Mean VAS: 3.75. 41 pts. reported discomfort. We observed no differences between M and F as to STAI score (p=0.13); VAS score (p=0.1) and discomfort (p=0.067). Assessment of method was 2.94 on a 2 to 5 scale. Pre-procedural STAI score correlated with VAS and discomfort scores (p=0.03) and with total no. of ineffective PCA doses (p=0.0017). 63 patients stated that they would rather sleep through the procedure, but 2only 7 refused the same regimen in the future. Results show that pts with a high STAI score assess the method as poor and suggest that not pain, but anxiety is the main issue during colonoscopy.
Conclusions: An analgesic-only technique for colonoscopy is poorly accepted; anxiety is confused with pain. The technique is acceptable for pts with tthe lowest anxiety level; the remaining pts. require sedation.

2AP2-1

Anaesthesia for somnoendoscopy: A preliminary study

Gentile A., Fritsch N., Tran Van D., François N., Benois A., Fontaine B.
Robert Picque Hospital, Department of Anaesthesiology and Intensive Care, Villenave d'Ornon, France

Background and Goal of Study: Somnoendoscopy allows to investigate snorers and Obstructive Sleep Apnea Syndromes (OSAS). This under sedation nasoendoscopy allows a dynamic visualization of upper-airway (UA) during an induced sleep to locate obstruction site and propose the appropriate treatment (prosthetic or surgical, with or instead of a continous positive airway pressure (CPAP) ventilation). Data are poor concerning the anaesthetic technique for this examination (1). The objective of our study was to assess feasability of bispectral index (BIS) monitored general anesthesia using traget-controlled infusion (TCI) of propofol for somnoendoscopy.
Materials and Methods: Prospective moncentric study. Patients scheduled for somnoendoscopy were included. Anaesthetic procedure used TCI of propofol (Schnider's model) associated with BIS monitoring. The initial effect-site target concentration (Ce) of propofol was 2 μg/ml. Ce was increased by 0.2 μg/ml to obtain a BIS range of 40-60 while maintaining spontaneous ventilation. Then nasendoscopy was realized. Oxygen flow of 6 l/min was delivered during the whole procedure. Cardiac frequency, arterial pressure, SpO_2, Ce and BIS values were watched every 2 minutes. Central or obstructive apnea was diagnosed by $EtCO_2$ and chest movements observation.
Results and Discussion: Thirty-four patients were included : 18 snorers and 16 OSAS, with 9 already treated with CPAP. Sex Ratio M/F : 22/12. Age: 52±9 years old. BMI: 28±5 kg/m². ASA score: 2 [1,3]. Mean procedure duration was 20±8 min. Mean Ce of propofol was 3±0.4 μg/ml during examination. Mean BIS value was 57±16 during endoscopy. Site of UA obstruction was identified in every case. UA obstruction was located in more than one site in all patients: the tongue base (94%) or the soft palate (85%) collapsed against the posterior pharyngeal wall and the nose (53%). In all cases, mandibular advancement improved the laryngeal view and the UA collapse during examination. The mean lowest SpO_2 during procedure was 91±6%. Two minor incidents led to stop endoscopy : one laryngospasm and one epistaxis.
Conclusion: BIS monitored anaesthesia using TCI of propofol seems to be feasible and safe for somnoendoscopy. This anaesthetic procedure provides sufficient muscular relaxation to cause UA collapse without central apnea. Hypoxemia can occur but more rarely than during polysomnography.
References:
(1) Roblin G, Target-controlled infusion in sleep endoscopy. Laryngoscope 2001;111:175-6

2AP2-2

Randomized clinical trial of pilonidal sinus operations performed in the prone position under spinal saddle block versus total intravenous anaesthesia

Schmittner M.D., Dieterich S., Weiss C., Bussen D., Viergutz T.
University Medical Centre Mannheim, Department of Anaesthesiology and Intensive Care, Mannheim, Germany

Background and Goal of Study: Spinal saddle block (SSB) is superior to total intravenous anaesthesia (TIVA) in patients undergoing perianal surgery in the lithotomy position in terms of multiple aspects [1]. Currently it is unknown, whether pilonidal sinus operations performed in the prone position, do also profit from a SSB. The aim of this randomized clinical trial was to determine whether SSB is superior to TIVA in terms of recovery times, postoperative complications and analgesic consumption in patients undergoing pilonidal sinus operations in the prone position.
Materials and Methods: After approval of a positive ethical vote (Ethics Commision II, Faculty for Clinical Medicine, Mannheim, Germany, vote: 2010-215N-MA) suitable patients aged 18-80 years and American Society of Anesthesiologists grade I-III scheduled for pilonidal sinus operations in the prone position were randomized to SSB (1,5 ml hyperbaric bupivacaine 0,5%) or TIVA (propofol, fentanyl and mivacurium by means of an endotracheal tube). Cumulative consumption of analgesics within 24 hours after surgery was recorded, and postoperative recovery and patient satisfaction were evaluated.
Results and Discussion: A total of 23 patients (two females, age 28,9±7,1 years, height 178±8 cm, weight 86,4 ±19,6 kg) were randomized within a five-months-period. Average monitoring time in the recovery room was 9,8±6,3 min for SSB vs. 41±23 min for TIVA (p=0,0003). Patients in the SSB group were able to drink (49,6±46,4 min vs. 154±64,7 min, p=0,0007) and eat (140,4±57,7 min vs. 238±95,5 min, p=0,01) earlier although times to mobilization and micturition were not significantly different. Patients with TIVA suffered more frequently from a sore throat (n=5 vs. n=0, p=0,0011) and needed more additional analgetics (n=4 vs. n=0, p=0,0237). Two patients in the TIVA group suffered from nausea and vomiting. Patients of both groups were equally satisfied with the anaesthesia technique offered.
Conclusion(s): SSB is superior to TIVA in patients undergoing pilonidal sinus operations in the prone position in terms of recovery times, postoperative complications and analgesic consumption.
References:
[1] Schmittner MD, Schreiber H, Janke A, Weiss C, Blunk J, Bussen DG, Luecke T (2010) Randomised clinical trial of anorectal surgery performed under spinal saddle block versus total intravenous anaesthesia. Br J Surg 97(1): 12-20

2AP2-3

Recovery and airway response to desflurane anaesthesia in smokers after aminophylline administration

Poulou S., Pavlidis M., Saridaki A.-M., Pantazopoulos C., Lampadariou A.
Laiko General Hospital, Department of Anaesthesiology, Athens, Greece

Background and Goal of Study: It is known that cigarette smokers have a greater risk of respiratory complications during anaesthesia compared with non smokers. It is known also that aminophylline in doses of 2-5 mg/kg shortens the recovery from anaesthesia and improves bispectral index scores. The purpose of our study is the evaluation of the hypothesis that administration of aminophylline at the end of anaesthesia with desflurane can influence the recovery time and it can reduce respiratory complications in smokers.
Materials and Methods: 56 smokers, ASA I or II, undergoing ambulatory urological procedures with the use of cLMA and spontaneous breathing were randomly allocated into 2 groups: DES and DES-A. The anaesthetic agent used was desflurane in a mixture of oxygen and nitrous oxide (1:1) with fresh

gas flow at 3 l/min and etMAC 1,0. The induction and the maintenance of anaesthesia was standardize in all cases. Standard monitoring (SpO2, etCO2, NIBP, ECG) was used in all patients. In DES-A group at the end of desflurane administration, aminophylline at a dose of 3 mg/kg was given. During recovery the following factors were assessed: 1) time of eye opening, 2) time to verbal command, 3) time of removal of the cLMA and 4) postoperative recovery score (Aldrete score >8). Respiratory complication such as the incidents of cough, laryngospasm, bronchospasm and desaturation were also recorded.

Results and Discussion: Spontaneous breathing after induction in anaesthesia was accomplished at 5,95 ± 1,6 min. The times of eye opening, verbal command and removal of cLMA in DES group were 7,15 ± 1,6 min, 7,8 ± 2,2 min, 8,5 ± 2,5 min and in DES-A group were 6,8 ± 1,4 min (p = 0,29), 7,3 ± 1,9 min (p = 0, 35), 8,2 ± 2,1 min (p = 0, 61) respectively .

The time of achieving Aldrete score > 8 was in DES group at 10 ± 2,3 min and in DES-A group at 9,7 ± 2,1 min (p = 0,59).

There were not important differences in the complication from the respiratory system in both groups. The DES-A group in comparison with the DES group appeared to have elevated heart rate during recovery.

Conclusion(s): The administration of aminophylline in smokers after desflurane anaesthesia is related with shorter recovery times without statistically significant differences but does not reduce the respiratory complications.

References:

Eshima R et al. Airway Responses During Desflurane Versus Sevoflurane Administration via a Laryngeal Mask Airway in Smokers. Anesth Analg 2006;103:1147-54

2AP2-4

Complications in outpatient continuous regional analgesia

Saporito A., Sturini E., Tomasetti R., Anselmi L., Petri G.J.
Ospedale Regionale Bellinzona e Valli, Department of Anaesthesiology, Bellinzona, Switzerland

Background and Goal of Study: Continuous regional analgesia (CRA) is an effective method to provide optimal analgesia with minimal side effects in ambulatory orthopaedic surgery [1-2]. Aim of this study is to evaluate its safety.

Materials and Methods: Following ethics committee approval, an observational prospective study was conducted on a consecutive cohort undergoing ambulatory foot surgery with a continuous popliteal block.

After informed consent, patients were discharged from hospital with a 5 ml/h ropivacaine 0.15% continuous infusion through a disposable elastomeric pump (Easy-pump, Braun, Germany). Exclusion criteria were contraindications to regional anaesthesia, patient's refusal, lack of an accompanying person, difficult accessibility to hospital, age less than 18 years. Patients were monitored daily by trained anaesthetic nurses through a telephone follow-up. Data are expressed as means ± standard deviations.

Results and Discussion: From January 2010 until September 2010, 117 patients were enrolled (11 males/106 females, age 58.0±12.8 years, ASA class 1/2). All of them bypassed PACU to be directly discharged to the day-hospital clinic. Home-based CRA was 4.3±1.4 days long, at the end of which all patients successfully removed their perineural catheters.

Treatment was very effective (mean NRS: 1.9±2.6), with a low incidence of PONV (1.7%). The more frequent side effect was persistent motor block of the ankle and foot (5.9%), which in all cases was successfully managed over the telephone, giving instructions to stop the infusion temporarily .

Complications observed were: accidental removal (5.9%) or obstruction (2.5%) of the catheter, mostly requiring readmission to day-hospital for repositioning and infections at insertion point (2.5%), which were all superficial and resolved completely after antibiotic therapy. 2.5% of patients referred an accidental fall at home, this was uneventful and not clearly related to CRA.

Conclusions: Outpatient CRA has few, generally benign complications, which can be effectively managed on an ambulatory basis.

References:

1) Grant SA, Nielsen KC, Greengrass RA et al. "Continuous peripheral nerve block for ambulatory surgery". Reg Anesth Pain Med 2001; 26:209-14.
2) Ilfeld BM, Morey TE, Wang RD et al. "Continuous popliteal sciatic nerve block for postoperative pain control at home: a randomized, double-blinded, placebo-controlled study". Anesthesiology 2002; 97:959-65.

2AP2-5

Pudendal block in hemorrhoidectomy

Cubes J., Delás F, Sivera S., Andrés R., Zavala S., Llopis J.E.
Hospital Universitario La Ribera, Department of Anaesthesiology and Pain Medicine, Alzira, Spain

Background and Goal of Study: Haemorrhoidectomy as ambulatory procedure is becoming more common. Pain after haemorrhoidectomy is very intense and causes delayed discharge and unplanned admission into hospital.Patients receiving a nerve stimulator guided pudendal block (NSGPB) for haemorrhoidectomy could experience an effective and prolonged postoperative analgesia. A prospective study was conducted to investigate the pain relief provided by NSGPB.

Materials and Methods: This is a prospective observational study with 124 consecutive patients undergoing ambulatory haemorrhoidectomy.

All cases underwent spinal anaesthesia with lidocaine 2% for the surgical procedure.

Immediately following surgery a bilateral NSGPB with 0.25% L-Bupivacaine (10 ml on each side) was performed.

Each patient was given a logbook and analgesics to take-home. They were asked to self-recorded pain scores according to numerical rating scale (NRS) in recovery, discharge, 12 and 24 hours after surgery.

Pain scores, postoperative complications, re-admissions into hospital and patient's satisfaction were reviewed.

Results and Discussion: Successful pudendal nerve stimulation was achieved in all patients. Early control of postoperative pain was excellent and no one needed opioids. The NRS (mean + confidence interval 95%) pain scores were: 0.65 (0.40-0.90) in recovery, 1.39 (1.14-1.64) at discharge, 3.29 (2.83-3.76) at 12 hours and 2.46 (2.12-2.82) at 24 hours.

Ambulatory surgery was performed in 122 patients (98.38%) and 2 cases (1.62%) became in-patients.

There were no re-admissions into hospital after discharge; no patient went to accident and emergency; nor had complications related to the NSGPB.

Patient's satisfaction (percentage, confidence interval 95%) was rated as excellent in 21% (14-29), good in 79% (72 - 86) and none rated regular or bad.

Conclusion(s): In our study NSGPB provided excellent, simple, safe and well accepted analgesia up to 24 hours after haemorrhoidectomy in ambulatory surgery.

Monitoring: Equipment and Computers

3AP1-1

Accuracy of continuous and noninvasive total hemoglobin measurement using multiwavelenght pulse-oximetry in ICU patients

Gölzenleuchter M., Kees M.G., Hilpert J., Gramm H.J., Reich C.A.
Charité, Department of Anaesthesiology and Intensive Care, Berlin, Germany

Background and Goal of Study: Recently a new technology of noninvasive and continuous hemoglobin measurement based on pulse oximetry (SpHb) was introduced by Masimo Corp. In critically ill patients dysfunction of peripheral perfusion is common, but data regarding measurement precision under these conditions are lacking.

We therefore studied the accuracy of SpHb on 71 ICU patients using Masimo Radical-7™.

Materials and Methods: After Institutional review board approval data were collected from patients of an operative ICU.

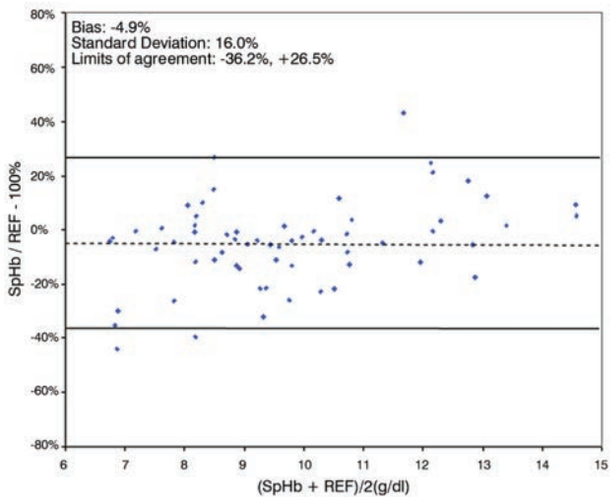
We predefined subgroups according to ACCP/SCCM consensus definitions: No SIRS, SIRS, sepsis, severe sepsis, septic shock (n=5 (7%),28 (39.5%),11 (15.5%),12 (17%),15 (21%)). SpHb and perfusion index (PI; shown by Masimo Radical-7™) were measured at 3 times (first value, after 5, 10 min). For reference, we measured hemoglobin in arterial blood (REF) by a lab method (Sysmex XE 5000).

Bland-Altmann analysis was performed for SpHb vs. REF. Influence of predefined subgroups, PI and APACHE II on SpHb-precision was assessed by linear regression analysis.

Results and Discussion: Compared to reference method, SpHb showed a systematic hemoglobin underestimation of 4.9%. Limits of agreement (mean +/- 1.96 SD) were -36% to +26% (Fig. 1).

Compared to previous studies in non-ICU patients deviation is more pronounced.

In 9 patients (12.7%) no SpHb was detected, all showing a perfusion index of ≤ 0.5. Furthermore SpHb precision was independent from predefined subgroups and APACHE II score.



[Figure 1]

Conclusion: In ICU patients with a wide range of inflammatory states, SpHb-monitoring showed an acceptable accuracy compared to a lab reference method. However, when making transfusion decisions based on SpHb, intensivists should be aware of limitations in precision.

References:

Macknet MR The Accuracy of Noninvasive and Continuous Total Hemoglobin Measurement by Pulse CO-Oximetry in Human Subjects Undergoing Hemodilution *Anesth Analg 2010 Nov 3*

3AP1-2

Use of a noninvasive hemoglobin monitor for volume kinetic analysis in an emergency room setting

Svensen C.H., Rodhe P., Lundström N., Berglund E., Sjöstrand F.
Karolinska Institutet/Department of Clinical Science and Education, Department of Anaesthesiology and Intensive Care, Stockholm, Sweden

Background and Goal of Study: The present study examines whether continuous measurement of noninvasive Hb (SpHb) provides data similar to that generated by serial, invasive sampling of venous blood in patients admitted to the emergency room in a tertiary setting.

Materials and Methods: Thirty patients in two age groups (≤40 yrs with a mean age of 30 yrs and ≥75 yrs with a mean age of 84 yrs) admitted for various reasons to the emergency room were included. A crystalloid glucose solution of 7 ml/kg was given intravenously for 15 minutes to induce plasma volume expansion. At the same time from another venous cannula, blood samples were taken at 0, 5, 10, 15, 30, 45, 60, 75 and 90 minutes and measured for total haemoglobin (tHb) with the Sysmex XE-5000 automated hematology analyzer. Subjects were also continuously monitored with a Radical-7 Pulse CO-Oximeter ®, software version 7.6.0.1 (Masimo, Irvine, CA) and adult resposable sensors (rev E,) for SpHb, which rendered nine pairs of samples per subject. Any data pair with low signal quality was eliminated from the analysis. Bland Altman plots were used to assess the agreement between the two methods. A volume kinetic calculation (ref) according to a one volume model was performed using both tHb and SpHb values.

Results and Discussion: tHb values ranged from 9.4 to 16.5 g/dL. SpHb values showed a bias and standard deviation of -0.2 +/- 1 g/dL, respectively, when compared to the Sysmex XE-5000. Bland Altman plots showed fairly good agreement between tHb and SpHb values across the entire measurement range with limits of agreement of -2.2 to 1.8 g/dL (Figure 1). Volume kinetic analysis showed no statistical difference between the target volumes (V) but showed a consistent difference for the elimination constant (kr), which was higher when analyzed with SpHb values ($p < 0.05$). The latter showed difference for both controls and geriatric patients.

Conclusion(s): SpHb monitoring provides hemoglobin values with good agreement to laboratory analysis of blood. In our volume kinetic model, SpHb monitoring detected the initial distribution of fluid (V) but SpHb values from the elimination phase after the end of infusion (kr) were consistently higher then those obtained from invasive sampling.

References:

1. Hahn et al. Non-invasive monitoring of blood haemoglobin for analysis of fluid volume kinetics. Acta Anaest Scand 2010; 54: 1233-1240

3AP1-3

Regional tissue saturation monitoring during anesthesia in neonate noncardiac surgery

Sola C., Raux O., Dadure C., Bringuier S., Rochette A., Capdevila X.
University Hospital of Montpellier, Department of Anaesthesiology and Intensive Care, Montpellier, France

Background: Tissue(cerebral/somatic)oxygenation monitoring by Near Infrared Spectroscopy(NIRS)is a noninvasive and easy implementation tool, recommended in cardiopulmonary surgery. This monitoring has shown an impaired cerebrovascular autoregulation in premature neonates, and can help to improve neurologic outcome after cardiac surgery. We describe the information from the NIRS during anesthesia for neonatal non-cardiac surgery.

Materials and Methods: 61 infants aged 39±5 weeks corrected age were included prospectively. Standard parameters and tissue saturations(INVOS-Oximeter, Somanetics)were collected before and during anesthesia. Desaturations tissue (-20% of baseline), the arterial hypotension (-30% of baseline) and systemic desaturation (SpO2< 90%) were compiled.

Results: 44% (27/61) of patients experienced at least one cerebral desaturation (-35±14%) and 44% at least one somatic desaturation(-37±14 %). 33%(20/61)of patients had multiple episodes. The cerebral and somatic desaturations were concurrent in 21%(13/61)of patients. Events associated with desaturations tissue are design in table 1.

	hypoTA isolate	SpO2<90% isolate	hypoTA + SpO2<90%	other
Cerebral desaturations N=41	27(66%)	3(7%)	6(15%)	5(12%)
Somatic desaturations N=31	18(58%)	4(13%)	4(13%)	5(16%)

[Table 1:]

Factors favoring the occurrence of desaturations tissue associated with hypotension are shown in table 2 and 3.

	Cerebral desaturations(C) N=24	Somatic desaturations(S) N=11	Concurrent desaturations (C+S) N=11	No tissue desaturation N=58
delta PAM %	-51.5+/-13.6%	-42.4+/-10.3%	-47.7+/-7%	-46.+/-10.7%
Hb g/dl	13.3+/-3	12.6+/-2.4	10.2+/-1.7*	13+/-3

[Table 2:]

	Cerebral desaturations (C) N=10	Somatic desaturations (S) N=5	Non simultaneous C and S desaturations N=4	Simultaneous C and S desaturations N=10	No tissue desaturation N=27
Birth weight Kg	2+/-0.6	2.4+/-1.5	2.6+/-0.9	1.6+/-0.7*	2.4+/-1
Term birth SA	34+6+/-3	35+/-4	35+/-5	31+6+/-4*	35+2+/-4
Age corrected SA	39+/-5	39+6+/-3	38+5+/-3	39+8+/-5	40+/-6
Current weight Kg	2.6+/-0.7	3+/-1	2.8+/-0.6	2.7+/-0.7	2.9+/-1

[Table 3:]

70% of patients who experienced an episode of simultaneous cerebral and somatic desaturation concurrent with low blood pressure had a Hb < 12 g/dl.

Conclusion: Tissue desaturations are common in neonatal anesthesia, most commonly associated with respiratory or hemodynamic incident. The depth of hypotension doesn't seem to be associated with the occurrence of desaturations tissue. The decrease in hemoglobin, low birth weight and a history of extreme prematurity could favor the occurrence of simultaneously cerebral and somatic desaturations, during a hypotensive episode. Intraoperative monitoring of tissue oxygenation for newborns would identify those at risk and allow for rapid action to reduce the tissue damage.

3AP1-4

Exploring the "two flights of stairs" rule with a novel step-oximetry device: Comparison with cycle ergometry exercise testing

Sheffy N., Eidelman L.A., Kramer M.R., Fox B.
Rabin Medical Center, Department of Anaesthesiology, Petah Tikva, Israel

Background and Goal of Study: Patients undergoing pre-operative evaluation who are able to climb two flights of stairs are traditionally considered to

possess sufficient physiological reserves to undergo major surgery with a reduced rate of peri-operative complications. In thoracic surgery peak oxygen uptake (VO2) < 10ml/kg/min predicts poor outcome while peak VO2>15 ml/kg/min correlates with good outcome. It is not known whether there is a good correlation between step climbing ability and peak VO2.

Materials and Methods: Seventy four subjects were recruited during routine attendance for cycle-ergometry cardiopulmonary exercise testing (CPET) in our pulmonary diseases institution. Following their CPET, patients rested for ~30 minutes and then performed a step-oximetry test. In this test they step on and off the step sensor until maximal exertion. The step sensor is a 17cm high 'aerobic' step, adapted with pressure sensors able to transmit a signal to the computer when the subject mounts the step with both feet. A pulse oximeter supplies data on heart rate and SpO_2. These integrated signals are then analyzed. Patients were allocated to two groups, according to whether or not they were able to climb 40 steps (approximately two flights or 6.8m).

Results and Discussion: Results are presented in table 1. Patients able to climb 40 steps had higher peak VO2 than those unable to do so (15.1 ml/kg/min and 10.8 ml/kg/min respectively, p< 0.0001). They also used higher percentage of their cardiac reserves during exercise (79 % and 67% respectively, p< 0.00001).

Conclusion(s): Patients unable to climb 40 steps have significantly lower exercise capacity during CPET. Mean values for VO2 in the two groups match well with known cut-off values for evaluating risk in patients undergoing thoracic surgery. Step oximetry is a promising novel technique of objectively and easily assessing patients' exercise capacity in the pre-operative clinic.

	Able to climb 40 steps - mean (SD)	Unable to climb 40 steps - mean (SD)	p value (t-test)
n	26	48	
age (mean)	59.31(11.9)	57.06(15.6)	0.49
gender M/F	18/8	23/25	0.07(Chi^2)
Work Rate (Watts)	46(13)	34(10.8)	0.000000001
Peak VO2 (ml/kg/min)	15.1(3.66)	10.8(2.97)	0.0000005
Peak VO2 (% predicted)	61(13)	44 (15)	0.000008
Use of cardiac reserve (%)	79 (9.7)	67(11.5)	<0.0000001
Use of breathing reserve (%)	70 (15)	64(20)	0.13
Respiratory Exchange Ratio	1.08 (0.13)	1.05 (0.13)	0.41

[Table 1]

3AP1-5

Effect of intermitent noninvasive blood pressure monitoring on the continuous noninvasive hemoglobin monitoring by pulse CO-oximetry (SpHb) with the masimo radical-7™ hemoglobin monitor

Balaguer J., Soliveres J., Estruch M., Sánchez A., Hernández M.J., Solaz C.
Dr. Peset University Hospital, Department of Anaesthesiology and Intensive Care, Valencia, Spain

Background and Goal of Study: SpO2 monitorization is known to be altered by non invasive blood pressure determiantion (NIBP). Althrough routine pulse oxymetry (SpO2) and NIBP cuff in the same arm is not recommended, the alteration on SpO2 and SpHb monitoring when NIBP is measured in the same arm are not described with the new Radical 7(TM) continuous SpHb (Masimo, USA). Our objective is to know wether NIBP and SpHb and SpO2 can be determined on the same arm.

Materials and Methods: After local ethics committee approval, written informed consent was obtained from 15 ASA I-III surgery scheduled patients. After standard monitoring, SpHb sensor and NIBP cuff were placed in the same arm patient. Patients with hemodynamic instability, severe vascular abnormalities or unable to acces to the upper extremity were excluded. After SpHb measurement stabilization, NIBP cuff was inflated every 10 minutes (a minimum of 4 measurements for each patient). Time between starting NIBP cuff inflation and SpO2 and spHb signal loss was recorded (measurement alteration time). Time between SpO_2 and SpHb signal loss and SpO_2 and SpHb baseline recovery was recorded (failure interval SpO_2 and SpHb). Student's t test was used for statistical analysis. A p< 0,05 was considered significant.

Results and Discussion: No patients were excluded. 67 measurements were collected. Three measurements were excluded (one because of twice NIBP cuff inflation, two because of inflation time not recorded).

Demographic data ar shown in Table 1.Measurement alteration time and failure interval are shown in Table 2.

Sex (Male/ Female)	Age (years)	Weight (Kg)	Height (cm)	ASA (I/II/III)	Time of surgery
9/6	43,5(±21,1)	72,3(±17,1)	170,7(±8,1)	8/3/1	89,3(±50,2)

[Table 1. Data show number or mean (±SD)]

	Measurement Alteration Time (seconds)	Failure Interval (seconds)(*)
SpO_2	10,31(±9,75)	15,13(±15,61)
SpHb	9,78(±8,93)	93,75(±170,18)

[Table 2. Data show mean (±SD) (*)p<0,05]

Twenty-five of the sixty-four measurements showed no alteration of the SpO_2 and SpHb measurement (measurement alteration time and failure interval of SpO_2 and SpHb equal to zero seconds).

Conclusion(s): SpO2 monitoring could be placed on the same arm as NIBP, althrough SpHb monitoring should not because of the much longer failure time.

3AP1-6

Accuracy of a non-invasive measurement of hemoglobin via pulse CO-oximetry in Japanese population

Ishida C., Shiraishi Y., Mimuro S., Yu S., Katoh T., Sato S.
Hamamatsu University School of Medicine, Department of Anaesthesiology and Intensive Care, Hamamatsu, Japan

Background and Goal of Study: A Masimo Rainbow SET, Pulse CO-oximetry developed by Masimo Corporation leverages 7 wavelengths and advanced signal processing technique to measure total hemoglobin (SpHb) values. The SpHb values can be objectively displayed and be shared by multiple doctors through the monitor, which may lead to the improvement of anesthesia safety. Furthermore, the function of SpHb measurement is included in a pulse oximeter which makes it much easier to operate it. This study is to evaluate the accuracy and to find out the possible problems of this device on Japanese patients.

Materials and Methods: After IRB approval and informed consent, 16 ASA Ⅰ-Ⅱ patients scheduled to undergo elective surgery were enrolled in this study (cardiac surgery was excluded). Standard anesthesia was taken and no treatment was made due to the data of SpHb. Arterial blood samples were analyzed by CO-oximetry (Radiometer ABL800 FLEX), at the same time the conventional gas analysis was made.

Results and Discussion: 89 samples from 16 patients were obtained. The correlation coefficient between SpHb and tHb was 0.8. The bias was 0.65 and precision was 1.1. The figure 1 shows the correlation between SpHb and tHb, and the figure 2 shows the Bland Altman plots.This is the first time that this device being introduced to Japanese patients. Our data shows that SpHb is reliable on Japanese patients, similar to previous studies on American people. The limitation of our study is that we only observed 16 patients, further studies may be needed.

Conclusion(s): On Japanese patients the non-Invasive Measurement of Hemoglobin via Pulse CO-oximetry may be reliable.

3AP1-7

Continuous tracking of hemorrhage by non-invasive hemoglobin monitor

Weinstein A., Gabis E., Herzenstein O., Singer P.
OrSense Ltd., Research and Development Department, Nes Ziona, Israel

Background and Goal of Study: Monitoring of Hemoglobin (Hb) is essential for the detection of anemia and hemorrhage, and is widely used in ICU, ER, operating and recovery rooms. The current measurement methods are invasive, off-line and discrete. Non-invasive measurement of Hb has many advantages including the freedom to take multiple measurements continuously, the reduced time spent by medical staff, and the prevention of pain and potential transmission of infectious diseases. The purpose of this study was to evaluate the performance of the recently introduced NBM-200MP device in continuous monitoring of Hemoglobin during hemodilution procedure in healthy volunteers. The NBM-200MP (OrSense Ltd.) is a non-invasive system for monitoring of Hemoglobin and Oxygen saturation, based on Occlusion Spectroscopy technology.

Materials and Methods: The clinical study was conducted on 12 healthy volunteers (6F 6M, ages 20-36) upon receipt of informed consent. Two units

of blood were drawn from each subject using an indwelling arterial catheter. Subjects then received, through an intravenous line, 30 ml/kg of isolyte fluid (up to a maximum of 2000 ml). The isolyte fluid compensated for the missing blood volume and rapidly reduced the level of Hb. Finally the removed 2 units of blood were reinfused through the intravenous line and increased the Hb again.The NBM sensor was placed on the subject's thumb and recorded a non-invasive reading every 2 minutes. For reference Hb values, arterial blood samples were taken periodically from the arterial catheter and analyzed by OSM3 CO-Oximeter (Radiometer).
Results and Discussion: Reference Hb values ranged from 8.4 g/dl to 15 g/dl and the reduction in Hb was between 2.6 g/dl and 3.8 g/dl. For a total of 258 paired data points, the mean bias between NBM readings and the arterial reference values was 0.3 g/dl.
The correlation was 0.9 and the standard deviation of error (SD) was 0.7 g/dl. The average personal SD was 0.5 g/dl. Use of the device did not cause any discomfort to subjects, was safe and well tolerated.
Conclusions: The readings obtained were in good agreement with the invasive reference values, and identified correctly the rapid variations in Hemoglobin. The study substantiates the potential of the non-invasive NBM-200MP for continual, safe, and easy-to-use monitoring of Hemoglobin.

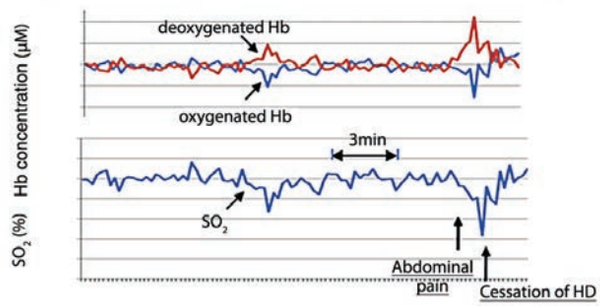
3AP1-8

Transcutaneous monitoring of hepatic oxygenation and hemoglobin concentration in adults using time-resolved spectroscopy

Kakihana Y., Okayama N., Ikoma K., Yasuda T., Imabayashi T., Daiguji A.
Kagoshima University, Department of Anaesthesiology and Intensive Care, Kagoshima, Japan

Background and Goal of Study: In time-resolved spectroscopy (TRS), the optical path lengths is directly measured, resulted in enabling determination of the hemoglobin (Hb) concentration, and tissue oxygenation.The aim of this study was to investigate whether in adults the liver can be detected by TRS placed on the skin above the liver surface, and the hepatic oxygenation can act as a noninvasive monitoring for early detection of intestinal ischemia.
Materials and Methods: With approval of the local Hospital Ethics Committee and informed consent, 6 volunteers aged 28.8 years, and 5 patients with chronic renal failure (CRF) aged 70.6 years were studied. In volunteers, following the echography, TRS (TRS-10, Hamamatsu Photonics K.K., Japan) probe consisting of a near-infrared light, was placed 4 cm apart on the skin above the liver or the intestine. After the monitoring by TRS, the total Hb (tHb) concentration, and oxygen saturation (SO_2) in the liver were compared with those in the intestine.
In patients with CRF, following the echography, TRS probes were placed 4 cm apart on the skin above the liver surface, and the Hb and SO_2 in the liver was continuously monitored during hemodialysis (HD).
Results and Discussion: The values of tHb was significantly higher in the liver than in the intestine (80.6±26.81 vs 44.6±23.1mM, P=0.0017), while the SO_2 in the liver was nearly the same as that in the intestine (71.5±3.6% vs 73.6±4.6%, P=0.19). One of 5 patients with CRF complained of the severe abdominal pain during HD, and the SO_2 in the liver was decreasing from 53% to 22%, but the pain relief occurred following cessation of HD, and SO_2 recovered to the baseline (Fig. 1).

Figure 1. Hepatic oxygenation and Hb concentration by TRS during HD



[Fig.1]

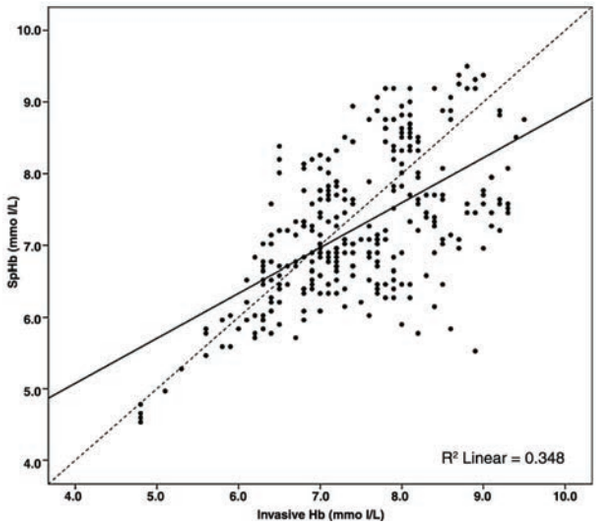
Conclusion(s): In adults the liver can be detected by the TRS placed on the skin above the liver surface, and the hepatic oxygenation can act as a noninvasive monitoring for early detection of intestinal ischemia.

3AP1-9

Continuous non-invasive measurement of total hemoglobin concentration during major liver resection by pulse co-oximetry

Vos J.J., Scheeren T.W.L., Struys M.M.R.F, Hendriks H.G.D.
University Medical Center Groningen, University of Groningen, Department of Anaesthesiology, Groningen, Netherlands

Background and Goal of Study: The Masimo Radical 7 (V7.6.0.1, Masimo Corp, Irvine, USA) pulse co-oximeter® uses multi-wave length spectrophotometric analysis (sensor R2-25) to calculate total hemoglobin concentration (SpHb). SpHb is monitored continuously and non-invasively, which may reveal advantages over invasive, snap-shot hemoglobin concentration (Hbin) monitoring. We compared SpHb and Hbin during surgery for major hepatic resection.
Materials and Methods: After local EC approval, 17 patients undergoing hepatic resection were included. Central venous blood samples were drawn every 30 min and analyzed using ABL 800 Flex (Radiometer GmbH, Copenhagen, Denmark). SpHb and Hbin were correlated and a regression curve was plotted. Prediction error analysis was done. Change in trend direction between consecutive Hbin measures in correspondence with a change in SpHb trend direction was studied.
Results and Discussion: 306 data points were obtained. Mean duration of surgery was 426 min (± 97 min) and median blood loss was 420 ml (range 50 - 1500 ml). Hbin ranged from 4.8 to 9.5 mmol/L and SpHb ranged from 4.5 to 9.5 mmol/L. Mean Hbin and SpHb was 7.5±0.9 mmol/L and 7.2 ± 1.0 mmol/L, respectively. Regression was significant between SpHb and Hbin ($p < 0.01$, R^2 linear=0.348, fig.1).



[Correlation between SpHb and invasive Hb]

Pearson Correlation=0.59. Compared to Hbin, SpHb showed a median prediction error (=bias) of 3.4% (SD 1.0%) revealing a slight underestimation. Median absolute prediction error is 9.4% (SD 5.8%) revealing a moderate bias. Pulse co-oximetry failed to adequately predict the trend of changes in hemoglobin concentration at a threshold value of 0.3 mmol/L (good trend=51.2%; false trend=48.8%).
Conclusion(s): SpHb showed a significant relation and moderate correlation with Hbin. SpHb slightly underestimated Hbin with moderate bias. In patients undergoing major hepatic resection, SpHb might become an alternative for Hbin. Further studies have to reveal if SpHb might replace Hbin in its current version.

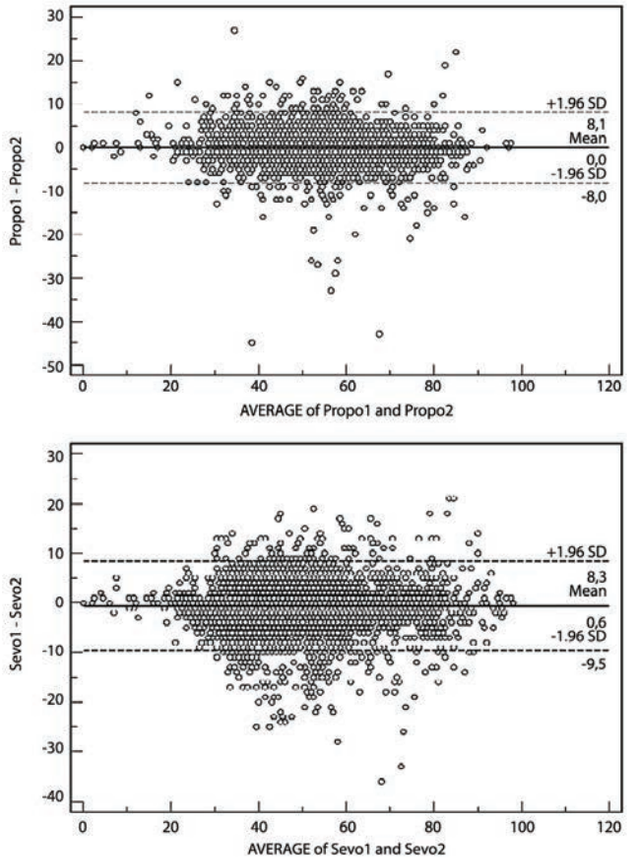
3AP2-1

Comparison of simultaneous bilateral measurements of the new bispectral index monitor BIS VISTA during anesthesia with propofol-nitrous oxide and with sevorafluorane

Estruch-Perez M.J., Soliveres-Ripoll J., Balaguer-Domenech J., Sánchez-Hernández A., Gomez-Diago L., Solaz-Roldan C.
Dr. Peset University Hospital, Department of Anaesthesiology and Intensive Care, Valencia, Spain

Background and Goal of Study: BISxp® Monitoring System readings simultaneously recorded over both sides of the forehead may differ in up to 30% of

the measured values(1), and it depends on the type of anaesthesia.
Our objective was to compare BIS values of the new BIS VISTA Monitoring System(Aspect Medical Systems, Norwood,MA) simultaneously measured from both sides of the head in the same patient during anaesthesia with 2% sevoflurane in 30% oxygen(Sevo group) and with propofol-70% nitrous oxide(Propo group).
Materials and Methods: This randomized, prospective, comparative, observational study was approved by the local ethics committee. It enrolled 99 patients older than 18 years scheduled for elective surgery.
Patients were excluded if they had a history of stroke, dementia, organic brain disease or carotid bruit. Two BIS Quatro® electrode strips from BIS VISTA® were placed on each side of their forehead. The clocks on both monitors were synchronized before each case to ensure a time difference of < 1second. BIS values generated by both sensors were downloaded for analysis to laptop computers from the induction until emergence from anesthesia.
47 subjects per group were considered necessary to differentiate a bias of 3 point with an alfa and beta error of 0,05.
Bland-Altman tests of agreement and bias were used. Bias differences were compared with the student's t test. Chi square was used to compare proportions.
Results and Discussion: Patients characteristics were similar. There were no bias(0,0,-0,6) between the BIS VISTA monitors in both groups indicating no clinical significant tendency for one side to produce a different measurement than the other.
The dashed line shows the 95% limits of agreement for the left vs right-sided BIS values(fig. 1). These limits with BIS VISTA were smaller than previous(1) and suggest a BISxp® improvement.
Conclusion: With both anaesthetic techiques, bias and limits of agreement were similar.



[Bland-Altman analysis in propo and sevo groups]

References:
1) Anesthesiology 2006;104:242-8

3AP2-2

A combination of standard monitoring parameters including permutation entropy of heart rate variability separates different levels of anaesthesia

Omerovic A., Pichlmaier E., Jordan D., Kochs E.F, Schneider G.
Klinikum rechts der Isar der TU München, Department of Anaesthesiology, Munich, Germany

Background and Goal of Study: Standard monitoring based on parameters of the cardiovascular system and respiration provides information for assessing the hypnotic component of anaesthesia. The present investigation evaluates the ability of a fuzzy based indicator combining different standard parameters and permutation entropy (PeEn) [1] of heart rate variability (HRV) to indicate "depth of anaesthesia".
Materials and Methods: After ethics committee approval, 263 adult patients undergoing surgery under general anaesthesia were included [2]. Standard parameters and EEG were continuously recorded and stored together with relevant patient data. During anaesthesia induction, Tunstall's isolated forearm technique was performed to detect loss of consciousness (LOC). After skin incision, the anaesthetic concentration was increased until EEG burst suppression (BS). At the end of surgery, drugs were discontinued and return of consciousness (ROC) was recorded.
Data were analyzed during consciousness (before LOC, after ROC), general anaesthesia and BS. A fuzzy inference based on a Takagi Sugeno Kang model [3] was used for data driven combination of standard parameters: heart rate (HR), blood pressure (BP), PeEn (m=5, 0.15-0.45Hz bandwidth) of HRV together with anaesthetic and oxygen concentration.
Prediction probability (P_K) including 95% bootstrap confidence intervals was investigated to indicate the indicators ability to separate anaesthetic levels (threefold cross validation).
Results and Discussion: The fuzzy model leads to a P_K of 0.85 (0.83-0.87) for separation of consciousness, general anaesthesia and BS.
This is significantly higher than the best included parameter BP with P_K of 0.76 (0.73-0.79).
Conclusion(s): In order to assess "depth of anaesthesia" the single standard parameters, which provide partial information about the hypnotic components, have to be combined into a single indicator. Results show that anaesthetic conditions can be revealed through such an indicator. In particular, inclusion of HRV permutation entropy may provide additional information related to non linear heart dynamics. Because of time delay of standard parameters, this indicator might be inadequate to reflect rapid changes. However, it could be integrated in standard anaesthesia monitoring to provide reliable trend information of the hypnotic component.
References:
[1] Phys Rev Lett 2002; 88: 174102
[2] Anesthesiology 2006; 105: A1553
[3] IEEE Trans Syst Man Cybern 1993; Vol. 23, No. 3

3AP2-3

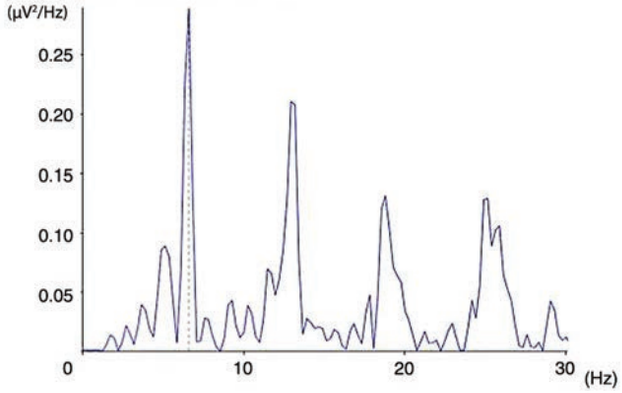
Why does EMG render EEG-based indices meaningless?

Kamata K., Aho A.J., Yli-Hankala A., Hagihira S., Jäntti V.
Tampere University Hospital, Department of Anaesthesiology, Tampere, Finland

Background and Goal of Study: Commercially available anaesthesia electroencephalogram (EEG) indices claim that the effect of electromyogram (EMG) can be separated from EEG on the basis of their different frequency characteristics. However, recent studies have suggested that EMG may interfere with EEG-derived index values and when EMG is abundant, it totally hides EEG and the indices measure only EMG. In this study the frequency characteristics of EMG were studied by analysing the lowest frequency of single motor unit activity of facial muscles.
Materials and Methods: With IRB approval and written informed consent, patients undergoing abdominal surgery under propofol/remifentanil-based anaesthesia were enrolled. EEG from Fp1, Fp2, left outer canthus, left mastoid and Cz were recorded by multichannel EEG (NicoletOne Monitor™) through the operation. Submental, masseter and frontal EMGs were also collected. Propofol infusion was titrated to SE value of Entropy™ to 50. No neuromuscular blockades were given. EEG recordings with visible EMG were screened in detail: when only one motor unit potential (MUP) was seen firing on top of EEG, the firing frequency of the MUP was analysed.
Results and Discussion: Among 40 anaesthetized females, 23-69 years, 22 patients showed MUPs of facial muscles with frequency range of 4-20 Hz. As the MUP steady fired, the power spectrum showed peak at this firing frequency and at harmonics of its primary frequency (Fig.1a-b).

Fig. 1a Typical example of MUP EEG, firing at 6 Hz (Fp1-M1).

Fig. 1b The power spectrum of EEG of this patient during suppression with one MUP. Notice maximum power at 6 Hz.



[Fig]

Conclusion: EMG contributes to the signal at frequencies as low as 4 Hz which is the slowest firing rate of single MUP. Interference pattern EMG contains even lower frequencies, down to zero Hz. There is no way of correcting the error in EEG-derived indices caused by EMG when it is abundant.

References:

Aho AJ, et al. Explaining Entropy responses after a noxious stimulus, with or without neuromuscular blocking agents, by means of the raw electroencephalographic and electromyographic characteristics. [doi:10.1093/bja/aeq300]

3AP2-4

Application of tsallis entropy to quantify burst suppression in rabbits under propofol anesthesia

Silva A., Campos S., Monteiro J., Guedes de Pinho P., Antunes L.
Universidade de Trás-os-Montes e Alto Douro, Veterinary Sciences Department, Vila Real, Portugal

Background and Goal of Study: Burst suppression (BS) activity of the electroencephalogram (EEG) reflects deep anesthesia and has been used to help intra operative anesthetic depth monitoring. It appears as a transitional pattern between isoelectricity and high-frequency EEG and its quantification is normally based in the percentage of isoelectricity in EEG epochs[1].

Tsallis entropy (TE) has been recently applied to quantify the presence of BS in the EEG of rats after cardiac arrest[2], but there is no data on this analysis during anesthesia. The use of a non-linear analysis based method (TE) could be a more practical alternative to the traditional BS ratio, as the first one does not need the set of an amplitude limit to consider the signal as isoelectric that may vary with amplitude and recording conditions. In the present study, the potential to use TE to quantify BS was accessed using EEG recorded in rabbits under propofol anesthesia.

Materials and Methods: Six rabbits were anesthetized with three propofol infusion rates: 70, 100 and 130 $mgkg^{-1}h^{-1}$, each maintained for 30 minutes, in a random order for each animal. Data recording was performed in the awake animals, 20, 25 and 30 minutes after beginning each infusion rate, in the recovered animals and consisted in:

1) Electroencephalogram recordings;

2) Evaluation of depth of anesthesia according to a clinical scale;

3) Arterial blood samples for plasma propofol determination. Tsallis entropy and the classic burst suppression ratio were analyzed. Performance of the indexes was compared by prediction probability (Pk) and pharmacodynamic analysis. The Wilcoxon Matched pairs test was used to compare the Pk values of TE and BS.

Results and Discussion: A higher mean Pk value was obtained for BS, although not statistically significant (BS 0.78±0.9; TE 0.59±0.7). Pharmacodynamic modeling revealed a better coefficient of determination for BS with the Emax stimulation curve (R^2=0.90) while TE had a lower R^2 which the Emax inhibitory curve (0.34).

Conclusions: The classic linear BS quantification method derived from the EEG shows better capacity to detect anesthetic depth and better correlation with drug dose in rabbits.

References:

1. Rampil, I. J. Anesthesiology 1998, 89, (4), 980-1002.
2. Dandan, Z.; Jia, X.; Ding, H.; Ye, D.; Thakor, N. V. IEEE Trans Biomed Eng 2010, 57, (4), 867-74.

3AP2-5

Clinical efficacy of deep sedation for endoscopic retrograde cholangiopancreatography: A comparison between clinical assessment and Narcotrend™ monitoring

Amornyotin S., Srikureja W., Chalayonnavin W., Kongphlay S.
Faculty of Medicine Siriraj Hospital, Mahidol University, Department of Anaesthesiology, Bangkok, Thailand

Background and Goal of Study: Moderate to deep sedation is generally used for endoscopic retrograde cholangiopancreatography (ERCP). The depth of sedation is usually judged by clinical assessment and EEG-guided monitoring. The aim of this study was to compare the clinical efficacy of clinical assessment and Narcotrend™ monitoring during sedated ERCP.

Materials and Methods: 138 patients who underwent ERCP in a single year, were randomly assigned to either group C or N. Patients in group C (90) were sedated by using MOAA/S scale. Patients in group N (48) were sedated by using the Narcotrend™ system. The MOAA/S scale 1 or 2 and the Narcotrend stage D0-E0 (index 27-36 to 57-64) were maintained during procedure. The primary outcome variable of the study was the total dose of propofol used during the procedure. The secondary outcome variables were complications during and immediately after procedure, and recovery time.

Results and Discussion: All endoscopies were completed successfully. Mean total dose of propofol in group C was significantly lower than in group N. However, the mean dose of propofol, expressed as dose/kg or dose/kg/hr in both groups, was not significantly different (p=0.400, 0.227). Recovery time, patient tolerance and satisfaction, and endoscopist satisfaction was comparable among the two groups. Sedation- related adverse events during and immediately after the procedure, such as hypotension, hypertension, tachycardia, bradycardia, transient hypoxia, or upper airway obstruction in group C (62.2%), were significantly higher than in group N (37.5%) (p=0.006).

Conclusion(s): Clinical assessment and Narcotrend-guided sedation using propofol for deep sedation demonstrated comparable propofol dose and recovery time. Both monitorings were equally safe and effective. However, the Narcotrend-guided sedation showed lower hemodynamic changes and complications as compare to the clinical assessment-guided sedation.

3AP2-6

Index of Consciousness (IoC) compared with richmond sedation agitation scale (RASS) during inhalatory sedation with sevofluorane using anesthetic-conserving device (AnaConDa®)

Grau L., González-Rodríguez R., Anaya R., Rivilla M.T., González C., Litvan H.
Hospital Santa Creu i Sant Pau, Department of Anaesthesiology, Barcelona, Spain

Background and Goal of Study: IoC monitor is a recently introduced anesthesic depth monitor which uses the information of EEG spectrum. The aim of this study was to validate IoC levels, as a measure of sedation depth, by comparing it with RASS scale during inhalatory sedation with sevofluorane via the AnaConDa® device after cardiac by-pass surgery.

Materials and Methods: Patients studied (n=14) were collected after cardiac by-pass surgery. They were inhalatory sedated with sevofluorane using the AnaConDa device. The average expired sevofluorane concentration (ETsevo) during the course of the study was 0,5%, according to the weight and minute ventilation of the patient[1].

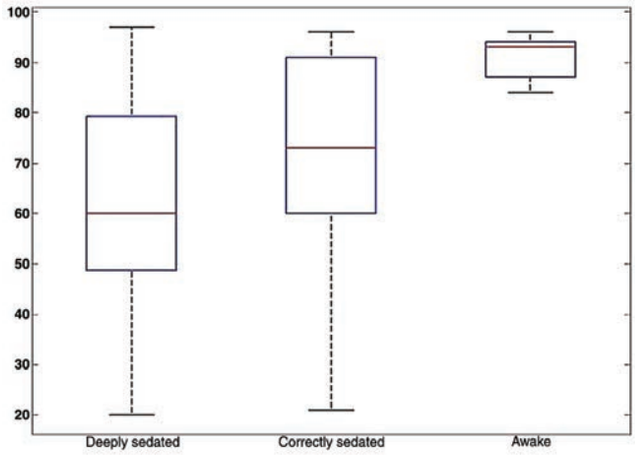
During the sedation, IoC monitoring and RASS were simultaneously registrated each 7,5 minutes until extubation criteria were achieved (spontaneous breathing with T-Tube or support pressure modality ≤ 8 cmH2O, PAFI ≥ 200 with PEEP ≤ 5, PCO2 35-45 mmHg, pH > 7,30, normothermia, hemodynamic stability, haemoglobin > 8 gr/dl, Richmond 0 - (-1)).

We considered deeply sedation RASS values under -3, correctly sedated RASS values between -3 and 0 and awake RASS values over 0. IoC values were considered correctly sedated between 60 and 80.

Pearson's correlation coefficient (r) and prediction probability (Pk) were calculated.

Results: We analyzed a total of 252 determinations. 3 cases were excluded of the study because ETSevo was over 1%. Pearson's correlation coefficient was 0,64 (p< 0,001). Prediction probability was 0,73.

Distribution of samples and IoC/RASS correlation are shown in the graphic below (IoC values are on the y-axis and RASS categories are on the x-axis).



[IoC-RASS correlation. Box Plot.]

Conclusions: IoC values obtained can predict correctly RASS values during sevofluorane sedation, using AnaConDa®, for ETSevo 0,5%.
IoC and RASS values as a sedation monitoring are interchangeable.
References:
[1] Belda JF. Anesth Anal 2008;106:1207-1214

3AP2-7

Spectral entropy monitoring is associated with reduced sevoflurane use and faster emergence in patients undergoing major abdominal surgery

El Hor T., Bidgoli J., Van der Linden P.
CHU Brugmann-HUDERF, Department of Anaesthesiology, Brussels, Belgium

Background and Goal of Study: Few studies evaluated the impact of depth of anaesthesia monitoring on sevoflurane consumption. This prospective randomized study tested the hypothesis that state entropy monitoring is associated with reduced sevoflurane use and faster emergence in patients undergoing colo-rectal surgery.
Materials and Methods: After institutional ethics committee approval, 50 ASA II-III patients were included in the study. Patients having given written informed consent were randomized in two groups: a control (CG) and an entropy (EG) groups. In the CG group, the target expired fraction of sevoflurane (Fetsevo) was adjusted according to haemodynamic and clinical parameters. In the EG group, Fetsevo was adjusted to maintain the state entropy values between 40 and 50. All patients were ventilated using a closed circuit (Zeus respirator, Dräger, Germany).
In addition to sevoflurane, patients received also sufentanil using a target control infusion system (target cerebral concentration: 0.25 ng/ml) that was stopped at the end of the distal colic anastomosis. Sevoflurane administration was stopped in both groups at skin closure. State entropy values were measured continuously (M-Entropy module, GE Healthcare, Helsinky, Finland) in both groups, but were blunted to the anaesthesiologist managing patients in CG group. Volume of sevoflurane used per hour of anaesthesia, time to tracheal extubation, and median state entropy values were compared between the two groups using a Mann Whithney-U test. Data are presented as median [interquartiles]. A $p < 0.05$ was considered significant.
Results and Discussion: Patients demographics were not different between groups. Duration of surgery was 135 [109-157] min in the CG and 161 [134-193] min in the EG groups ($p=0.03$)

Variables	CG group (N=25)	EG group (N=25)	p value
Sevoflurane consumption (ml/h)	5.3 [4.3-6.3]	3.3 [2.8-5.0]	0.003
Sufentanil consumption (µg/kg/h)	0.38 [0.29-0.49]	0.32 [0.28-0.41]	0.118
Median SE value	37 [30-45]	41 [34-47]	<0.001
SE < 40 (% of anaesthetic time)	57 [30-45]	30 [30-45]	0.140
Time to tracheal extubation after discontinuation of sevoflurane (min)	24 [15-30]	16 [10-22]	0.010

[Intra-operative variables]

IHypotensive episodes were more frequent in CG group (12%) than in EG group (0%) ($p=0.03$). Post-anaesthesia care unit length of stay (PACU) and piritramide consumption during PACU stay were not different between groups.
Conclusion(s): In the conditions of our study, spectral entropy monitoring was associated with a reduction in sevoflurane use and a faster emergence.

3AP2-8

EEG analysis periods of minimum length for detection of consciousness and unconsciousness by approximate and permutation entropy

Pilge S., Jordan D., Paprotny S., Kreuzer M., Kochs E.F, Schneider G.
University Witten/Herdecke, Department of Anaesthesiology, Wuppertal, Germany

Background and Goal of Study: Electroencephalographic (EEG) approximate entropy (ApEn) [1] and permutation entropy (PeEn) [2] have been suggested as measures of the hypnotic component of anaesthesia. In contrast to ApEn, the non-parametric approach of PeEn allows calculation based on short EEG intervals. This may be beneficial to indicate fast changes of cortical dynamics. The present investigation evaluates EEG analysis periods of minimum length required for ApEn and PeEn to separate consciousness and propofol induced unconsciousness.
Materials and Methods: After approval by the ethics committee, 15 volunteers were enrolled into the study [3]. Volunteers were instructed to relax and close eyes and EEG baseline (BL) recordings were performed (electrode positions: Fp1, Fz: reference). Subsequently propofol was infused with a target controlled infusion (TCI) pump until loss of consciousness (LOC) occurred. This concentration was maintained for 15min. Signal analysis was based on 30Hz low pass filtered, artefact free and stationary EEG signals of T=0.2s, 0.4s, ..., 30s length within the last 120s of levels BL and LOC. The ability of ApEn and PeEn to separate consciousness (BL) from unconsciousness (LOC) was indicated using P_K and 95% bootstrap confidence intervals (CI).
Results and Discussion: PeEn provides significant separation for T>0.4s, ApEn for T>6.0s. While PeEn indicates both conditions with $P_K>0.90$ (CI: 0.75-1.00) using T>0.8s, ApEn requires minimum analysis time of 23s.
Conclusion(s): Analysis reveals that very short EEG analysis periods below 1s contain sufficient information of underlying neural dynamics to separate consciousness from unconsciousness. Therefore, non-parametric PeEn is an adequate EEG-parameter with a fast response during dynamic changes of anaesthesia. As a consequence, it can be expected that PeEn provides short time delays which represents an advantage for EEG monitoring of anaesthesia, i.e. accurately timed indication of the hypnotic state and reliable detection of potential awareness. This is in contrast to ApEn and to EEG monitors BIS, CSI and Narcotrend leading to reported time delays of about one minute [4]. The present investigation completes results from a previous study [2] showing that PeEn represents a “state of the art” EEG-parameter of the hypnotic component of anaesthesia.
References:
[1] Anesthesiology 2000; 92: 715-26
[2] Anesthesiology 2008; 109: 1014-22
[3] Anesthesiology 2007; 107: A806
[4] BJA 2007; 103: 394-9

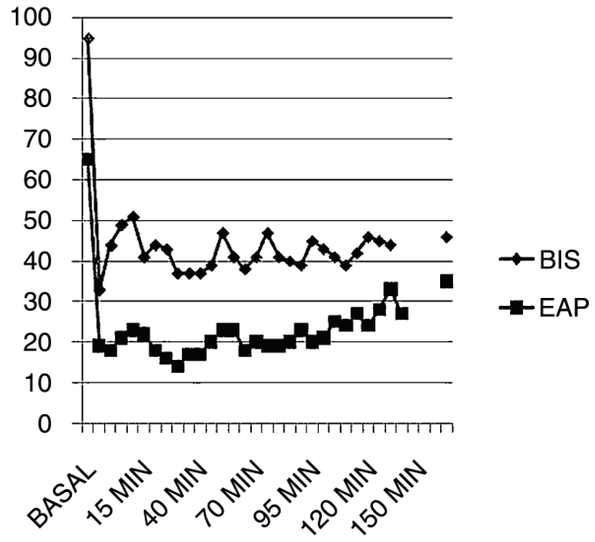
3AP2-9

A xenon depth of anesthesia monitor

Garrigues B., Hernandez J., Garcia M.L., Leon I., Llorens J., Belda F.J.
Hospital Clinico Universitario de Valencia, Department of Anaesthesiology and Intensive Care, Valencia, Spain

Background and Goal of Study: Xenon is a noble gas with anesthetic properties supposedly mediated by antagonism of N-methyl-D-aspartate receptors,and experimental data indicate that xenon has cardioprotective and neuroprotective effects. Monitoring the state of hypnosis during general anesthesia is an standard in anesthetic care. The objective of the study was to study the performance of Biespectral index (BIS) and Auditory evoked potentials (AEP) in xenon anesthesia in patients undergoing knee replacement.
Materials and Methods: We planned a prospective study, approved by ethical committee, in 10 patients undergoing knee replacement surgery, ASA I-II and older than 65 years.The maintenance of anesthesia was done with xenon 65% in oxygen and epidural analgesia.Bis and AEP were monitored every 5 minutes. Data are presented as mean and standard deviation (SD).
Results and Discussion: Ten patients (7 women and 3 men), ASA physical status I or II were studied. They had a mean of age of 75 (range 65-83) years, weighed 75 (13) and were 164 (7) cm tall. The awake mean values for BIS

were 95 (2.5) and 65 (2.82) for EAP. After the induction of anesthesia, BIS values decreased to 33 (9.01) and EAP to 19(6.79). When the administration of xenon was started,mean values for BIS were 44(10.67) and 21 (3.25) for EAP. During maintenance of anesthesia mean BIS values were between 36.6 and 51.4, mean EAP values were between 14.33 and 35.20. During surgery, BIS values between 40 and 60 is suggested. In case of AEP, the surgical anaesthesia range is between 15 and 25. In our study we can see that during xenon anesthesia an increase in depth of anesthesia indicated by BIS monitoring is accompanied by a decreased in AEP values.In both cases the main values during xenon anesthesia were situated in the surgical anesthesia range.



[Mean BIS and EAP values]

Conclusion(s): During xenon anesthesia the changes in depth of anesthesia are indicated by changes in BIS and AEP values. Both monitors show its values in the surgical anesthesia range.

3AP3-1

Noninvasive measurement of cardiac output by uncalibrated finger arterial waveform analysis

Broch O., Bein B., Gruenewald M., Meybohm P., Renner J.
University Hospital Schleswig Holstein, Campus Kiel, Department of Anaesthesiology and Intensive Care, Kiel, Germany

Background and Goal of Study: Several studies have shown that goal-directed perioperative optimization of cardiac index (CI) reduce morbidity after major surgery and the length of stay on the intensive care unit [1]. Therefore, non - or less-invasive, simple to interpret and quickly available continuous monitoring of CI has gained increasing interest. One of these non-invasive monitoring systems is the Nexfin-Monitor (bmeye, Amsterdam, NL) based on the calculation of CI by arterial waveform analysis without the need for calibration. The aim of our study was to investigate the accuracy of uncalibrated CI generated by arterial waveform analysis in patients undergoing coronary artery bypass grafting.
Materials and Methods: After ethics committee approval and written informed consent, 20 patients scheduled for elective CABG operation were studied before and after cardiopulmonary bypass (CPB). Each patient was monitored with the PiCCO system (Pulsion Medical System, Munich, Germany), a central venous line and the recently introduced Nexfin monitoring system. Haemodynamic variables included measurement of CI derived by TPTD (CI_{TPTD}) and CI derived by Nexfin (CI_{Nexfin}). To describe the agreement between $CI_{TPTD,}$ CI_{Nexfin} and haemodynamic trends ($\Delta CI_{TPTD,}$ ΔCI_{Nexfin}) Bland-Altman plots were performed before and after CPB. Before CPB and within the first 40 minutes after CPB CI derived by Nexfin was performed without additional calibration.
Results and Discussion: There was a significant correlation between $CI_{Nexfin\ uncal}$ and CI_{TPTD} ($r=0.77$, $p< 0.0001$) before CPB. Bland-Altman analysis showed a mean bias of 0.35 L/min (95% limits of agreement: -0.81 L/min to +0.57 L/min) with a percentage error (PE) of 25% [Figure 1]. After CPB $CI_{Nexfin\ uncal}$ showed a mean bias of 0.32 L/min (95% limits of agreement: -0.77 L/min to +0.49 L/min) with a percentage error (PE) of 22%. Trends of percentage changes in CI measured by uncalibrated Nexfin ($\Delta CI_{Nexfin\ uncal}$) and transpulmonary thermodilution (ΔCI_{TPTD}) revealed a significant correlation before ($r=0.54$, $p< 0.0001$) and after ($r=0.67$, $p< 0.0001$) CPB [Figure 2].
Conclusion(s): CI measurement by uncalibrated Nexfin monitoring system was able to reliably measure CI and track haemodynamic changes and trends compared with TPTD.
References:
1. Pearse R. Crit Care, 2005. 9(6): p. 687-93.
Acknowledgements: The authors are indebted to Volkmar Hensel-Bringmann, for excellent technical assistance and logistic support.

3AP3-2

Comparison of cardiac output measurements by thermodilution and arterial pulse waveform analysis (Flo Trac/Vigileo ®) in morbid obese patients

Tejedor A., Rivas E., Martinez-Palli G., Arismendi E., Rios J., Balust J.
Hospital Clinic Barcelona, Department of Anaesthesiology and Intensive Care, Barcelona, Spain

Background and Goal of Study: Arterial pressure-based cardiac ouput monitors are increasingly used as alternatives to thermodilution. It seems that arterial compliance, which has been shown altered in obese patients, has a large impact on the accuracy of CO calculation of the Flo Trac/Vigileo device. Our goal was to investigate the agreement between FloTrac-Vigileo and thermodilution through pulmonary artery catheter (PAC) to CO measurement in morbid obese (MO) patients before bariatric surgery (BS).
Materials and Methods: Under the IRB approval, we realized a prospective study in MO patients($BMI \geq 35\ Kg/m^2$) in the context of a wider study conducted to investigate the causes of hypoxemia in MO patients by ventilation-perfusion study. Exclusion criteria were cardiovascular and pulmonary diseases and obstructive sleep apnea syndrome. PAC (Opticath catheter, Hospira, Inc., Lake Forest, IL) and radial artery catheter were inserted. Data sets of thermodilution PAC-based and arterial pressure-based cardiac output were obtained simultaneously at predefined time points: breathing air (A) and pure oxygen (O_2), and in both sitting (S) and lying (L) position. At least 3 consecutive injections of 10 mL of cold-temperature normal saline through PAC at defined time points were performed and the results were accepted and averaged if the shape of the thermodilution curve was consistent. The arterial cannula was connected to a FloTrac pressure transducer (FloTrac sensor, Edwards Lifesciences) for continuous CO display and data were registered simultaneously. We analyzed data base through Blant Altman plot and Lin's corcondance coefficient to measure the accuracy and precision magnitude.
Results and Discussion: Eight MO patients (7F/1M; 51±9 years old) with BMI 44±4,4 Kg/m^2 were included. One hundred and thirty-two pairs of measurements were registered, 69 (51.9%) pairs while breathing A (32 S and 37 L) and 63 (48.1%) pairs while breathing O_2 (35 S and 28 L).The analysis of these 132 data pairs revealed, through Bland Altman plot and Lin's corcondance coefficient (LCC), inadequately correlation between these two devices, $LCC=0.299$. When data pairs obtained in S and L position were analyzed separately, LCC remained inadequately ($S=0.291$ and $L=0.291$).
Conclusion(s): The semi-invasive Flo Trac/Vigileo device was found to inadequately agree with bolus pulmonary artery thermodilution in obese patients.

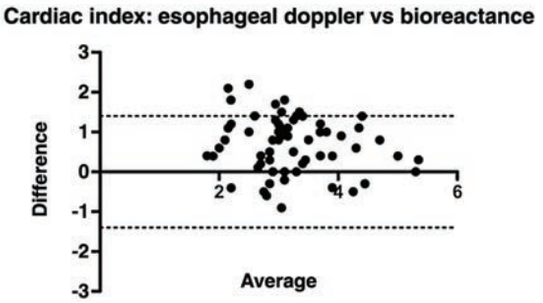
3AP3-3

Comparison of monitoring performance of bioreactance versus esophageal doppler in paediatric patients

Dubost C., Bouglé A., Ledorze M., Baujard C., Roulleau P., Benhamou D.
Hôpital Bicêtre, Department of Anaesthesiology and Intensive Care, Le Kremlin-Bicêtre, France

Background and Goal of Study: Bioreactance is a technology based on the analysis of frequency variations of a transthoracic oscillating current[1]. Bioreactance can be used to monitor cardiac output non-invasively. This study was designed to compare the value of bioreactance technology (Nicom®) with esophageal doppler (CardioQ®) monitoring to measure cardiac index (CI) in paediatric patients.
Materials and Methods: After obtaining parents consent, 11 paediatric patients undergoing major abdominal surgery under general anaesthesia were included. Continuous hemodynamic variables obtained from both Nicom® and CardioQ® were recorded and compared. Data were analysed by the Bland-Altman method.
Results and Discussion: A total of 70 pairs of CI measures from 11 patients were analysed. Mean age was 68 months (95% CI : 42-83) and mean weight was 18 kg (15-22). The Pearson correlation coefficient for Nicom® vs. Car-

dioQ® was 0.67 (0.52-0.78). Bland-Altman analysis revealed a bias of 0.67, precision of 1.33, limits of agreement of -0.66 - 2.0 L/min/m² and a percentage error of 38 %. As recently suggested a percentage error of ± 45% represents a more realistic expectation of achievable precision in clinical practice[2].



[Bland Altman]

Conclusion: These preliminary results suggest acceptable monitoring capabilities of Nicom® compared to CardioQ®.

References:

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2. Peyton PJ, Chong SW. Anesthesiology 2010;113:1220-35

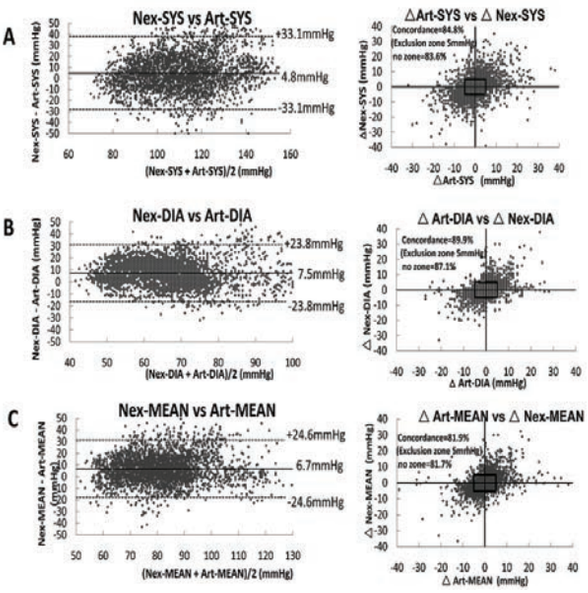
3AP3-4

Precision and accuracy of a new device (Nexfin) for continuous non-invasive blood pressure monitoring: Comparison with invasive arterial pressure during general anesthesia

Chen G., Meng L., Joseph R., Alexander B., Zeev N K., Cannesson M.
University of California Irvine, Department of Anaesthesiology, Orange, United States

Background: Nexfin HD (BMEYE B.V, Amsterdam, Netherlands) allows for non-invasive and beat-to-beat blood pressure (BP) monitoring and has been shown to detect acute changes in arterial pressure during sedation and spinal anesthesia. However, its accuracy and trending abilities have not been fully evaluated compared with invasive arterial pressure. The goal of this study was to assess the accuracy of the Nexfin device during general anesthesia by analyzing the agreement with invasive measurement of arterial pressure.

Methods: We studied patients (ASA I-III) undergoing abdominal or orthopedic surgery. Systolic, diastolic and mean blood pressures were measured with the Nexfin device (SBPnxf, DBPnxf, MBPnxf) and with a radial intra-arterial catheter (SBPart, DBPart, MBPart). Recordings were compared and analyzed every minute from skin incision to skin suture. Analysis was performed using Bland Altman analysis, mean percent error calculation, and evaluation of the ability of the Nexfin device to track changes in arterial pressure (concordance analysis).



[Comparision between BPnxf and BPart]

Results: Twenty-five patients (age 44±15 yrs, weight 84±21 kg and height 168± 17 cm) were enrolled in this study. 3981 pairs of systolic, diastolic and mean blood pressure were recorded. The agreement of SBP_{nxf}, DBP_{nxf} and MBP_{nxf} compared to SBPart, DBPart, and MBPart were 4.5 ± 33.1 mmHg, 7.5 ± 23.8 mmHg, and 6.7 ± 24.6 mmHg, respectively. The mean percent errors of SBP_{nxf}, DBP_{nxf} and MBP_{nxf} were 31%, 37% and 32%, respectively. Concordances in arterial pressure change between Nexfin and esophageal Doppler were 84.8%, 89.9% and 81.9%, respectively.

Conclusion: Nexfin provides non invasive and continuous estimates of arterial pressure compared with invasive arterial pressure measurements during general anesthesia. The trending abilities seem acceptable. This device has potential clinical applications.

3AP3-6

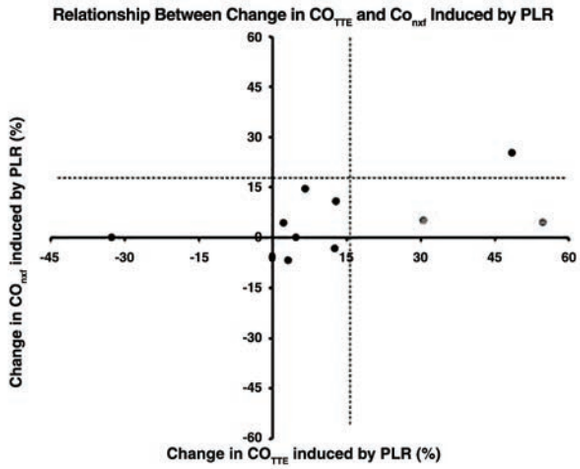
Ability of a new non-invasive cardiac output monitoring device (Nexfin) to detect hemodynamic changes induced by passive leg raising in spontaneously breathing subjects

Chung E., Chen G., Kain Z., Cannesson M.
University of California Irvine, Department of Anaesthesiology, Orange, United States

Background and Goal of Study: The Nexfin (BMEYE B.V, Amsterdam, Netherlands) monitoring system uses a non-invasive recording of pulse pressure profiles for continuous cardiac output (CO) estimation via a finger cuff. This device may have utility in detecting fluid responsiveness in spontaneously breathing patients. The purpose of this study was to assess this device's ability to detect changes in CO induced by passive leg raising (PLR) in spontaneously breathing subjects.

Materials and Methods: The study was a prospective observational study performed on ten healthy spontaneously breathing volunteers. Cardiac output was obtained via Nexfin (CO_{nxf}) and by transthoracic echocardiography (CO_{TTE}). CO_{TTE} and CO_{nxf} were recorded with the patient in a semirecumbent (45°) position and then compared to values obtained 3 minutes after PLR. Bland-Altman analysis and Critchley and Critchley's method were used to determine agreement and mean percentage error. Response to PLR was defined as a 15% increase in CO from baseline.

Results and Discussion: The mean CO_{TTE} and $CO_{nxf\ values}$ were 6.0 ± 1.3 L/min (min 4.2, max 9.5) and 6.8 ± 1.1 L/min (min 4.9, max 8.9) respectively for twenty data points. Regression analysis showed a statistically significant relationship ($r=0.61$ with $p< 0.01$) between CO_{TTE} and CO_{nxf}. Bland-Altman analysis revealed an agreement of 0.8 ± 1.1 L/min. The mean percentage error between the two techniques was 36%.The concordance for fluid responsiveness prediction was 70% (Figure 1).



[Figure 1]

Conclusion(s): The Nexfin monitor, a non-invasive and non-operator dependent device, may be useful for CO measurement. The mean percent error in the present study was 36%, above the 30% threshold recommended by Critchley and Critchley. However, a recently published meta-analysis of studies from the last ten years indicate that a mean percent error of ± 45% may be more realistic in clinical setting [1].

References:

1. Peyton et al. Anesthesiology 2010; **113**: 1220-35.

3AP3-7

Non-invasive assessment of arterial blood pressure

Philippi L., Closhen D., Fukui K., Schmidtmann I., Ikeda M., Pestel G.
Johannes Gutenberg-University Medical Centre, Mainz, Germany, Department of Anaesthesiology, Mainz, Germany

Background and Goal of Study: Exact assessment of arterial blood pressure to guide haemodynamic therapy is considered mandatory in major surgical cases. However, cannulation of an artery is invasive and not free of risks. Therefore, non-invasive measurement of arterial blood pressure would be helpful for clinicians. With Modelflow technology, a non-invasive measurement technique is meanwhile commercially available. Consequently, we intended to compare non-invasive Modelflow blood pressure measurements with standard measurement by radial artery catheter.
Materials and Methods: 26 Patients, ASA I-IV, undergoing elective major abdominal surgery, to be monitored by arterial line were recruited for this study after IRB approval and written informed consent. Cannulation of the artery of the non-dominant hand was performed according to clinical standards. Anaesthesia was induced by sufentanil, propofol and atracurium, and maintained with sevoflurane with additional boluses of sufentanil at the discretion of the attending anaesthesiologist. A non-invasive arterial pressure monitoring device based on Modelflow technology (Nexfin HD, BMeye Corp, Amsterdam, NL) was set up after induction according to manufacturer's recommendations. Data pairs of systolic (Psys), diastolic (Pdia) and mean arterial pressure (MAP) assessed by 1) arterial line 2) Nexfin HD were collected after induction, before incision, after incision, before and after fluid bolus, and at the end of surgery, to be compared by Bland-Altman analysis. We computed 95% confidence intervals (assuming normal distribution of the differences) and 95% limits of agreement. As in this study measurement was repeated at several instances for each patient, we determined variance components: patient variance and residual variance. Proc Mixed from SAS 9.2 was used
Results and Discussion: The observed mean differences, confidence intervals and limits of agreement are displayed in table 1.

Measurement	Mean difference	Lower limit of agreement	Upper limit of agreement	Lower confidence limit	Upper confidence limit
Psys	-2,19	-19,99	15,60	-4,58	0,20
Pdia	6,23	-7,76	20,23	4,82	7,64
MAP	4,15	-11,38	19,69	2,62	5,68

[Table 1]

Conclusion: With a small bias and tolerable precision, Modelflow technology to assess artery blood pressure is a promising option for non-invasive monitoring that deserves further study.

3AP3-8

Non-invasive estimation of stroke volume index by using pulse wave transit time both in adult and pediatric population

Ochiai R.
Toho University, Department of Anaesthesiology, Tokyo, Japan

Background and Goal of Study: For cardiovascular monitoring, stoke volume index (SVI) and stroke volume variation (SVV) have been shown as useful parameters to evaluate cardiovascular status, by representing cardiac contraction and preload, respectively. Pulse wave transit time (PWTT), which measures pulse wave propagation from cardiac contraction, depends on SV and physical property of peripheral arteries and enables us to estimate both SVI and SVV, non-invasively. A good correlation of SVI and SVV by using PWTT and thermodilution technique was preciously reported in clinical settings. In the present study, we evaluated the feasibility of SVI estimation by PWTT in both adult and pediatric population.
Materials and Methods: 16 adult patients and 7 pediatric patients, who underwent elective surgery, were studied with approval of the ethics committee and written informed consent. PWTT-derived SVI (esSVI) was compared with SVI (iSVI) measured by thermodilution technique in adult patients and by dye-dilution technique in pediatric patients. Also, PWTT was measured prior to anesthesia induction to obtain its relationship with body geometry (height and body surface area; BSA). Statistical analysis was done by linear correlation.
Results and Discussion: Demographics of adult patients: age 19-61, height 153-176cm, BSA 1.36-1.83m2). 61 pairs of SVI data were collected in adult patients, and there was a good correlation between esSVI and iSVI (R=0.620). Demographics of pediatric patients: age 9-14, height 97-143cm, BSA 0.78-1.17m2. 14 pairs of SVI data were obtained in pediatric patients, and there was a good correlation between esSVI and iSVI (R=0.627). PWTT at rest prior to the induction of anesthesia showed weak correlation with body geometry (height R=0.426, and BSA R=0.295). The result of the present study shows that the estimation of SVI by using PWTT is a good candidate for non-invasive and continuous cardiovascular monitoring in both adult and pediatric patients.
Conclusion(s): The present study shows that the non-invasive and continuous monitoring of SVI is possible in wide variety of age and body geometry by using PWTT. However, the independent manner of PWTT from body geometry indicates the need of calibration for the estimation of SVI during anesthesia and critical care.

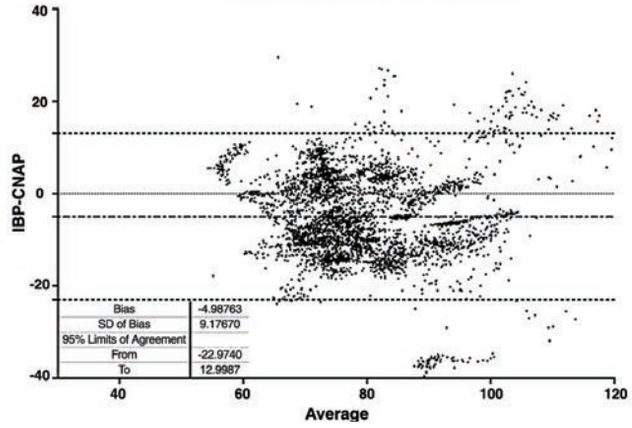
3AP3-9

Continuous blood pressure readings in intensive care patients, comparison of a continuous non-invasive pressure device and invasive recording by means of an arterial line

Grudev G.G., Grudev G., Ilies C., Haake N., Bein B., Steinfath M R., Hanss R.
University Children's Hospital of Kiel, Department of Anaesthesiology and Intensive Care, Kiel, Germany

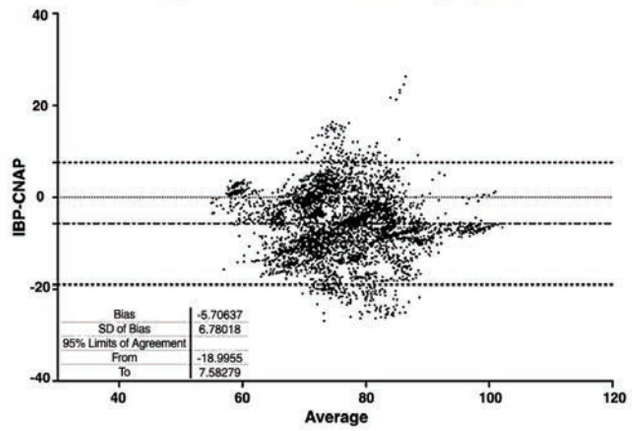
Background: Arterial pressure (AP) monitoring is routine in intensive care patients. It should be accurate, easy to use, free of complications and continuous. The newly developed CNAP™ device is non-invasive and provides continuous AP readings. This study was performed to compare agreement of CNAP and invasive AP monitoring (IAP).
Methods: 97 critically ill patients (ASA III or IV) admitted to the ICU after either CABG or heart valve repair were investigated. 42 patients showed cardiac arrhythmia (group CA, Lown-Classification II - IV). 50 patients demonstrated sinus rhythm (group SR). IAP was established at the radial artery. CNAP™ was applied on the contra-lateral arm. 150 randomized CNAP and IAP readings from each patient were compared following the Association for the Advancement of Medical Instrumentation (AAMI) criteria. Statistics: Bland-Altman method for comparison of the two devices, percentage error (PE) for interchangeability.

Figure 2: Bland Altman of MAP, group CA



[Group SA]

Figure 1: Bland Altman of MAP, group SR



[Group CA]

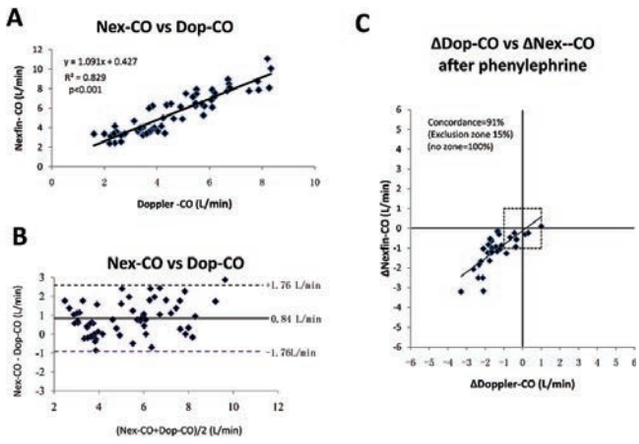
Results: We obtained 9607 valid AP readings. Bias, SD and PE during the measuring were as follows: Group SR: systolic AP: bias 4.39(11.7)mmHg, PE 21.7%; mean AP [figure 1]: bias -5.7(6.7)mmHg, PE 17.8%; diastolic AP: bias -8.5(7.8)mmHg, PE 25,5 %; Group CA: systolic AP: bias 4.9(13.8)mmHg, PE 24.8%; mean AP [figure 2]: bias -4.9(9.1)mmHg, PE 23,1%; diastolic AP: bias -8.6(9.0)mmHg, PE 28.3%.
Conclusion: CNAP™ showed acceptable agreement and adequate precision compared to IAP measurement in intensive care patients. Interchangeability criteria defined by the PE were met for mean AP in patients with SR. For systolic and diastolic AP, especially in group CA, we found moderate agreement. Interchangeability criteria were barely missed.
Thus, CNAP might be an alternative for AP measurement in ICU patients when sinus rhythm is maintained.

3AP4-1

Comparison between non invasive cardiac output measurements using the esophageal doppler and the Nexfin monitoring device: Impact of phenylephrine administration

Chen G., Meng L., Alexander B., Tran P. N., Zeev N K., Cannesson M.
University of California Irvine, Department of Anaesthesiology, Orange, United States

Background and Goal of Study: The non-invasive Nexfin device (BMEYE B.V, Amsterdam, Netherlands) provides continuous cardiac output (CO) measurements based on pulse contour analysis.
This could be used for intraoperative hemodynamic optimization.
However, its accuracy and trending abilities have not been fully evaluated. The goal of this study was to compare this device's ability to measure CO to the esophageal Doppler (which has been used in several GDT protocols) in steady conditions and after phenylephrine administration.
Materials and Methods: We studied patients (ASA I-III) undergoing abdominal or orthopedic surgery. CO was measured simultaneously using the Nexfin (CO_{nxf}) and esophageal Doppler (CO_{ed}) at baseline and when blood pressure peaked after a 100μg intravenous phenylephrine bolus.
Comparisons were then made between the two devices in order to evaluate the ability of the Nexfin to measure a change in CO (Bland Altman analysis, Critchley and Critchley analysis, and Critchley's method to evaluate the trending abilities of the Nexfin device).
Results and Discussion: Twenty patients (age 41±12 yrs, weight 92±17 kg and height 172±18 cm) referred for abdominal or orthopedic surgery were enrolled in our study. Fifty pairs of data were obtained. The mean±SD CO_{ed} was 5.5±2.1 L/min and the mean±SD CO_{nxf} was 4.7±1.8 L/min ($p< 0.001$). There was a significant relationship between CO_{ed} and CO_{nxf} ($r^2=0.829$; $p< 0.001$) (Figure 1 A). The agreement between CO_{nxf} and CO_{nxf} was 0.84 ±0.88 L/min (Bland Altman) (Figure 1B).
The mean percent error of CO_{nxf} compared to CO_{ed} was 32%. Despite this relative lack of agreement, trending analysis found a 91% concordance between changes of CO_{ed} and CO_{nxf} after phenylephrine administration (Figure 1C).



[Comparision Between COnxf and COed]

Conclusion(s): Despite a relative lack of agreement between Nexfin and Esopahgeal Doppler we found a very good concordance regarding the trending ability of Nexfin versus Esophageal Doppler.

3AP4-2

An ultrasonic study on anatomic relation of the overlap in right internal jugular vein and common carotid arteries in 306 patients

Wang X., Zheng M., Lu L.
The Affiliated Drum Tower Hosptial, Medical School of Nanjing University, Department of Anaesthesiology, Nanjing, China

Background and Goal of Study: The right internal jugular vein (IJV) is a common vessel to obtain venous access in clinic[1]. To avoid inadvertent arterial puncture, it should be important to have a clear understanding in the anatomic relation of the right IJV and the common carotid arteries (CCA) [2, 3]. This study aims to objectively evaluate the anatomic relation of the overlap in the right IJV and the CCA, and to assess its influence factors on these anatomical structures.
Materials and Methods: 306 adult patients were random elected and their right IJV and CCA were investigated at three cross section (high point: the upper border of the thyroid cartilage; middle point: the cricoid cartilage; low point: 2cm below cricoid cartilage) by portable ultrasonography.
Results and Discussion: From the high point to the low point, the partial overlap ratio and the complete overlap ratio were significantly increased. The non-overlap ratio was significantly increased at middle point in male compared to female. The non-overlap ratio was decreased at low point more frequent in patients older than 60 years. Compared with the lean, the complete overlap ratio of the obesity was significantly increased at middle and low points. According to the discriminatory analysis, the impact degree of factors which influence overlap ratio is in the following sequence: point, BMI, gender and age, meanwhile the accordant diagnostic rate was 71.24%. As many documents indicated that different puncture point, gender, age, and BMI may influence the anatomic relation of the overlap in the IJV and the CCA. Our results suggest that the gender, age and BMI influence the anatomic relation of the overlap in the right IJV and the CCA in different points.
Conclusion(s): Knowledge of the IJV anatomy and relationship to the CCA is important information for the operator performing an IJV puncture, to potentially reduce the chance of laceration of the CCA and avoid placement of a large catheter within a critical artery.
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3AP4-3

Increased variability and loss of accurracy of hepatic hemodynamic measurements under deep sedation in patients with portal hypertension

Blasi A., Reverter E., Martinez-Palli G., Gonzalez-Abraldes J., Garcia -Pagán J.C., Bosch J.
Hospital Clínic de Barcelona, Anesthesiology Department, Hepatic Hemodynamic Laboratory, Liver Unit. Hospital Clinic, IDIBAPS and CIBERehd., Barcelona, Spain

Background and Goal of Study: Measurement of portal pressure gradient (PPG) by the hepatic venous pressure gradient (HVPG) offers valuable prognostic information in patients with cirrhosis. In specific circumstances (children, agitated patients or TIPS procedure) deep sedation is required, but its impact on measurements has not been adequately assessed. The current study addresses this issue.
Materials and Methods: Patients were studied at HVPG (n=20) and after TIPS placement (PPG, n=13). HVPG, PPG, cardiopulmonary pressures and cardiac output were obtained awake or under sedation with continuous i.v. propofol and remifentanil through a target-controlled infusion (TCI) device to maintain deep sedation.
Results and Discussion: Under sedation, there was a marked respiratory variability in hepatic venous, portal and inferior vena cava pressures (mean variability between inspiratory/expiratory: 7 mmHg, range 0-36.5 mmHg). Variability was directly related to body mass index. Under sedation, end-expiratory HVPG values had a better agreement with awake HVPG than inspiratory measurements (mean ± SD in mmHg: awake 15.0 ± 4.7; end-expiratory 15.3 ± 4.5, inspiratory 14.3 ± 5.0), showing a better intraclass correlation coefficient (ICC) in comparison to inspiratory HVPG: 0.91 vs. 0.79. However, variability was higher. Thus, in 45% of patients end-expiratory HVPG differed by more than 10% from awake HVPG. After TIPS end-expiratory PPG also

showed a better agreement with awake PPG than PPG obtained at inspiration (ICC: 0.84 vs. 0.73). However, end-expiratory PPG infraestimated awake PPG (10 ± 4 vs. 12.5 ± 5 mmHg; p< 0.05) and misclassified 15% of patients as to the target PPG of 12 mmHg. The mean pressure value over the respiratory cycle showed no better agreement than end-expiratory measurements and had a higher variability. Compared to awake values, deep sedation significantly decreased mean arterial pressure (-13.6 mmHg) and increased pulmonary artery pressure (+3 mmHg), while cardiac output remained unchanged .
Conclusion(s): Deep sedation with propofol/remifentanil does not significantly modify mean end-expiratory HVPG but markedly increases its variability. In addition, profound sedation significantly underestimates post-TIPS PPG. Thus, whenever possible measurements should be repeated after recovery from sedation, especially in overweight/obese patients.

3AP4-4

Non-invasive assessment of functional haemodynamic parameters

Philippi L., Closhen D., Fukui K., Schmidtmann I., Ikeda M., Pestel G.
Johannes Gutenberg-University Medical Center, Department of Anaesthesiology, Mainz, Germany

Background and Goal of Study: Exact assessment of haemodynamic parameters is considered mandatory in major surgical cases. However, most monitoring devices are invasive and require special training. Therefore, non-invasive measurement of haemodynamic parameters would be helpful for clinicians. With Modelflow technology, a non-invasive measurement technique is meanwhile commercially available. Consequently, we intended to compare non-invasive Modelflow haemodynamic measurements with standard measurement by oesophageal doppler (ED).
Materials and Methods: 26 Patients, ASA I-IV, undergoing elective major abdominal surgery, to be monitored by arterial line were recruited for this study after IRB approval and written informed consent. Anaesthesia was induced by sufentanil, propofol and atracurium, and maintained with sevoflurane with additional boluses of sufentanil at the discretion of the attending anaesthesiologist. Haemodynamic monitoring by ED was started after induction. Additionally, a non-invasive haemodynamic monitoring device based on Modelflow technology (Nexfin HD, BMeye Corp, Amsterdam, NL) was set up after induction according to manufacturer's recommendations. Data pairs of stroke volume (SV), cardiac output (CO) and cardiac index (CI) assessed by 1) ED 2) Nexfin HD were collected after induction, before incision, after incision, before and after fluid bolus, and at the end of surgery, to be compared by Bland-Altman analysis. We computed 95% confidence intervals (assuming normal distribution of the differences) and 95% limits of agreement. As in this study measurement was repeated at several instances for each patient, we determined variance components: patient variance and residual variance. Proc Mixed from SAS 9.2 was used.
Results and Discussion: The observed mean differences, confidence intervals and limits of agreement are displayed in table 1.

Measurement	Mean difference	Lower limit of agreement	Upper limit of agreement	Lower confidence limit	Upper confidence limit
SV	-6,85	-49,66	35,96	-13,96	0,25
CO	-0,48	-3,40	2,45	-0,94	-0,01
CI	-0,29	-2,05	1,47	-0,57	-0,00

[Table 1]

Conclusion: With a small bias, Modelflow technology to assess haemodynamic stability, is a promising option for non-invasive monitoring that deserves further study. However, with wide limits of agreement it cannot replace standard monitoring technology presently.

3AP4-5

Plethysmography variability index: Comparison with pulse pressure variation in vascular surgery

Guinet P., Daviet L., Wodey E., Laviolle B., Ecoffey C.
Pontchaillou Hospital, University of Rennes 1, Department of Anaesthesiology and Intensive Care, Rennes, France

Background and Goal of Study: Fluid optimization is a daily issue in the operating room. Pulse Pressure Variation (PPV) is a reliable predictive index of cardiac output response after volume expansion (1), but requires an arterial catheter. Respiratory variations of plethysmographic curve show similarities with PPV curve although non invasive (2). We sought to test the reliability of Plethysmography Variability Index (PVI) in comparison with PPV.
Materials and Methods: Observational study in vascular surgery patients (carotid and aortic surgery). PPV (Philips Intellivue MP 60) and PVI (Masimo Corp) were recorded 7 times in each patient: T0, after induction of general anesthesia; T1: table position at +20°; T2: Trendelenbourg, -20°; T3: table at 0°, after fluid expansion (500ml Ringer's lactate); T4: beginning of carotid or aortic clamping period; T5: end of clamping; T6: end of surgery. In a subgroup of patients, arterial pressure and plethysmographic raw curves were recorded in order to allow manual assessment of PPV (PPVm) and PVI (PVIm). Agreement between PPV, PVI, PPVm and PVIm was evaluated using a Bland-Altman plot and Intraclass Correlation Coefficient (ICC, strong correlation if >0,6) (3).
Results and Discussion: 41 patients (7 women, 34 men, mean age 69) were included. Correlation betwwen PPV and PVI over the 287 measurements was not strong (0,55). Correlation for each time point was 0,27 at T0, 0,60 at T1, 0, 69 at T2, 0,30 at T3, 0,58 at T4, 0,50 at T5 and 0, 49 at T6. Bland-Altman plot showed a broad dispersion for high values of PPV and PVI. In the subgroup of 15 patients (8 carotid and 7 aortic surgeries) with manual computing of PPVm and PVIm, ICC was 0,87 between PPV and PPVm, 0,73 between PPVm and PVIm (strong correlations), and 0,51 between PVI and PVIm.
Conclusion(s): Correlation between PPV and PVI is not strong in our vascular surgery patients. PVI may not be as reliable as PPV for guiding volume expansion. Nevertheless the strong correlation between PPV and PVIm underlines the potential interest of the plethysmographic curve in providing a predictive index for fluid opimization.
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3AP4-6

What is the best site for measuring the pleth variability index (PVI) during a surgery procedure?

Pavlakovitch I., Desebbe O., Cannesson M., Bastien O., Lehot J.-J.
Hospices Civils de Lyon Hopital L Pradel, Department of Anaesthesiology and Intensive Care, Bron-Lyon, France

Background: The PVI (Masimo corp) is a non invasive and continuous monitoring of fluid responsiveness in mechanically ventilated patients. The PVI is derived from the respiratory variations in the perfusion index (PI) measured from the photoplethysmograpich waveform. The PVI has been evaluated only in steady state conditions and from the finger site. However, the cephalic region seems to allow better detection of the respiratory signal within the plethysmographic waveform than the finger and seems to be less sensitive to sympathetic tone.
The goal of our study was to evaluate three different sites for PVI measurement (ear, forehead, and finger) and to test their ability to detect a pulse pressure variation (PPV) > 10% during ongoing surgery.
Materials and Methods: Sixteen patients were studied during abdominal aortic aneurysm. Hemodynamic data, PPV (automatically and continuously displayed on Philips Monitors) and PVI at three sites (forhead, ear and finger) were recorded at 5 different steps (after induction, after incision, after aortic clamping, before and after aortic declamping). Pulse oximeters (LNOPAdt, Masimo Corp) attached to the forehead, ear and finger were 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; PVI is averaged over 2 minutes.
Results and Discussion: The PVI was correlated with the PPV (r=0.43 for PVIfinger with p< 0.001; r=0.60 for PVIforehead with p < 0.001; r=0.72 for PVIear with p< 0.001). A PVIforehead > 14% and a PVIear > 15% predicted a PPV > 10% with a sensitivity of 73% and a specificity of 72%

	area	p	cutoff	sensibility (%)	specificity (%)
PVIforehead	0.742	<0.001	14%	73	72
PVIear	0.732	<0.001	15%	73	72
PVIfinger	0.61	0.1	13%	78	44

[Area under the curve for PVI to predict a PPV>10%]

Conclusion: Ear and forehaed seems to provide the best accuracy for PVI determination compared to the finger.This observation may be related to a smaller vasomotor tone at these sites than at the finger.

3AP4-7

PRAM vs FloTrac-sensor/Vigileo™ for hemodynamic monitoring during liver resection - preliminary date

Feltracco P., Barbieri S., Galligioni H., Bertoldi E., Ori C.
University Padova, Department of Anaesthesiology and Intensive Care, Padova, Italy

Background: Liver resection because of HCC poses serious risks of hemodynamic derangement due to reduction of venous return, bleeding and attitude at fluid restriction regimens. Non-invasive measurement of cardiac output (CO) and related variables has been proposed to optimise hemodynamic during liver surgery. This study aim at assessing the reliability of CO determination obtained by two methods of arterial pulse wave analysis during liver resection: Pressure recording analytical method (PRAM - Most-Care) versus FloTrac/Vigileo (Edwards VigileoTM).
Methods: After Ethic Committee approval, 30 patients scheduled for liver resection were enrolled in 21 months. In all patients the hemodynamic parameters such as CO, SV, SVV%, and SVRI were detected by VigileoTM and PRAM and were registered. General anesthesia with sevoflurane and Fentanyl were adopted in all interventions.
Results: Patient population consisted of 22 male, age 29-79 and 8 female, age 45-65. All patients were non cirrhotic, and were preoperatively judged able to tolerate the planned resection. Resections included 14 trisegmentectomies, 9 right hepatectomies, 4 left lobectomies and 3 left lateral segmentectomies. In this patient population CO measured by the two methods ranged between 2.3 to 6.2 l/min. The comparison of all intraoperative measurements obtained with PRAM and Vigileo resulted in: r2=0.84, bias=-0.007 l/min, precision= ±0.86 l/min. A series of CO measurements registered during acute surgical bleeding revealed less agreement between methods: r2=0.62; bias=-0.39 l/min; precision= ±1.12 l/min. Comment: Improved intraoperative anesthesiological management along with bloodless surgery have led to satisfactory results during liver resections. Hemodynamic monitoring is recommended in this setting, particularly when fluid restriction is adopted. The simultaneous comparison of pulse contour CO monitoring and beat-to-beat recording-analytical-method showed a good linear correlation (0.84) in these individuals without hyperdynamic circulation. However, when comparing the CO measurements in cases of active intraoperative bleeding, the degree of correlation appeared less closed, though still clinically acceptable.
Conclusion(s): In conclusion, the newly developed uncalibrated hemodynamic monitors Vigileo and PRAM appear reliable tools to detect changes in CO during liver surgery, however, further studies are required to validate their capability and accuracy in measuring CO during hemodynamic instability.

3AP4-8

Comparison of transpulmonary thermodilution, echocardiography and conventional haemodynamic parameters in infants after open heart surgery

Gergely M., Ablonczy L., Sapi E., Szudi L., Gal J., Szekely A.
Semmelweis University, Gottsegen Hungarian Institute of Cardiology, Pediatric Heart Center, Department of Anaesthesiology and Intensive Care, Budapest, Hungary

Background: Transpulmonary thermodilution (TPTD) is an increasingly used method to monitor the complex haemodynamic changes of the critically ill children as well. The aim of our study was to compare volumetric TPTD measurements with conventional pressure parameters and transthoracic echocardiographic (TTE) data in infants and neonates undergoing correction of congenital heart disease (CHD).
Materials and methods: After Ethics Committee Approval and individual parental consent patients younger than one year of age with CHD were prospectively enrolled. In parallel with continuous postoperative conventional monitoring, TPTD was measured four times, and TTE was performed once a day. Pressure, TPTD and TTE parameters were compared with weighted linear regression statistics.
Results: 145 TPTD measurements, 36 TTE examinations of 13 enrolled patients were analyzed. The correlation between TPTD and echocardiographic preload parameters was significant (global end-diastolic volume index, GEDVI vs. left ventricular diastolic diameter, LVDD, r=0,89, p=0,001). Central venous pressure showed no correlation with these values (CVP vs. GEDVI, r=0,37, ns., CVP vs. LVDD, r=0,21, ns.). Thermodilution cardiac index (CI) correlated good with GEDVI, r=0,69, p=0,008. Despite the heterogenity of the anatomy after correction of CHD thermodilution global ejection fraction (GEF) and TTE ejection fraction (EF) showed also significant correlation (r=0,81, p=0,016).
Conclusions: TPTD and TTE have been proven to be reliable and comparable diagnostic tools to follow the volumetric changes and cardiac function in the postoperative period. Our results indicate the significant impact of TPTD and TTE in measurement of preload and contractility in neonates and infants after cardiac surgery.

3AP5-1

A comparison of the accuracy of ulnar versus median nerve stimulation for neuromuscular monitoring

Kim K.S., Lee H.J., Shim J.C.
Hanyang University Hospital, Department of Anaesthesiology and Pain Medicine, Seoul, Korea, Republic of

Background and Goal of Study: Inexperienced anesthesiologists are frequently unclear as to whether to stimulate the ulnar or median nerve to monitor the adductor pollicis. The primary purpose of this study was to determine whether monitoring the adductor pollicis by positioning the stimulating electrodes over the median nerve is an acceptable alternative to applying electrodes over the ulnar nerve.
Materials and Methods: In 20 patients anesthetized with propofol and remifentanil, one pair of stimulating electrodes was positioned over the ulnar nerve. A second pair was placed over the median nerve on the other hand. The acceleromyographic response was monitored on both hands. Rocuronium 0.6 mg/kg was administered. Single twitch (ST) and train-of-four (TOF) stimulations were applied alternatively to both sites.
Results and Discussion: None of the patients showed a twitch response at either site after injection of rocuronium. There were no differences in the mean supramaximal threshold, mean initial TOF ratio, or mean initial ST ratio between the two sites. Bland-Altman analysis revealed a bias (limit of agreement) in the TOF and ST ratios over the median nerve of 7% (±31%) and 26% (±73%), respectively, as compared with the ulnar nerve. The median nerve TOF ratio was overestimated by 16.2%, as compared with that of the ulnar nerve value, and the median nerve ST ratio was overestimated by 72.9%, as compared to that of the ulnar nerve.
Conclusion(s): The ulnar and median nerves cannot be used interchangeably for accurate neuromuscular monitoring.

3AP5-2

Surgical Pleth Index to evaluate analgesia during esophagogastroduodenoscopy (EGD) procedures

Bossolasco M., Olivero F., Palmisano S., Manassero A., Coletta G.
Azienda Ospedaliera S. Croce e Carle, Department of Anaesthesiology, Cuneo, Italy

Background and Goal of Study: We design a clinical RCT to study if Surgical Pleth Index (SPI) monitorization could be used to evaluate nociception-antinociception balance in people undergoing sedation endoscopic procedures in operatory room of a country hospital (elective EGD with biopsy); a value of 100 corresponds to a high stress level and a value of 0 to a low stress level; values near 50 corresponds to the mean stress level.
The applicability of SPI for monitoring analgesia in sedation procedures has not been previously published.
Materials and Methods: We recruited 30 patients, each of them was randomly assigned to group P (propofol alone; 15 patients) or group RP (remifentanil and propofol; 15 patients). All vital signs, the SPI score, Entropy index and level of sedation (with a modified Ramsay sedation scale and a reactivity score) were recorded by a certified nurse. At the end of the EGD, a tree point satisfaction scale was given to the endoscopist, to evaluate the procedure feasibility, using a 1 to 3 scale where 1 represents “worst than normal”, 2 “normal” and 3 represents “better than normal”.
In both group, sedation was started at least five minutes before the beginning of the endoscopy procedure and was obtained using a target-controlled propofol infusion (Schnider pharmacokinetic model). Sedation level was adjusted by the anesthesiologist to obtain a SE entropy value between 60 to 70.
A fixed remifentanil infusion (0,15 μg/kg/min) was added in group RP at the same time of propofol infusion.
Results and Discussion: Patients were mostly men (63%), had a mean age of 53.5 (18-88). Demographic characteristics of both groups were comparable in age, gender, ASA classification, body mass index.
Group P had an higher mean SPI [74.9 (50-96)] then group RP [72.8 (35-89)] $p < 0.05$. More patients in the group P showed cough, hiccup and movement which temporary interfered with the examination.
Mean arterial pressure of group P was 86.5 mmHg (66-101) while in group RP was 74.7 mmHg (66-89) $p < 0.05$.
Mean Hearth rate of group P was 77.3 bpm (63-95), while in group RP was 71.3 bpm (51-86) $p > 0.05$.
No apnoea was recorded; we had two bradypnea in group RP.

There were no statistically significant differences in surgeon satisfaction: group P mean value 2.1, group RP 2.5 (p>0.05).
Limit(s): Low number of patients.
Conclusion(s): Surgical Pleth index seems to be a useful and good predictor of surgical stress-analgesia level during EGD sedation procedure.

3AP5-3

Selection of the optimal pharmacokinetic parameter set of alfentanil for use in anesthesia display systems

Sigmond N., Schnider T.W., Luginbuehl M.
Bern University Hospital, Department of Anaesthesiology and Pain Medicine, Bern, Switzerland

Background and Goal of Study: Anesthesia display systems visualize the combined effect of hypnotics and opioids in the OR and may help in rational titration. The performance of the systems depends on the underlying pharmacokinetic and -dynamic models. In optimal parameter sets the performance error is unaffected by the mode of administration (bolus vs. infusion), the accuracy is ≤ 30% and the bias is within ±20%. We evaluated the performance of six pharmacokinetic parameter sets of alfentanil in two data sets from our department obtained in patients anesthetized with propofol or inhalation anesthetics.
Materials and Methods: The dosing history of two studies was used to predict plasma concentrations with different published parameter sets using the PKPD tools by Minto and Schnider (www.pkpdtools.com). In one study[1] (N=30, 676 arterial blood samples) an alfentanil TCI (Stanpump) was combined with xenon or a combination of low dose desflurane and nitrous oxide, in the other (N=40, 126 arterial blood samples, unpublished) alfentanil (boluses) was combined with Propofol TCI (Schnider Parameters). MDAPE and MDPE [2] were compared with Mann-Whitney rank test with Bonferroni correction and repeated measurements on ANOVA on ranks with Tukey Test for multiple pair-wise comparisons (Sigmastat 3.5).
Results and Discussion:

	MDAPE ("accuracy")		MDPE ("bias")	
	Bolus / Propofol	Infusion / Inhalation	Bolus / Propofol	Infusion / Inhalation
Scott & Stanski 1987	30.2 (21.2,40.1)	30.1 (17.8,36.5)	-30 (-40.1,-13.6)	-15.7 (-28.8,3.4)
Fragen et al. 1983	26 (15.8,41.8)	29.2 (26.1 ,46.4)	-18.3 (-29.4,5.3)	4.1 (-22.3,19.1)
Shafer (Stanpump)	40.5 (23.9 ,51.1)	42.8 (32.1 ,51.1	-40.5 (-51.1,-22.4)	-42.2 (-50.2 ,-29)
Schüttler et al. 1982	27.4 (15.8 ,42)	56.1 (37.4 ,91.9) *	11 (-10.5 ,32)	50 (28.8 ,86.3) *
Maitre et al. 1987	24.1 (15 ,40.9)	51.9 (37.2 ,93.2) *	0.6 (-12.4 ,32.8)	46.2 (21.6 ,79) *
Mertens 2001	37.8 (25.7 ,70.9)	73.6 (35.4 ,96.1) *	27.5 (8.9 ,66)	66.4 (19.6 ,92.5)

[Table 1]

Legend to Table 1: The data are median (inter-quartile range, numbers are %). *p< 0063 compared to bolus application.
Conclusion(s): In the context of general anesthesia the parameter set by Scott and Stanski is the preferred one for use in anesthesia display systems because it is not affected the hypnotic co-medication, does not underestimate the measured concentration and showed an acceptable accuracy. The effect of application mode and hypnotic co-medication cannot be distinguished, however.
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3AP5-4

Influence of ventilator circuit in sevoflurane washin and washout: General Electric Avance versus Dräger Primus

Hernández M.J., Soliveres J., Sánchez A., Balaguer J., Estruch M., Solaz C.
University Hospital Dr Peset, Department of Anaesthesiology and Intensive Care, Valencia, Spain

Background and Goal of Study: Sevoflurane washin and washout may vary according to fresh gas flow (FGF) and depending on the respirator manufacturer. Our aim is to know wether there are differences in 2% sevoflurane time washin and washout withing and between two models of anaesthesia machines: Dräger Primus (TM) and General Electric Avance (TM).
Materials and Methods: Six ventilators (3 for each brand) were analysed with a mock lung. After respirator autocheck, 3, 6 and 9 L/min of FGF were used. In all cases a tidal volume of 500 mL and 12 resp/min were set. Sevoflurane was sampled from the Y piece to the same gas analyzer. After starting mock lung ventilation, an 2% inspiratory sevoflurane fraction was set and end tidal sevoflurane (ETs) recorded to a computer until no change in ETs was observed for at least 5 minutes. In all cases, at least 10 minutes of ventilation were recorded for each run. At this moment, the vaporizar was closed, so washout time started. Data were analyzed off line after each run. Each run was repeated 5 times for each ventilator and each FGF For each FGF and ventilator, time to obtain sevoflurane from the Y piece, maximum end tidal sevoflurane obtained (iFAA), time to washin and washout (3 time constants, 95% of iFAA), and time to full washout (ETs=0) were recorded. Student's t test or ANOVA (Bonferroni post hoc analysis) were used as appropiate. A p< 0,05 was considered significant. Data show mean (SD).
Results and Discussion: Results (tieme in seconds) are shown in Table 1and Table 2.

	iFAA			Time to obtain sevo			Washin 3 time constants		
FGF	*3 L/min*	*6 L/min*	*9 L/min*	*3 L/min*	*6 L/min*	*9 L/min*	*3 L/min*	*6 L/min*	*9 L/min*
Avance	1,8 (0,08)(*)	1,9 (0,09)(*)	2 (0,09)(*)	22,4 (4,58)	23,4 (5,2)	22,2 (1,97)	561,1 (115,8)(*)	60,9 (23,6)	43,9 (5,37)
Primus	2,1 (0,07)(*)	2,3 (0,04)	2,3 (0,05)	29,7 (0,5)	32 (1,2)	27 (3,39)(*)	1004,3 (74,4)(*)	368,4 (40,6)(*)	189,4 (20,81)(*)

[(*) p<0,05 wihin ventilator. Data show mean (SD)]

	Washot 3 time constants			Full washout		
FGF	*3 L/min*	*6 L/min*	*9 L/min*	*3 L/min*	*6 L/min*	*9 L/min*
Avance	452,3 (31,7)(*)	44,3 (7,9)(*)	31,3 (2,96)	688,8 (50,04)(*)	112,8 (24,3)(*)	49,9 (4,62)(*)
Primus(*)	872,5 (70,9)	175,4 (16,9)	90(6)	1437,8 (121,6)	424 (41,8)	163,4 (10,52)

[(*) p<0,05 wihin ventilator. Data show mean (SD)]

A total of 90 runs were analysed. Washin and washout are much longer with FGF= 3L/min. Higuer ETs is observed as FGF increases (see table). All variables are different for each FGF between ventilators (p< 0,05).
Conclusion(s): Both washin and washout shorten as FGF increases. The Avance ventilator's performance is better in all cases when compared to Primus ventilator.

3AP5-5

Monitoring muscle strength by using ventilatory flow triggering during recovery of neuromuscular blockade

Akdemir C., Ozcam M.G., Basar H., Kaymak C.
Ankara Training and Research Hospital, Department of Anaesthesiology and Intensive Care, Ankara, Turkey

Background and Goal of Study: We aimed for evaluating muscular strength during neuromuscular recovery by using patient flow triggering in the pressure support mode, almost present in newer anesthesic machines and, to put forth their relation with train of four which measures muscular blockade and if the use of the flow triggering can be a parameter for assessment of muscle strength as a routine.
Materials and Methods: After hospital Ethics Committee approval of the protocol and written informed consent was obtained from all subjects, 65 ASA I-II patients scheduled for elective thyroidectomy were enrolled in the study. Following the induction of anesthesia, at the 10th, 30th, 45th minute of operation, at the end of surgery, at the end of anesthesia and at the 3rd minute after using reversal agents, HR, MAP, SpO2, TOF, TOF ratio, DBS, BIS, patient triggering and pressure support levels, respiratory rate, EtCO2 were recorded. At the first 30th minute of operation S-IMV mode performed with patient triggering level of 0.3 L/min. After 30th minute, the ventilation mode was changed to pressure support ventilation with initially the same flow triggering setting. Provided adequate ventilation in the upper limit of ETCO2 was 45 mmHg. Ventilation was realized by manually adjusting the level of flow triggering at the minimal value of trigger which starts the spontaneous inspiration in every breath. The appropriate value for extubation with TOF ratio , trigger and pressure support levels were recorded.
Results and Discussion: TOF values arised after the 30th minute and reached the average value of 3.2±1.1 at 45th and after the reversal of the neuromuscular blockade, all patients gave complete response to four stimuli. At the end of surgical procedure TOF ratio was 56.3±23.3 and after 3 minutes of reversal TOF ratio was 86.4±16.4. Patient flow triggering values were re-

corded as 0.6±0.4 L/min, 2.3±1.18 L/min, 3.2±1.2 L/min and 3.8±1.0 L/min, at 45th minute, at the end of surgical procedure, at the end of anesthesia, after reversal respectively. There is a strong relationship between flow triggering levels and TOF ratio.

Conclusion(s): We conclude that; following up the muscular strength by flow trigger which can be used as an objective parameter to evaluate and decide the right time to extubate the patients and the triggering values of 3 L/Mn and up, is the take off point for the ,sufficient Recovery , from the neuromuscular blockade.

3AP5-6

Is an acceleromyographic train-of-four ratio of 0.9 an adequate benchmark for sugammadex-induced recovery

L'Hois G., Leclercq M., Fuchs-Buder T., Meistelman C.
Nancy, Department of Anaesthesiology and Intensive Care, Nancy, France

Background and Goal of Study: Recovery of nondepolarizing neuromuscular (NM) block is generally expressed as fade of the train-of-four response, (TOF-R). The degree of fade, however, has been suggested to be due to prejunctional actions of the drugs causing inhibition by a nicotinic receptor-mediated positive feedback of transmitter release. Thus, the relative prejunctional effects of NM blocking drugs or NM reversal drugs may lead to different degrees of TOF fade. Moreover, the degree of fade may also be influenced by method of measurement (2). Sugammadex is a reversal agent with a novel mechanism of action: it encapsulates steroidal NM blocking agents, thereby preventing them from acting at the nicotinic receptor. Surprisingly, its reversal properties had only been investigated using acceleromyography (AMG), and no information about its recovery when using the reference method, i.e. mechanomyography (MMG) are available (3). Therefore the present study assessed sugammadex induced recovery from rocuronium NMblock with MMG and compared it with simultaneously assessed AMG TOF-R.

Materials and Methods: After approval and consent 20 ASA I - III patients were included. Anaesthesia was induced and maintained with sufentanil and propofol. NM block was assessed simultaneously with AMG and MMG. NM block was induced with rocuronium 0.6 mg/kg and bolus doses of 0.15 mg/kg as needed. At the end of surgery sugammadex 2 mg/kg were given at 2/4 TOF responses and the following parameters registered: MMG twitch high (T1), MMG TOF-R at an AMG TOF-R of 0.9 and time from injection of sugammadex until recovery to a MMG TOF-R of 0.9. Data were compared using the Mann-Whitney test and were expressed as mean ± 95%CI or range; a P value < 0.05 was considered statistically significant.

Results and Discussion: Data from all 20 patients could be analyzed. At AMG TOF-R 0.9 the corresponding MMG TOF-R was 0.64 (range: 0 - 1.0), $p < 0.01$ and the MMG twitch high (T1) was 56% (range: 0 - 96%). However, complete MMG recovery occurred within 161 s (95% CI: 122s - 200s).MMG recovery of sugammadex-induced reversal of rocuronium block is incomplete at an AMG TOF-R of 0.9. However, recovery assessed by MMG was complete in 160 s after sugammadex 2 mg/Kg (95%CI: 133s - 186s).

Conclusion(s): AMG and MMG recovery parameters after sugammadex reversal are not interchangeable. This study confirmed rapid reversal of rocuronium-block with sugammadex.

3AP5-7

Real-time monitoring of end-tidal propofol in exhaled air: PTR-MS implementation and improvement of the set-up

Rodiera J., Miquelay J., Matute P., Caccia M., Torres R., Aliaga L.
Centro Medico Teknon, Department of Anaesthesiology, Barcelona, Spain

Background and Goal of Study: In recent years several works studding propofol particles in exhaled air by PTR-MS were published. This technology is complex and requires extensive studies to obtain more reliable conclusions. We have designed the integration of a PTR-MS using software that allows data acquisition in real-time form the Vital signs monitor, BIS, infusion pumps and PTR-MS. This setup is designed to study particles in exhaled air, as protonated Propofol 179, 137 and 95 AMU

Materials and Methods: We developed a software in LabView, which enables connection via an RS232 an Orchestra TCI pump and the BIS as well as through the LAN a Philips MP50 monitor and PTR-MS with a PC that continuously collects data from all these devices and stored in a database for further study. The software stored in real time: BIS, SQI, BP, HR, SatO2, CO2, O2, Plasma and Effect propofol concentration (Shnider TCI), infused Propofol, Pump Rate, Exhaled Propofol 179, 135, 96 (PPB) and H_3O^+(%). The best sampling point out of the endotracheal tube or inspiratory branch after the filter and humidifier versus a intratracheal sampling cannula also was studied. H_3O^+ monitoring controlled the respiratory phases. We have investigated at 20º, 30º, 40ºC "in vitro" the propofol dissociation during the ionization process.

Results and Discussion: The improvement of the sampling point, allowed to monitoring more effectively particles in exhaled air. Propofol has a sticky property which makes it engages on tubes and delay or hinders their reaching the detector. This effect is minimized by the sampling point inside of the trachea. The dissociation of propofol during the protonation with the PTR-MS at 20ºC 30ºC and 40ºC has been observed with a linear and constant ratio, propofol 179 (67%), 135 (19%), 95 (12%) as the total propofol entering the ionization chamber will be the sum of the concentration of 179 *0.67 + 135 concentration * 0.19 + 95 concentration * 0.12.

Conclusions: The set-up and software developed, allows the execution of large series of patients in the studies with much more accuracy and precision.

References:

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3AP6-1

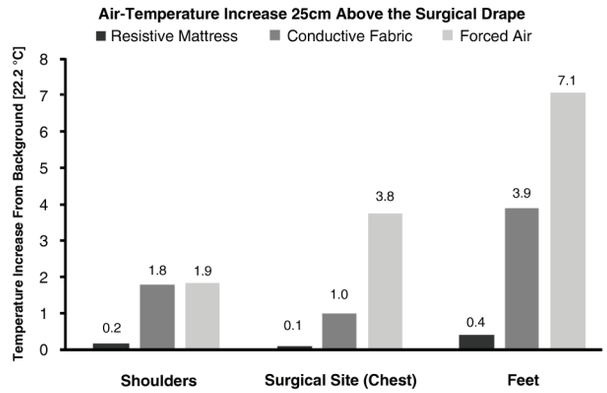
Patient warming and laminar-flow ventilation: Effect of surgical drape radiation on ventilation performance

Dasari K.B., Harper C.M., Albrecht M.
BSUH NHS Trust, Department of Anaesthesiology and Intensive Care, Brighton, United Kingdom

Background and Goal of Study: Forced air warming is effective for preventing surgical hypothermia, but its use releases hot exhaust that can disrupt operating theatre airflows. We hypothesize that such concerns might be eliminated if the drapes are arranged to vent the exhaust out of the environment. Thus, we examined air temperatures in a laminar flow theatre using forced air and two air free patient warming systems as controls.

Materials and Methods: Ventilation field temperature was measured with 24 thermistors placed floor to ceiling around a draped mannequin. The drape was raised at the foot end to vent the exhaust. Temperatures were recorded with the devices off and on under simulated surgical conditions, with forced air blanket (Bair Hugger-Arizant), conductive blanket (HotDog-Augustine) and resistive mattress (Inditherm). Temperature differences between warming devices, experimental conditions and their significance were determined via ANOVA.

Results and Discussion: Air temperature differences were significant between devices when averaged across locations 25cm above the drape ($p < 0.01$). Air temperature differences were insignificant between devices when averaged across measures at floor ($p=0.33$), knee ($p=0.80$) and head height levels ($p=0.57$).



[Air temperature increases 25cm above the drape]

Conclusion(s): Significant increases in air temperature were observed near the surgical site for both blankets whilst the mattress had no noticeable effect. Elevated air temperatures were due to blankets contacting and heating the backside of drape, which then radiated this heat into the laminar flow field. Of the blankets, forced air generated the greatest increase in air temperature over the surgical site, which was 4-fold greater than conductive fabric. Thus, carefully venting the exhaust did not prevent forced air from elevating laminar flow field air-temperatures, which can result in localized convection currents that disrupt protective clean airflow patterns over the surgical site.

3AP6-2

Effect of surgical injury on vascular function - a prospective study using a novel non-invasive technique

Schier R., Singh Heir J., El-Zein R., Teschendorf P., Riedel B., Gottumukkala V.
University Hospital of Cologne, Department of Anaesthesiology and Intensive Care, Cologne, Germany

Background and Goal of Study: Endothelial function lies central to microvascular homeostasis and is known to be impaired by systemic inflammation[1-2]. Non-invasive surveillance of endothelium-dependent vascular function, as measured by Digital Thermal Monitoring (DTM), may assist with perioperative risk assessment and guide targeted interventional strategies.
Materials and Methods: We conducted an observational study to evaluate the utility of perioperative endothelial function monitoring and the effect of surgical injury on perioperative vascular function.
Fifty three patients scheduled for major thoracic surgery were tested at baseline (Day 0 / preoperatively) and at postoperative days 1, 2, 3, and 5. Fingertip thermocoupling probes measured temperature during 2 minutes of upper arm cuff occlusion and subsequent reactive hyperaemia that followed cuff deflation. DTM variables included Temperature Rebound (TR = Tmax [observed during reactive hyperaemia] - T_S [starting temperature prior to cuff inflation]), adjusted TR (aTR = TR/T_S), and AUC_{TR} (area under the curve between T_{max} and T_{min} [lowest value during cuff inflation])'.
Results and Discussion: DTM (N = 196) tests were performed in 53 patients (mean age 60.3±10.5 years) scheduled for major thoracic surgery. All temperature rebound measures (TR, aTR and AUC_{TR}) decreased at 24 hours and peaked at 72 hours after surgery.
Multivariate analysis showed significant ($p < 0.05$) decrease in DTM variables postoperatively in patients with preoperative cardiac risk factors (Hypertension and Lee Cardiac Risk Index ≥2).
Conclusion(s): We demonstrated that preoperative cardiovascular risk factors are associated with impaired endothelium-dependent vascular reactivity, as measured by Digital Thermal Monitoring (DTM). This novel non-invasive technique may further improve risk stratification, thereby allowing timely preoperative optimization of high risk patients.
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3AP6-3

Changes in motor-evoked potentials do not reflect spinal cord ischemia in thoracicoabdominal aortic aneurysm surgery with deep hypothermic circulatory arrest

Kimijima T., Sugino S., Miyashita R., Masuda Y., Imaizumi H., Yamakage M.
Sapporo Medical University School of Medicine, Department of Anaesthesiology, Sapporo, Japan

Background and Goal of Study: The technique of deep hypothermic circulatory arrest (DHCA) is often used in thoracicoabdominal aortic aneurysm (TAAA) surgery without aortic cross-clamping to prevent neurological complications. Although recordings of motor-evoked potentials（MEPs）are often used for detecting spinal cord ischemia, DHCA decreases the amplitude of MEPs during hypothermia.
This decrease frequently continues to be recorded following rewarming; however, the mechanism has not been elucidated. The aim of this study was to determine the accuracy for predicting paraplegia in patients after TAAA surgery with DHCA.
Materials and Methods: We retrospectively studied 37 patients in which TAAA surgery was required during the period from Feb. 2007 to Nov. 2010. A total of 25 patients participated in the study and were assigned to a DHCA group (n = 7) and a control group (with no hypothermia; n = 18). Anaesthesia was induced by midazolam or propofol and maintained by propofol, ketamine, fentanyl, and remifentanil within levels of the bispectral index between 40 and 60 and of hemodynamics ±20% of preoperative values. MEPs were recorded at the adductor pollicis and hallucis muscles using transcranial electrical stimulation.
Changes in MEPs were defined as decrease in amplitude of less than 25% of controls in the hallucis muscle. In the DHCA group, deep hypothermia (approx. 20°C) was induced during proximal anastomosis of the aorta. After anastomosis of intercostal arteries, MEPs were recorded for evaluation of prolonged spinal cord ischemia. Paraplegia following ischemia was diagnosed on the day after the operation. Sensitivity and specificity were calculated for evaluating the accuracy of MEP monitoring.
Results and Discussion: In the control group, MEPs changed in six patients (6/18; 33%) and paraplegia occurred in four patients (4/18; 22%). In the DHCA group, MEPs changed in three patients (3/7; 42%) and paraplegia did not occur in any patient. Sensitivity and specificity in the control group were 50% and 71%, respectively, and those in the DHCA group were 0% and 57%, respectively. These data suggested that MEP monitoring is unreliable in TAAA surgery with DHCA.
Conclusions: The accuracy of MEPs in the DHCA group was lower than that in the control group. The present study indicates that changes in MEPs might not reflect spinal cord ischemia in TAAA surgery with DHCA.

3AP6-4

The effect of electrically heated humidifier on the body temperature in spinal surgery under general anesthesia

Lee J.H.
National Health Insurance Corporation Ilsan Hospital, Department of Anaesthesiology and Pain Medicine, Koyang-Shi, Korea, Republic of

Background and Goal of Study: General anesthesia often produces some degree of hypothermia and hypothermia causes much more blood loss, wound infection, shivering, and perioperative cardiac events than normothermia. Electrically heated humidifiers (EHHs) add moisture and heat to inspiratory gases from temperature-regulated water reservoirs. EHH can maintain body temperature by reducing evaporation of water from the surface of mucous membrane and providing some convective energy with intubated patients theoretically. But, few studies have been carried out about the effects of EHH on the body temperature of the patients receiving general anesthesia.
Materials and Methods: Patients, who were scheduled to receive posterior lumbar spinal fusion within two spinal levels, were assigned either to receive a respiratory circuit with an EHH (set at 37°C; MR 290 autofeed chamber, Fisher & Paykel Healthcare,) or a conventional respiratory circuit.
After all patients had been placed in the prone position, upper extremities, thoracic area, and head were covered with two-layers blankets, and forced air-warmer set 40-42 °C was applied between the layers of blanket. Tympanic membrane temperatures were measured at immediate after induction and every 30 minute for up to 180 minute.
The primary endpoint was the effect of EHH on the body temperature and, the second was the comparison of the body temperature between the EHH group and the control group. A repeated measures ANOVA with post hoc Bonferoni correction was used to compare group body temperatures at specific times.
Results and Discussion: In the control group, all measured body temperature during surgery were significantly lower than at immediately after induction. In EHH group, mean temperature was significantly lower than immediately after induction except 30 minute after induction. When body temperature were measured with repeated measures ANOVA in respect to time, a significant difference was observed between the two groups ($p < 0.000$). In particular, the EHH group had a significantly higher mean tympanic membrane temperature than the control group during surgery.
Conclusion(s): This current study provides the result that electrically heated humidifier (EHH) cannot maintain body temperature in general anesthesia from 30 minute after induction. However, comparing with patients used with conventional respiratory circuit, the patients used EHH showed higher body temperature during surgery.

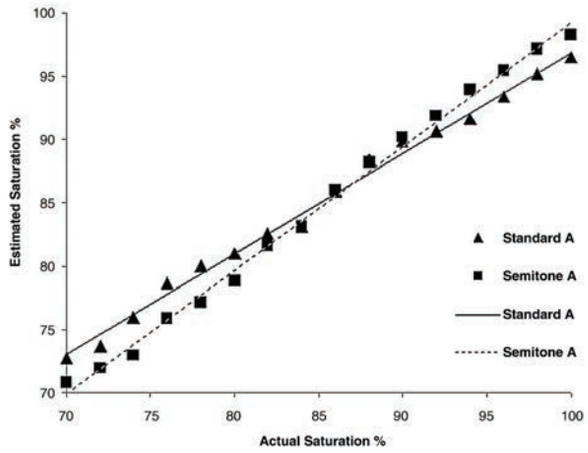
3AP6-5

Comparison of musical and linear tone scales for pulse oximeter sonification

Brown Z., Edworthy J., Sneyd R.
Anaesthesia Research Group, Peninsula Medical School and University of Plymouth, Department of Anaesthesiology, Plymouth, United Kingdom

Background and Goal of Study: The intensive care unit and the operating room are complex environments with distracting sounds and tones. Many oximeter tones rise as a linear scale across a small range making it difficult to discriminate changes in saturation. We hypothesized that use of a semitone (musical) scale for pulse oximetry sonification would improve user interpretation of the tones representing saturation levels.
Materials and Methods: 40 anaesthetists listened to synthesised oximeter tones on linear or semitone scales in random order. After familiarisation they compared the 86% tone to other tones and estimated their saturation. In a 2nd experiment they compared pairs of saturation tones and estimated the direction and magnitude of the change in saturation.

Results and Discussion:



[Figure one]

Figure one. Actual vs estimated saturation for each scale, with regression lines.

2-way within-subjects ANOVA showed significant difference between the scales ($F = 23.95$, $df = 1$, $p < 0.001$), mean error= 2.4% (standard) & 1.6% (semitone). Differences were greatest at the ends of the scales, semitone scale outperformed the standard linear tone scale ($F = 16.82$, $df = 15$, $p < 0.001$). There was an interaction between tone and percentage ($F = 3.98$, $df = 1, 15$, $p < 0.001$).

When estimating changes in saturation, estimates were more accurate for the semitone scale ($F = 61.27$, $df = 1$, $p < 0.001$). Performance was worst at the ends of the scale and best for the middle values ($F = 16.27$, $df = 7$, $p < 0.001$). Estimations of oxygen saturation and its changes are more accurate when a semitone (musical) tone scale is used for sonification.

Conclusion(s): Using a semitone sonification scale, with pitch intervals that agree with human pitch perception, may enhance users' estimation of oxygen saturation from pulse oximeter tones.

3AP6-6

Difference between pleth variability index obtained from the finger and the forehead

Matsunaga A., Kakihana Y., Kuniyoshi T., Kumemura M., Uchida Y., Kanmura Y.
Kagoshima University, Department of Anaesthesiology, Kagoshima, Japan

Background and Goal of Study: The pleth variability index (PVI), which is calculated from respiratory variations in perfusion index (PI), has been reported to predict fluid responsiveness. However, PI, especially at the fingers, is more sensitive to vasomotor tone. Therefore, surgical stimuli might be easy to reduce the accuracy of PVI at the fingers. The aim of this study was to confirm whether the effect of surgical stimuli on PVI depends on the site of measurements.

Materials and Methods: The study was conducted on 9 patients (ASA I~II, age 28 to 77 yr) with sinus rhythm and normal left ventricular function after induction of general anesthesia. All patients were anesthetized with sevoflurane and remifentanil and mechanically ventilated with a tidal volume of 8~10 ml/kg at frequency of 12 cycles per minute. PI and PVI, which were calculated by a Radical 7 pulse oximeter, were recorded at the finger and at the forehead simultaneously before and after the skin incision. Data are expressed as median values and the interquartile range (25%-75%). Changes in variables induced by the skin incision were tested with Wilcoxon signed-rank test. A *p* value of < 0.05 was considered statistically significant.

Results and Discussion: After the skin incision, the finger PI decreased significantly and the finger PVI increased significantly, whereas the forehead PI and PVI remained stable (Table 1).

	Before the skin incision	After the skin incision	
Finger-PI	5.2 (3.8-6.0)	3.4 (1.5-4.1)	p<0.05
Finger-PVI	9.0 (7.0-10.0)	14.0 (8.0-15.0)	p<0.05
Forehead-PI	1.7 (1.4-2.7)	2.0 (1.5-2.6)	NS
Forehead-PVI	9.0 (5.0-10.0)	8.0 (6.0-11.0)	NS

[Table 1. Changes in PI and PVI]

Conclusion(s): This study showed that the PI and PVI recorded at the fingers were more sensitive to vasomotor tone than those recorded at the forehead. These results suggest that the PVI obtained fron the forehead may be more reliable predictor of fluid responsiveness under the conditions in which vasomotor tone varies widely.

3AP6-7

Correlation, accuracy, precision and practicability of perioperative sublingual temperature measurement in awake and in anaesthetised patients

Höcker J., Bein B., Böhm R., Steinfath M., Horn E.P.
University Medical Center Schleswig-Holstein, Department of Anaesthesiology and Intensive Care, Kiel, Germany

Background and Goal of Study: Inadvertent perioperative hypothermia (core temperature < 36.0 °C) causes serious complications (1,2) so detection and therapy of hypothermia were increasingly recognized in the perioperative period. However, the most appropriate method of temperature assessment is still under debate, especially in patients scheduled for minor surgery. An invasive measurement in the pulmonary artery is considered as the gold standard, followed by less but still invasive measurement at the tympanic membrane using thermocouples (probes with direct contact to the tympanic membrane) (3). Alternatively, the sublingual temperature, measured in the posterior sublingual pocket, is an applicable and minimally invasive approach for "near-core" temperature assessment in awake and cooperative patients (4). The aim of our study was to evaluate the performance of perioperative sublingual versus tympanic temperature measurement by thermocouples in awake and in anaesthetised patients.

Materials and Methods: We enrolled 171 patients, aged 18-75 years, scheduled for surgery with duration < 1h during general anaesthesia. Sublingual and tympanic temperatures were measured simultaneously preoperatively, intraoperatively and postoperatively. Spearman rank correlation and Bland-Altman analysis for assessment of correlation, accuracy and precision of both methods were determined analysing 3 x 171 independent paired values at three different measurement times.

Results and Discussion: Sublingual temperatures were significantly higher than tympanic temperatures in a range of 0.1-0.2°C. Coefficient of determination (r^2) of both methods was between 0.50 and 0.59 and Bland-Altman analysis revealed a bias (SD) between -0.09 °C (0.21 °C) and -0.15 °C (0.24 °C).

Conclusion: Sublingual temperature measurement provided accuracy and precision completely adequate for clinical use and a high correlation with tympanic temperature monitoring. Therefore, sublingual temperature measurement has been demonstrated as a good and applicable alternative for perioperative temperature monitoring both in awake and anaesthetised patients.

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3AP6-8

Sonographic measurement of ONSD(optic nerve sheath diameter) in robotic prostatectomies - a non invasive measure of intracranial pressure

Immanni S., Aglan A., Grigoras A., Ni Mhuircheartaigh R., Frizelle H.
Mater Private Hospital, Department of Anaesthesiology and Intensive Care, Dublin, Ireland

Background: The steep Trendelenburg position (40-60 degrees) optimizes surgical exposure during robotic prostatectomy. Surgical access requires up to four hours of steep (45 degrees) trendelenberg with pneumoperitoneum, two factors known to increase intracranial pressure (ICP)[1]. Optic nerve sheath diameter (ONSD) has been described as a useful surrogate measure to track changes in ICP [2,3].The goal of our study is to assess the impact of steep trendelenberg position with CO2 pneumoperitoneum upon ICP over 4 hours. We present pilot data on the first 21 patients.

Methods: 21 ASA I -II patients who were undergoing elective Robotic Prostatectomy were prospectively recruited in a six month period in a tertiary level hospital.Three independent trained investigators have measured the Optic nerve sheath diameter sonographically(SonoSite® M-Turbo™). OSND was measured in two planes , saggital and transverse, immediately after induction and again at one and four hours after surgical positioning. Both of these measurements were then used to estimate the cross sectional elliptical area of the optic nerve. The %change in cross sectional (%CSA)area during the procedure 1 hour and 4 hours after steep trendelenburg position is caluculated.

Results and Discussion: The %CSA during the procedure 1 hour and 4 hours after steep trendelenburg position is normally distributed about zero.
Conclusion(s): This is a pilot study in which the feasibility and reproducibility of ultrasound assessment of optic nerve %CSA change was assessed.This may prove to be a sensitive tool in the detection of raised ICP in these circumstances. Since our data showed no significant change in optic nerve CSA over a four hour period, further work may provide reassurance to anaesthetists that steep trendelenberg position with pneumoperitoneum has no adverse effects on this surrogate measure of ICP.
References:
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3AP6-9

New ultrasound software delineates the needle brightly even at the angle of 60 degrees

Takatani J., Takeshima N., Okuda K., Oyama Y., Uchino T., Noguchi T.
Oita University Faculty of Medicine, Department of Anaesthesiology and Intensive Care, Oita, Japan

Background and Goal of Study: Ultrasound delineates the needle and confirms its precise position, and this reduces the chance of malpuncture. Though the needles with insertion angle of over 45 degrees are difficult to be visualized, a new program Enhanced Needle Visualization for SonoSite's ultrasound shows bright image of the needle with steep insertion angle. We examined the indication and advantages of this program in vitro.
Materials and Methods: A 17-gauge regional anesthesia needle was placed in pork using in-plane technique with a needle guide CIVCO Infinity, with the needle tip 1, 2, 3 and 4 cm below the phantom surface, at the insertion angles of 0, 30, 45 and 60 degrees relative to the phantom surface, using SonoSite S-Nerve with a linear 6-13 MHz transducer. The probe was fixed and ultrasound image of needle shaft and tip was recorded in 4 modes (Enhanced Needle Visualization: Off, Shallow, Medial, and Steep). The images were evaluated in gray scale values between 0 (black) and 255 (white), and the objective visibility [pixel intensity units] was estimated as the difference in mean pixel intensity between the needle and the background. Objective visibility < 20 pixel intensity units was considered as not visible, and < 40 pixel intensity units was defined as poor. Objective visibility > 80 pixel intensity units was considered as good, and objective visibility > 120 pixel intensity units was considered as excellent. The values were compared using ANOVA test and Fisher's post hoc assessment. Data were described as means ± standard deviation, 95% confidence intervals.
Results and Discussion: No significant difference in objective visibility among the 4 modes at 0 degrees. Compared with off-mode, at 1 and 2 cm depth in shallow mode showed significantly higher visibility as excellent at 30 degrees, and at 1 cm depth steep mode showed significantly higher visibility as excellent at 45 degrees. At 60 degrees, only at 1 cm depth in steep mode showed significantly higher visibility as excellent (Medial 20±15 pixel intensity units vs steep 139±59 pixel intensity units, P=0.0007. Data not available in off and shallow mode).
Conclusion(s): Enhanced Needle Visualization delineates the needle brightly when optimal mode is selected, even at 60 degrees which was considered very challenging previously. This technology can allow us safer ultrasound procedure in various approach.

Clinical and Experimental Circulation

4AP1-1

Stroke volume-directed administration of hydroxyethyl starch in prone position during neurosurgery

Lindroos A.-C., Niiya T., Randell T., Niemi T.
Helsinki University Central Hospital, Department of Anaesthesiology and Intensive Care, Helsinki, Finland

Background and Goal of Study: General anaesthesia in the prone position is often associated with hypotension[1], which may compromise cerebral perfusion pressure. The aim of the study was to determine the volumes of hydroxyethyl starch (HES) and a crystalloid that are required to achieve comparable hemodynamics in neurosurgical patients operated on in a prone position. Furthermore, whole blood coagulation capacity was studied using thromboelastometry.
Materials and Methods: Thirty elective neurosurgical patients were randomized to receive either HES (Mw 130 kDa/ DS 0.4) in saline (HES group) or Ringer's acetate (RAC group) in a goal directed fashion. Exclusion criteria were congestive heart failure, other than sinus rhythm, renal insufficiency, hepatic insufficiency, anemia and thrombocytopenia.
After induction of standardized general anaesthesia stroke volume (SV), measured by arterial pressure waveform analysis, was maximized before placement in the prone position. The first dose of 200ml was followed by boluses of 100ml until SV did not increase over 10%. SV was maintained during surgery by repeated administration of either study fluid. RAC 3 ml/kg/h was infused in both groups during surgery.
Results and Discussion: The mean age of the patients was 54 (range 23-80) years. Mean arterial pressure, heart rate, SV and cardiac index were comparable between the groups before and 5 minutes after placement in the prone position. The mean (SD) cumulative doses of HES or RAC were 240 (51) or 267 (62)ml (p=0.207) before the prone position, 340 (124) or 453 (160)ml at 30 min after the prone position (p=0.039), and 440 (230) or 653 (368) ml at the end of the surgery (p= 0.067). At the end of the surgery mean (SD) total basal amount of RAC was 813 (253) or 814 (419) ml (p=0.997) in the HES and RAC group, respectively.
The weight gain or the total amount of vasoactive drugs used was not different between the groups. Fibrin clot firmness was decreased in the HES-group at the end of surgery but platelet/fibrinogen-fibrin interaction remained unchanged.
Conclusion(s): The total amount of RAC needed to achieve a similar hemodynamic prophile as HES in the prone position was 50% higher, which is lower than previously reported. HES-induced disturbance in fibrin clot strength and the possible effects of the higher amount of RAC on postoperative complications needs further investigations.
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4AP1-2

Fluid resuscitation with hyper-hydroxyethyl starch versus lactated ringer's results in similar plasma viscosity in pigs with hemorrhagic shock

Guerci P., Tran N., Bouazza Y., Menu P., Meistelman C., Longrois D.
Hopital Nancy Brabois, Department of Anaesthesiology and Intensive Care, Vandoeuvre-Les-Nancy, France

Background and Goal of Study: Volume expansion is the primary therapeutic goal in hemorrhagic shock. The choice of volume expander (VE) is debated[1,2] over the past 30 years. Among the effects of VEs, the changes in plasma viscosity (PV) are barely investigated. PV modulates functional capillary density, microcirculation and organ function.
We investigated the influence of two VEs, with viscosities at the extremes of spectrum, on the macro-, microcirculatory and rheologic variables (PV) during hemorrhagic shock (HS).
Materials and Methods: 10 healthy white pigs were anesthetized and mechanically ventilated. A pulmonary artery catheter was inserted through the right heart and the intern right carotid was catheterized. Sublingual microcirculatory flow was assessed by laser Doppler flowmetry and tissue oxygen tension determined by fluorescence quenching probe. Hemorrhagic shock was performed by the withdrawal of 40% of the calculated blood volume. Systemic hemodynamic variables and microcirculatory parameters were recorded at baseline, 30 minutes after induced shock (S-30), immediately after goal directed (SvO_2 and SVI) resuscitation (R-0) and 60 minutes after resuscitation. Biologic and rheologic measurements were performed at the same time points. Lactated Ringer's (LR, n=5) and HyperHES® (4ml/Kg max.) + Voluven® (n=5) were administered for fluid resuscitation.
Results and Discussion: For similar SvO_2, SVI and macrocirculatory values at R-0 and R-60, 61±5.9 mL/kg of LR and 9.8±5.0 ml/kg of colloids were

necessary. PV decreased significantly in both groups following resuscitation but there were no differences in PV (from 1.32 to 1.20 in LR and from 1.36 to 1.21 in colloid groups respectively), rheologic variables, microcirculatory flow or tissue oxygen tension (R-0, R-60) between groups.

Conclusion(s): In this porcine HS model, resuscitation with LR or HES 200/0.5+NaCl 7.2% and HES 130/0.42, despite 6 fold differences in cumulative volumes, resulted in identical PV values. This lack of difference in PV could explain the similar effects on outcome observed in clinical studies.

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4AP1-3

Fluid resuscitation based on dynamic predictors of fluid responsiveness: Closed loop algorithm vs. anesthesiologists

Rinehart J., Alexander B., Meng L., Cannesson M.
UC Irvine, Department of Anaesthesiology, Orange, United States

Background: Closed-loop management of fluid resuscitation has historically been difficult. Given the dynamic predictors of fluid responsiveness automated management is now feasible. We present simulation data for a novel closed-loop fluid-management algorithm using pulse pressure variation (PPV) as the input variable.

Methods: Using a simulator which includes physiologic PPV output, twenty practicing anesthesiology residents and faculty were asked to manage fluids and pressors for a one-hour simulated hemorrhage case of 2L blood loss over 20 minutes (group 1). One week later, they repeated the simulation, but this time fluids were secretly managed by the closed-loop system while practitioner fluid administrations were ignored and only the pressors were entered (group 2). The simulation was also run twenty times with only the closed-loop (group 3) and twenty times with no management (group 4).

Results: Conditions across all groups were similar at baseline for simulated patient weight, height, heart rate (HR), mean arterial pressure (MAP), and cardiac output (CO).

Once the hemorrhage began, the closed loop groups (2&3) intervened significantly earlier than the practitioners (group 1) and gave more fluid (Table 1). The mean and final CO was higher in both closed-loop groups than in the practitioners group, and the coefficient of variance was lower (Table 1). There was no difference in MAP between intervention groups, but all other hemodynamic data were significantly higher than the unmanaged group.

Conclusion: Our data demonstrate that closed-loop management of fluid resuscitation is feasible using our novel dynamic-parameter based algorithm and that this approach can be used to optimize cardiac output.

In the present study, our closed loop fluid management system induced an earlier administration of fluid, a higher mean cardiac output during the case, as well as a better stability in cardiac output compared to anesthesiologists. This system has potential clinical applications.

Group	(1) Anesthesiologist Managed	(2) Anesthesiologist Managed Pressors, Closed-loop Fluids	(3) Closed-loop Managed	(4) No Management
First Bolus (minutes)	21.5 ±5.6	15.6 ±1.1**	16.0 ±1.3**	-
Total Fluid Given (ml)	1968 ±644*	2875 ±275**	2675 ±244**	-
Mean Mean Arterial Pressure (mmHg)	76 ±4.2	79 ±2.0	79 ±1.1	61 ±6.9
Mean Cardiac Output During Case (L/min)	5.2 ±0.6*	5.8 ±0.2**	5.9 ±0.2**	3.8 ±0.4
Final Cardiac Output (L/min)	4.8 ±1.5*	5.6 ±0.5**	5.7 ±0.4**	1.7 ±0.9
Cardiac Output During Case, Coefficient of Variation (%)	36.7 ±23*	16.6 ±9**	16.3 ±8**	89 ±29

[Fluid Management: Anesthesiologist vs. Closed-Loop]

Data are reported as mean +/- standard deviation. * p< 0.05 vs. groups 2,3,4. ** p< 0.05 vs. groups 1 & 4

4AP1-4

The role of hypertonic solution in intraabdominal blood flow microcirculation disturbances during NOTES cholecystectomy: An experimental study

Vendrell M., Magaldi Mendaña M., Claramunt Miró A., Delitala A., Ibarzábal Olano A., de Lacy Fortuny A.M.
Hospital Clínic Barcelona, Department of Anaesthesiology and Pain Medicine, Barcelona, Spain

Background and Goal of Study: A higher than normal pressure in an anatomically closed space jeopardizes tissue viability. Surgical techniques such as natural orifice translumenal endoscopic surgery (NOTES), with transgrastric peritoneoscopy, have shown marked increments and wide variations in intra-abdominal pressure (IAP), implying the possibility of regional flow decrease and disturbances on blood flow microcirculation (BFM).

Hypertonic saline 7.5% (HS) has demonstrated its properties in mantaining blood flow by improving rheology. Pre-treatment with HS may increase the flow supply and help protect BFM. The aim of this study was to evaluate the impact of pretreatment with HS on microcirculatory disturbances during NOTES surgery.

Materials and Methods: Fourteen Yorkshire female pigs, weighing 20-25kg, underwent cholecystectomy via NOTES. The pigs were randomized in two groups in order to receive pre-treatment with HS (HG=7), or receiving saline serum 0,9% (SG=7). Procedures lasted 1 hour. Colon and small bowel BFM, expressed in $ml \cdot g^{-1} \cdot min^{-1}$, were measured by spectophotometry analyisis using coloured microspheres; before pneumoperithoneum (T0), at end of surgery (T1) and 30 minutes after abdomen deflation (T2). Systemic hemodynamic variables (using PICCO® system) were also recorded. Results were analyzed using the Mann-Whitney test.

Results and Discussion: After HS administration, cardiac index and all the intravenous volume indexes increased significantly, with a decrease in stroke volume variation. At time of measurement, no differences in systemic hemodynamic variables were found between groups. No differences in colon and small bowel BFM were found between groups.(Table 1)

	SG (n=7)	HG (n=7)	p-value
Colon T0	0.38±0.3	0.41±0.4	1.00
Colon T1	0.49±0.2	0.47±0.3	0.80
Colon T3	0.71±0.6	0.21±0.1	0.13
Small bowel T0	0.47±0.5	0.70±0.7	0.21
Small bowel T1	0.59±0.4	0.73±0.2	0.07
Small bowel T2	0.93±0.6	0.37±0.2	0.07

[Table 1: BFM in Colon and Small bowel]

Conclusion: These results suggest that hypertonic serum pre-treatment does not have any effect on BFM. This could be because a one-hour procedure is not long enough to reflect the hypothetical blood flow disturbances.

4AP1-5

6% Hydroxyethyl Starch Solution vs. 4% gelatin preload before tourniquet release

Bouali Y., Rais K., Askri A., Kais B., Kaabachi O.
Kassab Orthopedic Institute, Department of Anaesthesiology and Intensive Care, Tunis, Tunisia

Background and Goal of Study: Preoperative fluid therapy is the subject of much controversy. Numerous studies and systematic reviews have compared different types of fluids for resuscitation; the results so far have been inconclusive. Tourniquet use in orthopaedic surgery could lead to preoperative blood pressure modification. Fluid preloading regimens together with vasopressors have been used to reduce its incidence.We suggested that 6% Hydroxyethyl Starch Solution preload could reduce incidence of hypotension after tourniquet release in total knee arthroplasty (TKA) compared to 4% Gelatin.

Materials and Methods: After institutional ethical committee approval and informed consent were obtained, forty patients undergoing TKA under spinal anesthesia (SA) were included in a prospective, controlled, randomized, double blinded study. Standard fluid therapy included 5 ml/kg of Ringer's Lactate solution before SA and 4 ml/kg during surgery. Patients received also IV tranexamic acid.Thirty minutes before tourniquet deflation, patients were allocated to one of two groups: groupV received 10 ml/kg Voluven and group G received 10 ml/kg Plasmion given over 15 min. Blood pressure (BP) measurements were made after fluid loading every 5 min for 30 min and every 1 H

for 12 hours. Incidence of hypotension (defined as a 30% reduction in Systolic BP from SBP thirty min after SA) was recorded and treated with 250 ml Ringer's lactate solution and bolus of ephedrine. We also assessed postoperative blood loss at H1, H3, H6 and H12. Continuous data were compared using Mann Whitney test and parametric data were analysed using Fisher exact test.
Results and Discussion: Patient characteristics, heart rate, SBP were similar among groups. There were no significant differences in mean SBP values between the two groups immediately after tourniquet release. Mean SBP were significantly lower in group G only at H6, H7, H8 and H9. The incidence of hypotension was significantly higher in group G (82% vs 47% ; p=0.03). But the difference between the two groups for blood loss and allogeneic blood transfusion was not statistically significant
Conclusion(s): The primarily results of our study suggest that preloading with Voluven® (Hydroxyethyl Starch 130/0.4) before tourniquet release in patient undergoing TKA was associated with better hemodynamic stability than Plasmion® (4% Gelatin). The study is going one to confirm such results.

4AP1-6

Cerebral repercussions of general anesthesia and severe hypotension: A study in pigs measuring EEG parameters and cerebral oxygenation during acute bleeding and fluid resuscitation

Silva A., Amorim P, Oliveira A., Venâncio C., Souza A., Ferreira D.
Universidade de Trás-os-Montes e Alto Douro, Departamento de Ciências Veterinárias, Vila Real, Portugal

Background and Goal of Study: BIS and other EEG derived parameters may be indicators of cerebral hypoperfusion caused by systemic hypotension[1]. Our goal was to investigate EEG-derived indexes and cerebral oxygenation during acute hemorrhage and fluid resuscitation.
Materials and Methods: Twelve male pigs, 27±3 kg, were anaesthetized with constant rates of propofol (15 mg/kg/h) and remifentanil (0.3 μg/kg/min) and submitted to acute hemorrhage and 4 resuscitation protocols: Ringer Lactate starting right after bleeding or 20 minutes later; Hydroxyethyl Starch right after bleeding or 20 minutes later. Mean arterial pressure (MAP) and global cerebral oxygenation (SVJO2/Opticath) were measured continuously. BIS-XP was used to monitor bispectral index (BIS), suppression ratio (SR) and total power (TP) and to collect EEG to calculate permutation entropy, approximate entropy and spectral edge frequency. Statistics used two-way repeated measurements ANOVA to compare between groups and Spearman rank correlation analysis to examine EEG-derived parameters and MAP.
Results and Discussion: Bleeding caused a 55±12% decrease in MAP; TP decreased and SR increased significantly (p< 0.001). During hypotension, significant (p< 0.001) correlations were found between MAP and SR (r=-0.47) and MAP and TP (r=0.43). During resuscitation, MAP and BIS increased significantly (p< 0.05), while SR decreased (p< 0.05); however, during this phase, correlations between MAP and EEG parameters were not found. SVJO2 dropped below 60 in only 2 animals. At any phase of the study were there differences between the 4 groups.
Conclusions: For a constant infusion of propofol and remifentanil likely to cause steady state anesthesia, several EEG derived parameters changed significantly suggesting that hypotension produced by bleeding caused a decrease in EEG activity. Cerebral oxygen desaturation occurred only in two cases and briefly, suggesting that cerebral hypoperfusion was not the cause of EEG changes. It is possible that the likely decrease in cardiac output could have resulted in a relative increase in plasma concentrations of anesthetics and depressed cerebral metabolism. Resuscitation with crystalloid or colloid did not seem to make a difference.
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4AP1-7

Volume replacement with hydroxyethyl starch (HES) 130/0.4 and ringer lactate solution in pigs after severe haemorrhage: A small bowel mucosa preliminary study

Oliveira A., Venâncio C., Silva A., Souza A., Vala H., Ferreira D.
Instituto Politécnico de Viseu, Escola Superior Agrária de Viseu, Viseu, Portugal

Background and Goal of Study: Perioperative and intraoperative hypovolemia may cause intestinal hypoperfusion and postoperative complications[1]. The objective of this study is to analyse the effect on the small bowel mucosa of HES 130/0.4 and Ringer solutions used for volume replacement after severe haemorrhage in pigs.
Materials and Methods: Six Large White pigs under TIVA with propofol 15 mg/kg/h and remifentanil 0.3 ug/kg/h; 25 ml/kg of arterial blood was removed during 20 minutes from each pig. Blood volume was replaced at 999 ml/h, 20 minutes after the end of the bleeding as follows: Gr1- three pigs, volume was replaced with 25 ml/kg Ringer; Gr2- three pigs, the volume was replaced with 20 ml/kg HES 130/0.4. Pigs were maintained under the same TIVA for an additional one hour before euthanasia with 40 mEq of KCl. Small bowel samples were collected and a) semiquantitative parameters oedema, congestion, hyperaemia, haemorrhage, inflammatory infiltration, cellular degeneration and necrosis, and b) the epithelial detachment were evaluated and classified in a specific scale from 0 to 3[2], and 0 to 5[3,4], respectively. The quantitative morphological assessment to mucosal loss (ML) percentage and crypt:interstitium ratio (C:I) was also analysed. Mean arterial pressure (MAP) and heart rate (HR) were analysed.
Results and Discussion: Gr1- MAP decreased 60% from baseline (69.3±3.8 mmHg to 27.7±4.2 mmHg); ML percentage was 2.18±0.46% (duodenum), 0.62±1.07% (jejunum) and 0.45±0.77% (ileum); the C:I was 0.5±0.06% (duodenum), 0.49±0.02% (jejunum) and 0.46±0.09% (ileum). Gr2- MAP decreased 71% from baseline (78.7±18.9 mmHg to 22.7±0.1 mmHg); ML percentage was 0.75±1.3% (duodenum), 0.0±0.0% (jejunum) and 0.0±0.0% (ileum); the C:I was 0.73±0.28% (duodenum), 0.48±0.11% (jejunum) and 0.43±0.12% (ileum). C:I ratio did not presented relevant differences among the Groups. There were no significant changes in HR in both groups.
Conclusions: Volume replacement with HES 130/0.4 may reduce the ML in the small bowel after severe haemorrhage, when compared to using Ringer Lactate. Duodenum mucosa seems to be more sensitive to hypoperfusion than jejunum and ileum mucosa.
Acknowledgements: Portuguese Foundation for Science and Technology under the project COMPETE: FCOMP-01-0124-FEDER-009525 (PTDC/CVT/101999/2008)
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4AP2-1

Comparison of sevoflurane and propofol anesthesia during off-pump coronary artery bypass grafting: A randomized study

Kirov M.Y., Eremeev A., Smetkin A., Slastilin V.
Northern State Medical University, Department of Anaesthesiology and Intensive Care, Arkhangelsk, Russian Federation

Background and Goal of Study: Off-pump coronary artery bypass grafting (OPCAB) can be accompanied by hemodynamic changes, cardiac dysfunction, tissue hypoperfusion and pain. The aim of our study was to compare the effects of sevoflurane and propofol anesthesia during OPCAB and postoperative period.
Materials and Methods: We enrolled 24 patients who underwent elective OPCAB using combined general (sevoflurane/fentanyl or propofol/fentanyl) and epidural (at Th_{2-3} level) anesthesia. The patients were randomized into two groups: sevoflurane group (SG) (n=12) and propofol group (PG) (n=12). In both groups, anesthesia was induced with intravenous midazolam 0.07 mg/kg, propofol 1 mg/kg, fentanyl 3-5 μg/kg and pipecuronium 0.1 mg/kg. In the PG, anesthesia was maintained with propofol 3-5 mg/kg/h, whereas the SG group received sevoflurane 0.5-3 vol%. Both groups received intravenous fentanyl 2-3 mcg/kg/h and epidural anesthesia with ropivacaine 0.75% 1 mg/kg and fentanyl 1 μg/kg during OPCAB, as well as continuous epidural infusion and patient-controlled administration of ropivacaine 0.2% and fentanyl 2 mcg/ml postoperatively. In all patients, we monitored hemodynamics using PiCCOplus (Pulsion Medical Systems, Germany) and measured blood gases. The data were assessed by ANOVA and t-test or by Mann-Whitney test. The discrete data were analyzed by chi-square test or Fisher's exact test.
Results and Discussion: We found no significant differences between the groups concerning demographic data, including co-morbidities and preoperative ejection fraction. Intra- and postoperatively, stroke volume index was higher in the SG by 20% (p < 0.05). After the surgery, extravascular lung water reduced by 20-25% in the SG (p < 0.05 compared with preoperative value). During 12 h after OPCAB, plasma lactate concentration and visual analog scale score for postoperative pain were increased in the PG (p < 0.05).
Conclusion: In patients with OPCAB, sevoflurane improves myocardial performance and lung fluid balance during and after surgery and attenuates postoperative tissue hypoperfusion and pain as compared to propofol anesthesia.

4AP2-2

Hemodynamic stability of xenon during general anaesthesia for carotid endariectomia in old patients

Le Manach Y., Doufflé G., Goarin J.P., Cristina I., Fléron M.-H., Coriat P.
GH. Pitié Salpétrière, Department of Anaesthesiology and Intensive Care, Paris, France

Background and Goal of Study: General anesthesia (GA) during carotid endarterectomy (CEA) requires a tight hemodynamic control in order to limit neurological and cardiovascular complications. This study aimed to demonstrate that the hemodynamic stability is better respected with Xenon than with sevoflurane during CEA under GA in old patients.
Materials and Methods: This randomized controlled trial was approved by our local ethic committee (CPP ParisVI). Patients older than 65 years scheduled for CEA were included. Anesthesia was induced in both groups with propofol and remifentanil and a non-depolarizing neuromuscular blocking agents (atracurium) was used for tracheal intubation. For the maintenance phase, patients were randomly allocated to either Xenon (60%) or Sevoflurane (1.7%). 30% of oxygen was used for all patients. Both groups received remifentanil targeted concentration of 2 ng/ml and adapted according to clinical needs and spontaneous EEG (BIS) monitoring. Continuous recording of arterial blood pressure (ABP), airway pressure and electrocardiogram was done (Biopac(tm)). Tachycardia, bradycardia, hyper and hypotension were defined as a change of more than 40% compared to the basal state recorded at rest before induction. Intraoperative hemodynamic variability was calculated using sequential analysis of one minute provided by the continuous recordings of ABP. After integration over the time, hemodynamic variability was expressed as a continuous variable in %.min. Fisher exact test and non parametric Wilcoxon test were used to compare these endpoints.
Results and Discussion: 46 old patients (mean age was 75 +/- 7) were included in the two groups.

	Sevoflurane	Xenon	P value
	(n=23)	(n=23)	
Bradycardia	0 (0%)	1 (4%)	0.99
Tachycardia	0 (0%)	0 (0%)	0.99
Hypertension	0 (0%)	2 (9%)	0.49
Hypotension	22 (96%)	10 (43%)	<0.001
Phenylephrin (ng)	750 +/- 375	300 +/- 300	<0.001
Ephedrin (mg)	30 +/- 14	16 +/- 10	<0.001
Nicardipin	0 (0%)	2 (9%)	0.49
Global hemodynamic variability (%.min)	1080 +/- 440	230 +/-60	<0.001

[Hemodynamics comparisons]

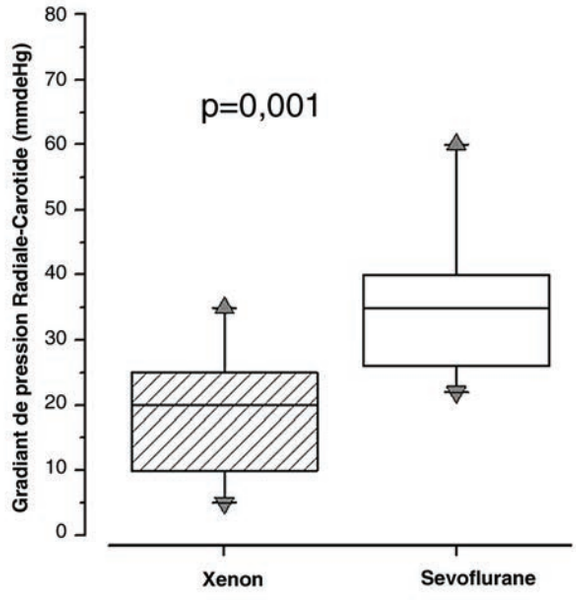
Conclusion(s): GA for CEA conducted with Xenon reduced the time with hypotension and the use of vasopressors (phenylephrin or ephedrin) in old patients comparing to sevoflurane. This reduced frequency of hypotensive events was associated with less hemodynamic variability.

4AP2-3

Xenon reduces the gradient of blood pressures between radial blood pressure and occluded carotid artery during carotid endarterectomy: A randomized controlled study

Le Manach Y., Cristina I., Gaudric J., Goarin J.P., Fléron M.H., Coriat P.
GH. Pitié Salpétrière, Department of Anaesthesiology and Intensive Care, Paris, France

Background and Goal of Study: During the cross clamping of the carotid required by Carotid endarterectomy (CEA), the brain circulation is mainly supplied by the controlateral carotid . A residual carotid blood pressure (RCBP) reflecting this can be measured. In this study we defined a gradiant of pressures (Gp), as the difference between the systemic arterial blood pressure (sABP) and the RCBP The aim of this randomized study was to compare this Gp during CEA conducted under general anesthesia (GA), with Sevoflurane(S) or Xenon(X).
Materials and Methods: This randomized controlled trial was approved by our local ethic committee (CPP ParisVI). Patients older than 65 years scheduled for CEA were included. Anesthesia was induced in both groups with propofol and remifentanil. For the maintenance phase, patients were randomly allocated to either X (60%) or S (1.7%). Both groups received remifentanil targeted concentration of 2 ng/ml and adapted according to clinical needs and BIS monitoring. Continuous recording of systemic arterial blood pressure (sABP), and of RCBP was done (Biopac(tm)). RCBP was obtained by the placement, by the surgeon, of a Fogarty's probe in the carotid during the cross clamping. The primary endpoint, Gp, was calculated directly, and the means of these Gp over the time were compared using non parametric Wilcoxon test.
Results and Discussion: 24 patients were included in this study, 12 in each group. No postoperative neurological adverse event has been observed. The mean cross clamping duration was 22 +/- 5 minutes, and was not different in the groups. Mean Gp of the X Group was inferior ($p < 0.001$) compared to the one observed in the S group.



[Figure]

Conclusions: The use of Xenon to conduct GA for CEA reduced the observed mean Gp during cross clamping compared to Sevoflurane. This suggests that X provides a better regulation of the cross clamping than S. Nevertheless, these physiological observations need to be confirm by neurological outcomes.

4AP2-4

Propofol attenuates apoptosis induced by angiotensin II via the PI3-kinase/Akt pathway in neonatal rat cardiomyocytes

Wong K.-L., Cheung C.-W., So E.C., Leung Y.-M., Cheng T.-H.
China Medical University and Hospital, Department of Anaesthesiology, Taichung, Taiwan, Republic of China

Background and Goal of Study: Propofol protects cells against oxidative injury in several organs, but the mechanism by which it exerts the cardioprotective effect is not well established. Angiotensin II (Ang II) can induce cardiomyocyte apoptosis which has an important role in the transition from compensatory cardiac remodeling to heart failure. In the present study, we evaluated the effects of propofol on Ang II-mediated cardiomyocyte apoptosis.
Materials and Methods: Cultured cardiomyocytes from neonatal rats were stimulated with Ang II. Apoptosis was evaluated by measuring caspase 3 activity and by TdT-mediated dUTP nick-end labeling (TUNEL) method. To further investigate the underlying mechanisms, the quantity of cleaved caspase-3, cytosol cytochrome c release, BcL-x_L expression, and ROS generation were examined. The effects of propofol on Akt phosphorylation and the involvement of PI3K/Akt pathway also assessed.
Results and Discussion: It was found that incubation with Ang II (0.1 μM) for 48 h increased cardiomyocyte apoptosis. Administration of propofol (3-10 mM) significantly decreased this Ang II-induced apoptosis.
These results suggest that propofol abates cardiomyocytes from Ang II-induced apoptosis possibly via reduced the quantity of cleaved caspase-3, and cytosol cytochrome c, and increased BcL-x_L expression, and inhibiting the increased ROS generation. In addition, propofol was found to increase the Akt phosphorylation in cardiomyocytes. The siRNA transfection for Akt significantly reduced propofol-induced Akt phosphorylation and propofol's protec-

tive effect. Pretreatment with the PI3K inhibitors wortmannin and LY294002 inhibited serine phosphorylation of Akt in dose-dependent manners. These findings indicate that propofol induces Akt phosphorylation via the PI3K/Akt pathway.
Our data provide the first evidence that the anti-apoptotic effect of propofol may be an important underlying mechanism accounting for its cardioprotectant action.
Conclusion(s): Propofol might potentially be developed to treat heart failure or other apoptosis-related heart diseases if further studies were performed to define and clarify rationale for its clinical use.
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4AP2-5

Isoflurane and Mg^{2+} as regulators of Ca^{2+} uptake in cardiac mitochondria

Boelens A.D., Agarwal B., Stowe D.F., Dash R.K., Camara A.K.
Academic Medical Center (AMC) at the University of Amsterdam (UvA), Department of Anaesthesiology, Amsterdam, Netherlands

Background and Goal of Study: Mitochondrial (m) free Ca^{2+} ($m[Ca^{2+}]$) may regulate oxidative energy metabolism, is implicated as an upstream factor that initiates volatile anesthetic-mediated cardioprotection, and in excess, induces apoptosis. The main route for mCa^{2+} uptake is via the Ca^{2+} uniporter (mCU) so its regulation modulates mCa^{2+} flux and mitochondrial function. We investigated two factors that may influence mCU, isoflurane and Mg^{2+}, both of which can affect mCU uptake of Ca^{2+} and thereby alter mitochondrial function.
Materials and Methods: Rodent cardiac mitochondria were isolated by differential centrifugation, energized with pyruvate with or without malate, and $m[Ca^{2+}]$ was measured using indo-1 AM at λ_{ex} 350 nm and λ_{em} 395 and 456 nm in response to different concentrations of $CaCl_2$ in the presence or absence of $MgCl_2$ or isoflurane. Indo-1 signals were corrected for background fluorescence (NADH). Ψ_m was measured using rhodamine-123. O_2 consumption was assessed using a Clark-2 type electrode during states 2-4 respiration, i.e. before, during and after adding 250 μM ADP.
Results and Discussion: Adding 0.25 and 0.5 mM $CaCl_2$ to the buffer containing 1 mM EGTA increased $m[Ca^{2+}]$ in a dose-dependent manner at 0 $MgCl_2$; the presence of 0.5 and 2 mM $MgCl_2$ reduced the mCa^{2+}-uptake in both groups. Adding 0.5 mM $MgCl_2$ did not increase $m[Mg^{2+}]$, but 2 mM $MgCl_2$ increased $m[Mg^{2+}]$ slowly from 0.35 to 0.55 mM over 10 min. State 3 respiration was not different among the 3 $MgCl_2$ groups, but state 4 was faster with added $MgCl_2$. Isoflurane at 0.5 to 2 mM dose-dependently increased mCa^{2+}-uptake despite a slight fall in $\Delta\Psi_m$, but increased duration of state 3 respiration as well as the duration of the ADP-induced rise in $m[Ca^{2+}]$; moreover, isoflurane increased redox state (increased NADH), possibly by inhibiting complex I.
Conclusions: Mg^{2+} interferes with mCa^{2+}-uptake via mCU whereas isoflurane enhances mCa^{2+} uptake, possibly by modulating mCU function. Together, these factors appear to modulate mCa^{2+} uptake and thereby alter mitochondrial function in different ways so that in health or disease a change in Mg^{2+} may alter the mitochondrial effects of isoflurane.

4AP2-6

Genetic effects on propofol induced hypotension

Chakithandy S., Anderson P.G., Wouters K.M., Arenas M., Lewis C.M., Morley A.P.
Guy's and St. Thomas' NHS Foundation Trust, Department of Anaesthesiology, London, United Kingdom

Background and Goal of Study: Propofol-induced hypotension (PIH) may affect postoperative outcome.[1] Its mechanism is unclear. We previously studied PIH in 262 ASA I-II Caucasian surgical patients aged 18-65 years, excluding diabetics, hypertensives and the obese. PIH was associated with weight and baseline mean arterial pressure (MAP).[2-4]
In the current study, we aimed to establish the effect of selected genetic polymorphisms on PIH.
Materials and Methods: We recruited 247 more patients using the same criteria. All 509 patients received intravenous propofol for 15 minutes in all, initially at 40mg/kg/h. When electroencephalographic bispectral index decreased to 50, propofol dose (PD) was recorded and infusion rate reduced to 8mg/kg/h. Patients breathed facial oxygen at 4l/min. Non-invasive airway support was applied if needed. MAP was recorded every minute.
For each patient, we calculated the maximum percentage decrease from baseline MAP (max%ΔMAP) and then corrected for PD before testing for genetic association. The 155 patients at the upper (PIH sensitive) and lower (PIH resistant) tails of the distribution were selected for genotyping. DNA was extracted from blood samples.
Genotyping was conducted at the insertion/deletion polymorphism in the angiotensinogen converting enzyme gene (ACE In/Del) and four single nucleotide polymorphisms (genes): rs4961 (α adducin, ADD1), rs699 and rs5051 (angiotensin, AGT) and rs5186 (angiotensin II receptor type1, AGTR1). All have been associated with antihypertensive drug response. At each polymorphism, patient genotypes were coded 0,1 or 2, with 1 representing heterozygosity.
Association of polymorphisms with PIH sensitive and PIH resistant groups was tested with a linear model.
Results and Discussion: Mean (SD) max%ΔMAP was 32.2(3.7)% and 17.4(4.7) % in PIH sensitive and PIH resistant groups respectively. Genotype frequencies did not differ significantly between groups. P values for each polymorphism were: ACE In/Del = 0.27, rs4961 = 0.65, rs699 = 0.37, rs5051 = 0.26, rs5186 = 0.07.
Conclusion: These polymorphisms do not strongly affect PIH. This does not preclude effects of other polymorphisms on PIH in these or other genes.
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4AP2-8

Xenon general anesthesia benefits for cerebral oxygenation measured by near-infrared spectroscopy during carotid endarterectomy

Godet G., Legac G., Gibert H., Couaud A., Lucas A., Cardon A., Ecoffey C.
Rennes University, Department of Anaesthesiology and Intensive Care, Rennes, France

Background and Goal of Study: Providing an optimal brain oxygenation is a mainstay during Carotid Endarterectomy (CEA) and the Near-InfraRed Spectroscopy (NIRS) method provides data on cerebral oxygen saturation level (rS02).
A decrease of more than 12% of rS02 during carotid clamping has been correlated with an increase of post-op neurological damage after CEA [(1)] . Xenon gas properties on hemodynamic control could be of benefit for general anesthesia of CEA[(2-4)] .
This study evaluated the effect on rS02 values modification during CEA surgery when performed under Xenon (Xe) or propofol (P) general anesthesia (GA).
Materials and Methods: Prospective controlled study in patients scheduled for CEA. After informed consent and following a cluster design, patients were assigned to Xe (60% inhaled) or P (Target Controlled Infusion (TCI) group for the maintenance of GA, with 35% Fi02 and remifentanil TCI adapted according to clinical needs. Induction was identical for groups (propofol, cisatracurium & remifentanil.)
For each patient rS02 was measured by Invos® (Somanetics), haemodynamic parameters by invasive blood pressure and arterial Pulse Pressure Variation (PPV) (IntelliVue®,Philips), anaesthesia depth by BIS® (Aspect). Values were compared using Wilcoxon and Fisher tests.
Results and Discussion: 74 patients were included, 37 per group (Xe or P), with no difference in general, medical history, baseline treatments, and surgical characteristics. In the Xe group, -to maintain a similar level of blood pressure within groups and during clamping, fluid load (850±240 *vs* 1020±315ml,p< 0.01) and ephedrine amount (9±11*vs* 16±18 mg, p< 0.04) were lower, -patients with > 12% decrease of rS02 were 1/3 less numerous (p=0.041) during carotid clamping, -perop use of nicardipine (n:8 *vs* 1,p< 0,02) and increase in remifentanil dose (4.5± 2 *vs* 3.3± 1.2 ng/ml,p=0,001) were higher, - all patients could be "on table" extubated whereas for 30% in the P group the extubation was delayed (mean 25±13min).
Conclusion(s): In CEA, the use of Xe for the GA maintenance allows a better rS02 than P during carotid clamping. This benefit has to be confirmed in randomized controlled study more particularly for patients at post-operative neurological risk.
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4AP3-2

Differential effects of anesthetic preconditioning on the cardiac sodium channel during trigger phase and following oxidative stress

Tampo A., Bosnjak Z.J., Kwok W.-M.
Asahikawa Medical University, Department of Anaesthesiology, Asahikawa, Japan

Background and Goal of Study: The cardioprotective effects of anesthetic preconditioning (APC) are well established with reduction in infarct size and increased functional recovery against ischemia/reperfusion injury. We have reported on the APC-induced persistent change in the inactivation kinetics of the sarcolemmal L-type calcium channel.[1] APC could also potentially impact other sarcolemmal ion channels, but no systematic characterizations have been reported. The cardiac sodium channel current (I_{Na}) is a major depolarizing current responsible for the initiation of the action potential. In addition, the cardiac sodium channel contributes to modulate intracellular electrolyte balance. In this study, we investigated the effects of APC on I_{Na} during the trigger phase and following oxidative stress.
Materials and Methods: Male Wistar rats were divided into two groups, control and APC. In the APC group, rats were exposed to isoflurane (1.4%, 1 MAC) for 30 minutes with a 30-minute recovery period prior to thoracotomy. The whole-cell patch clamp technique was used to record I_{Na}. The peak I_{Na} density and inactivation kinetics were compared between the groups. The expression level of the cardiac sodium channel α-subunit protein ($Na_v1.5$) was determined by Western blotting. The effect of APC on I_{Na} following oxidative stress between the groups was also investigated. Data are reported as mean ± SEM. Statistical analysis was performed using unpaired t-test and $P < 0.05$ was considered as significantly different.
Results and Discussion: APC significantly increased peak I_{Na} density by approximately 50% (from −8.6 ± 0.4 to −13.2 ± 1.0pA/pF), and accelerated I_{Na} inactivation kinetics (n = 17-18/group). The APC-triggered increase in the I_{Na} density was correlated with an increase in the $Na_v1.5$ expression level (n = 4/group). On the other hand, peak I_{Na} density following oxidative stress was significantly smaller in the APC group (−18.8 ± 2.0 and −12.3 ± 1.2 pA/pF, respectively). In addition, I_{Na} inactivation kinetics were significantly decelerated in the APC group following oxidative stress (n = 10-12/group).
Conclusion: APC triggered persistent changes in I_{Na} density and inactivation kinetics. Interestingly, these changes by APC were in the opposite direction following oxidative stress. The decrease in peak I_{Na} density may contribute to inhibit intracellular sodium overload of cardiac myocytes.
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4AP3-3

Sevoflurane do not induce renal protection in patients undergoing off-pump coronary artery bypass surgery

Sakamoto H., Harasawa K., Morimoto Y., Wakisaka H.
Cardiovascular Center Hokkaido Ohno Hospital, Department of Anaesthesiology, Sapporo, Japan

Background and Goal of Study: Sevoflurane induces pharmacologic preconditioning and postconditioning and protects organs. Off-pump coronary artery bypass grafting (OPCAB) avoids the organ damage induced by cardiopulmonary bypass. But displacement and immobilization of the heart result in significant hemodynamic instability and can cause organ ischemia-reperfusion injury. We hypothesized that the use of sevoflurane during OPCAB would decrease postoperative renal damage.
Materials and Methods: With IRB approval and informed consent obtained from each patient, 31 patients undergoing scheduled OPCAB were enrolled in this study. Patients were randomly allocated to PreCnd, PostCnd or control group. Anesthesia was induced and maintained with propofol, remifentanil and rocuronium. Dopamine was administered if necessary. In control group, no further treatment was done. In PreCnd group, patient received 2 vol% end-tidal sevoflurane (approximately 1 MAC) for 20 minutes during harvesting the last graft. In PostCnd group, patient received 1 MAC of sevoflurane for 20 minutes after conclusion of graft anastomosis. The primary outcome was the percentage of postoperative glomerular filtration rate (GFR) to preoperative GFR. The secondary outcomes were blood urea nitrogen, creatinine, urine output, diuretics dose and the length of ICU stay (ICUstay). Data were compared using ANOVA followed by Games-Howell test. A P-value < 0.05 was considered statistically significant.
Results and Discussion: Each group consists of 10 to 11 patients. Patients' demographic data showed no significant difference. The GFR result is shown in table.

GFR (%, mean +/- SD)	Control	PreCnd	PostCnd	p-value
Arrival in ICU	98 +/- 24	109 +/- 22	104 +/- 24	0.092
POD1	87 +/- 17	94 +/- 19	96 +/- 14	0.136
POD2	86 +/- 20	95 +/- 22	95 +/- 13	0.358
POD3	91 +/- 19	104 +/- 21	96 +/- 31	0.230
POD4	87 +/- 18	103 +/- 26	93 +/- 26	0.365

[Percentage of GFR change]

Percentage of GFR change did not show significant difference among groups. Only the dose of diuretics on the third postoperative day showed significant difference. Those suggests sevoflurane did not induce renal pre- and post-conditioning in OPCAB.
Conclusion(s): Sevoflurane did not induce pharmacologic renal protection in OPCAB.

4AP3-4

Comparative effects of interrupted versus continuous administration of sevoflurane before cardio-pulmonary bypass on post-operative levels of troponin T in coronary artery surgery

Gorokhovatskiy Y.I., Zamyatin M.N., Gorokhovatskaya N.Y., Gudimovich V.G., Kim K.F.
National Medical Surgical Centre n.a. N. Pirogov, Department of Anaesthesiology and Intensive Care, Moscow, Russian Federation

Background and Goal of Study: Volatile anaesthetic agents have direct cardioprotective properties, but the degree of anaesthetic preconditioning in patients undergoing cardiac surgery may be related to the protocol of drug administration. The purpose of this study was to compare the effects of interrupted administration of sevoflurane before cardiopulmonary bypass with continuous sevoflurane administration on cardioprotection.
Materials and Methods: Eighty patients scheduled for coronary bypass surgery were randomly allocated to 1 of 2 groups. All patients received inhaled anaesthesia with sevoflurane (1 minimum alveolar concentration (MAC)) and fentanil (mean total dose - 15-20 mcg/ kg) and and warm (34°) blood cardioplegia. The first group had no further intervention. Patients of the second group received 10 minutes before establishing the extracorporeal circulation two times for 5 minutes of 2,5 MAC of sevoflurane interrupted by 5-minute washout to the base-line concentration period. Troponin T was measured as marker of cardiac cellular damage before and after (12 and 24 h) extracorporeal circulation. We compared also the frequency of arrhythmias, need for inotropic support, duration of ventilatory support, the values of cardiac output and blood lactate levels.
Results and Discussion: Up to 24 h postoperatively Troponin T values (mean (SD) 0.11 (0.06) ng x ml(-1)) were significantly ($p < 0.05$) lower in the second group than in the first (0.49 (0.17) ng x ml(-1)) group. Cardiac output was also significantly higher and lactate value and time of respiratory support were lower in the second group.
Conclusion(s): Interrupted administration of sevoflurane in high concentration prior to cardiopulmonary bypass gives more cardioprotective effects as compared with continuous sevoflurane administration in usual for general anaesthesia doses.
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4AP3-5

Does propofol or isoflurane protect the kidney against ischemia-reperfusion injury during transient hyperglycemia?

Vianna P.T., Carraretto A.R., Vianna Filho P.T.G.
University State São Paulo, Botucatu Medical School, Department of Anaesthesiology, Botucatu, Brazil

Background and Goal of Study: Perioperative hyperglycemia is predictors of morbidity and mortality[1]. Hyperglycemia enhances renal ischemia-reperfusion injury (IRI) in rats anesthetized with isoflurane (Iso). The effect of propofol (Prop) in these cases is unknown. The purpose of this investigation was to examine the effect of isoflurane (Iso) and propofol (Prop) on renal ischemia/reperfusion injury (IRI) during normoglicemia and transient hyperglycemia

Materials and Methods: Rats were randomly assigned into six groups of six animals each: **PHS** (Prop + Hyperglycemia - Sham); **IHS** (Iso + Hyperglycemia - Sham); **PHI** (Prop + Hyperglycemia + Ischemia); **IHI** (Iso + Hyperglycemia + Ischemia); **PI** (Prop + Ischemia) and **II** (Iso + Ischemia). The animals received 1 mg.kg^{-1}.min-1(equivalente to 0.16 mg.kg-1.min-1 for humans) of either propofol ((PHS, PHI and PI) or isoflurane (IHS, IHI and II). Hyperglycemia was induced by injecting 2.5 g.kg-1 of glucose solution intraperitoneal. Both sham groups underwent right nephrectomy and hyperglycemia induction only. The other groups were submitted to left renal ischemia for 25 minutes. Serum creatinine levels were determined before (T1) and after 25 minutes of ischemia (T2). Twenty four hours after experiment (T3) blood collection and left kidney removal were performed for histological analysis, using a tubular necrosis score system (0 -5= injury maximum). In addition, cells from t he left kidney were evaluated for apoptosis by flow cytometry (FCM) as a % of initial apoptosis (APTi) and viable cells (VC).
Results and Discussion: Serum creatinine (mg/dL) was statistically different at T3 in groups **PHI** (3.60±0.80) and **IHI** (3.23±2.16) in comparison with the other groups: **PHS** (0.95±0.27), **IHS** (0.62±0.12), **PI** (0.88±0.38) and **II** (1.42±1.00). Histopathological examination showed that groups **PHS** (0.0[0.0;1.0]) and **IHS** (0[0.0;0.0]) were significantly different from groups **PHI** (4.0[4.0;5.0]) and **IHI** (4.5[4.0;5.0]). FCM showed that APTi in groups **PHS** (9.9±6.6), **IHS** (4.2±2.0), **PI** (15.7±22) and **II** (15.8±17.2) statistically differed from groups **PHI** (73.2±14.2) and **IHI** (48.1±27.9). VC percentage was statistically lower in groups **PHI** (25.8±13.8) and **IHI** (38.5±18.4B).
Conclusion(s): Propofol (prop) and Isoflurane (Iso) showed the same level of protection against IRI in the normoglycemic groups and increased IRI in hyperglycemic animals.
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Acknowledgements: Financial Support of Fundação de Amparo a Pesquisa do Estado de São Paulo (FAPESP)

4AP3-6

Ketamine dose-dependently interferes with cardioprotection elicited by direct inhibition of glycogen synthase kinase 3b in intact rat hearts

Sandesc D., Gheorghiu G., Ordodi V., Hentia C., Papurica M., Muntean D.
University of Medicine and Pharmacy, Department of Anaesthesiology and Intensive Care, Timisoara, Romania

Background and Goal of Study: Inhibition of glycogen synthase-kinase 3b (GSK-3b) has been reported as a common event integrating protective pathways underlying both anaesthetic and ischaemic conditioning strategies. Our previous data points towards the interference of high- but not low dose racemic ketamine with anaesthetic postconditioning and diazoxide preconditioning. The present study was designed to investigate the effects of high (80 mg/kg, H-K) vs. low (20 mg/kg, L-K) dose of ketamine on cardioprotection elicited by the administration of a selective GSK-3b inhibitor, SB216763.
Materials and Methods: To this aim ketamine (either H or L dose) anaesthetized rats (n = 6/group) subjected to 30 min regional ischaemia and 120 min reperfusion were randomized to receive either the GSK-3b inhibitor (0.6 mg/kg, via the jugular vein) or the vehicle (DMSO) 10 min before ischaemia or 5 min before reperfusion. Heart rate, blood pressure and lead II electrocardiogram were continuously recorded. Infarct size was determined by the tetrazolium staining and was expressed as percent of the area at risk.
Results and Discussion: In animal anaesthetized with L-K, the GSK-3b inhibitor significantly reduced infarct size as compared to vehicle (59 ± 6%) when administered before ischaemia (41 ± 4%) and showed similar protection when given at reperfusion (39± 5%; p < 0.05). In the presence of H-K the anti-infarct protection was abrogated regardless the type of drug administration, pre-ischaemia or before reperfusion (56±8 % and 61±5, respectively, p > 0.06 vs. the corresponding control).
Conclusion(s): Ketamine dose-dependently interferes with the anti-infarct protection elicited by the direct inhibition of GSK-3b.
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4AP3-7

Dose-dependent interference of ketamine with cardioprotection elicited by anaesthetic conditioning

Hentia C., Ordodi V., Gheorghiu G., Bedreag O., Muntean D., Sandesc D.
University of Medicine and Pharmacy ‚Victor Babes' Timisoara, Department of Anaesthesiology and Intensive Care, Timisoara, Romania

Background and Goal of Study: Volatile anaesthetics effectively trigger pharmacological pre- and postconditioning and are able to protect the heart against ischaemia-reperfusion (I/R) injury in several experimental settings. Ketamine, largely used for background anaesthesia, has been reported to block protection associated with ischaemic preconditioning in rabbit hearts in vivo and in isolated rat hearts.The present study was designed to investigate if ketamine interferes with anaesthetic conditioning with isoflurane (Iso) or sevoflurane (Sevo), 1 MAC each, in the *in vivo* model of regional I/R injury.
Materials and Methods: To this aim rats (n = 6-8/group) anaesthetized with either a high (80 mg/kg, H-Keta) or a low (20 mg/kg, L-Keta) ketamine dose plus xylazine (5 mg/kg) and subjected to 30 min of regional ischaemia and 120 min reperfusion were randomized to receive:
(i) no additional intervention (Ctrl);
(ii) Iso preconditioning (IsoPC) achieved by 3 episodes of 5 min Iso interspersed with 10 min washout;
(iii) Iso postconditioning (IsoPost) achieved by 5 min of volatile agent administration (3 min before and 2 min after reperfusion);
(iv) Sevo preconditioning (SevoPC) achieved by 2 episodes of 5 min Sevo administration each followed by 10 min of washout;
(v) Sevo postconditioning (SevoPost) according to the same protocol as for IsoPost. Heart rate, blood pressure and lead II electrocardiogram were continuously recorded. Myocardial injury expressed as the percent of infarct to risk area ratio (I/R%) was determined by tetrazolium staining.
Results and Discussion: In the presence of H-Keta both IsoPC and SevoPC protocols significantly reduced infarct size (25+/-7% and 28+/-5%; mean+/-SE) albeit to a lesser degree than in animals anaesthetized with L-Keta (19+/-7% and 24+/-6%) vs. Ctrl (51+/-8%; p< 0.05). Protection was lost for the postconditioning protocols with both volatile agents (43+/-8% and 47+/-10%) in animals anaesthetized with H-Keta, but was restored when L-Keta was used (28+/-8% and 31+/-4%; p< 0.05 vs. Ctrl) for IsoPost and SevoPost, respectively.
Conclusion(s): In the in vivo rat model of regional I/R injury, high- but not low-dose ketamine interferes with cardioprotection associated with anaesthetic postconditioning.
Acknowledgements: Research supported by the National Authority for Scientific Research grant 4.2.122/2008

4AP4-1

Is pre-induction hypertension associated with perioperative major adverse cardiovascular events?

Sierra P., Sabate S., Ortiz J.C., Mases A., Hernando D.,
ANESCARDIOCAT Study Group
Fundació Puigvert, Department of Anaesthesiology, Barcelona, Spain

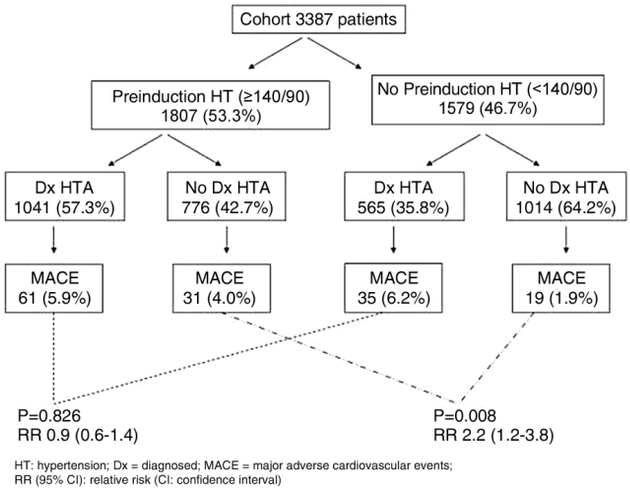
Background and Goal of Study: Arterial hypertension (HT) *per se* is not considered to be an independent risk factor for cardiovascular complications in non-cardiac surgery. Despite preoperative evaluation to identify patients with target organ damage, some patients have pre-anaesthesia elevated blood pressure (BP). We investigated the incidence of preinduction HT and its association with perioperative major adverse cardiovascular events (MACE).

Materials and Methods: We analyzed data from a prospective multicentre cohort study performed in 23 hospitals.Eligible population were patients aged 40 yr or older undergoing intermediate-high surgery-specific risk of non-cardiac surgery.We studied the prevalence of diagnosed HT, isolated or with associated comorbidity and, the prevalence of preinduction HT and their relationship with MACE. Preinduction HT was defined as a BP≥140/90 mmHg.
Results and Discussion: Our results are based on a sample of 3387 surgical patients. The prevalence of HT and incidence of MACE are shown in Table 1 and Figure 1.

	Patients n (%)	MACE n (%)	RR (95%CI)	P
No diagnosed HT	1780 (52.5)	50 (2.8)	2.1 (1.5-2.9)	P<0.001
Diagnosed HT	1607 (47.4)	96 (6.0)		
Isolated HT	505 (31.0)	14 (2.8)		P<0.001
Associated co-morbidity HT	1102 (69.0)	82 (7.4)		
Preinduction HT ≥ 140/90 mmHg	1807 (53.3)	92 (5.1)	1.5 (1.1-2.1)	P=0.018
No Preinduction HT < 140/90 mmHg	1579 (46.7)	54 (3.4)		
Preinduction HT ≥ 180/110 mmHg	272 (8.0)	16 (5.9)	1.4 (0.9-2.3)	P=0.210
No Preinduction HT < 180/110 mmHg	3114 (92)	130 (4.2)		

MACE: Major adverse cardiovascular events; HT: hypertension; Blood pressure (mmHg); systolic/diastolic; RR: relative risk; CI: confidence interval

Table 1



[Figure 1]

Conclusion(s): Hypertensive patients without associated comorbidities had similar risk for MACE than no diagnosed HT patients.
Our results confirm that HT *per se* is not an independent risk factor for perioperative MACE, even when patients showed high level of blood pressure in pre-induction anaesthesia. However, we should be cautious in the case of patients without preoperative diagnosed HT with high level of BP in preinduction anaesthesia.

4AP4-2

Postoperative cardiac events in patients with coronary stents undergoing noncardiac surgery

Rodríguez-Pont A., Tremps C., Lopez-Galera S., Guilera N., Rosas M., Colilles C.
Hospital de Sabadell, Department of Anaesthesiology, Sabadell, Spain

Background and Goal of Study: The aim of this study is to register perioperative cardiovascular events in patients with coronary stents undergoing noncardiac surgery, to describe the incidence and severity of these adverse events and to assess the relationship between the incidence of cardiac or neurovascular events and bleeding complications with the perioperative management of antiplatelet therapy (APT).
Materials and Methods: Observational and prospective study, approved by the Ethical Comittee of our Institution. We registered all patients with cardiac stents undergoing noncardiac surgery with admission from February 2009 to January 2010.
Patients were selected from preanaesthetic evaluation or during perioperative period in emergency surgery. They were followed-up during hospital stay until discharge, and contacted by phone call 30 days after surgery. We registered demographic data, perioperative active cardiac conditions and clinical risk factors.
Major cardiac events (cardiac mortality, non-fatal Myocardial Infarction and unstable angina) and APT management were registered, secondary variables such other cardiac and neurovascular events, bleeding complications and overall mortality were collected as well. χ^2 test was used to compare qualitative variables and Mann-Whithney to compare quantitative variables.
Results and Discussion: During one year period we included 81 surgical procedures, 75.3 % were male, median age was 65.8 (37-93), 13.6 % underwent high risk surgery, 65.4% intermediate and 21% minor risk surgery. 30.9% was emergent surgery. 93.8% were treated with APT, perioperative withdrawal (defined as ≥ 5 days) was present in 25.9% of patients.
The incidence of perioperative major cardiac events was 13.3 %, and total mortality 6.2 % (5 patients), other perioperative cardiac and neurovascular events were present in 34.6%. Global transfusion (packed red blood cells) and haemoglobin level < 85 gr/dL were present in 18.5% and 24.7% respectively.
Conclusion(s): This population has a high perioperative morbidity and mortality. Our study confirm that perioperative severe anemia and transfusion is a risk factor for main cardiac events, but no correlation was found with perioperative APT management. APT maintenance is not related to transfusion neither to anemia.
Our sample size is too small, multicenter registries are necessary to assess the relation between perioperative events and APT management.

4AP4-3

Circulating endothelial progenitor cell response to exhaustive exercise - a potential role in perioperative risk prediction

Schier R., El-Zein R., Teschendorf P., Heymach J.V., Mehran R.J., Riedel B.
University Hospital of Cologne, Department of Anaesthesiology and Intensive Care, Cologne, Germany

Background and Goal of Study: Bone-marrow derived endothelial progenitor cells (EPCs) exhibit direct (cellular) and indirect (paracrine) effects that are crucial to vascular repair responses. Impaired bone-marrow response during critical illness associates with poorer survival[1]. In this prospective study we evaluated whether preoperative exhaustive exercise stimulates bone marrow-derived EPC release (primary endpoint) and whether this correlates with postoperative outcome (secondary endpoint).
Materials and Methods: Following IRB approval, 61 patients (aged 60.7±10.0 years) scheduled for major thoracic surgery performed exhaustive (above anaerobic threshold to peak VO_2) exercise testing within one week of surgery. Peripheral blood was collected both before and 10 minutes after peak exercise for quantification of circulating EPCs by fluorescence-activated cell sorter analysis. The EPC response to exercise was correlated to postoperative cardiac, pulmonary, wound healing, and surgical complications. Wilcoxon signed-rank test and Pearson Chi-Square test determined the effect of EPC release to exercise and the incidence of postoperative complications. Statistical significance was set as $p < 0.05$*.
Results and Discussion: A limited period (~10 minutes) of exhaustive exercise to peak VO_2 significantly increased peripheral circulating levels of EPCs. Those patients exhibiting a decrease, in response to exercise, of circulating cells with CD45- 133+ 276+ surface marker lineage and with CD45- 133+ 34+ surface marker lineage suffered more frequent ($p = 0.01$; $p = 0.05$, respectively) postoperative complications compared to those patients exhibiting an increase in these cells after exhaustive exercise.
Conclusion(s): Acute preoperative exhaustive exercise elucidates a ‚cell-mediated stress response' characterized by an increase in circulating EPCs. An impaired response to this physiologic ‚stressor' associates with greater incidence of postoperative complications. Identification of non-responders may allow for improved preoperative risk stratification and thus facilitate timely preoperative optimization, e.g. preoperative physical ‚prehabilitation' in patients scheduled for major surgery.
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4AP4-4

Use of B-type natriuretic peptide (BNP) as an early diagnostic tool for postoperative myocardial ischemia in noncardiac surgery

Hoffmann C., Falzone E., Pelée de Saint Maurice G., Muller V., Vest P., Ausset S.
Hôpital d'Instruction des Armées Percy, Department of Anaesthesiology and Intensive Care, Clamart, France

Background and Goal of Study: Postoperative myocardial ischemia (PMI) and infarction remain leading causes of morbidity and mortality in patients undergoing surgery [1]. Preoperative B-type natriuretic peptide (BNP) has been shown to predict early postoperative cardiac events in patients undergoing major noncardiac surgery [2].
In this study, we studied the ability of BNP to predict precociously in PMI with release of troponin Ic (TnIc).
Materials and Methods: We conducted a post-hoc analysis of postoperative changes in BNP levels in a population of 86 patients with a Cardiac Risk Index (CRI) >1 and who underwent noncardiac surgery. To assess the ability of BNP to predict PMI with release of TnIc, three hypotheses were tested: we compared the release of TnIc with, first, elevation of BNP above 100, then, with elevation of BNP above 400 and finally with a variation of more than 50% between two consecutive dosages of BNP. TnIc and BNP have been systematically measured in the recovery room and in the morning of the first three postoperative days. Different statistical tests were made using the Fischer test.
Results and Discussion: Eighty six patients were included (orthopedic surgery 57%, thoracic surgery 24%, visceral surgery 14%, others 5%). The mean age was 73 +/- 9 yrs, the sex ratio 49/37 (M/F). The CRI was 2 for 39 patients, 3 for 43, 4 for 4. 20 patients sustained a PMI with TnIc release.
With BNP above 100, 70% of patients with PMI have a positive BNP. 55% of patients with negative troponin also have a positive BNP (Se=70% ; Sp=45%). The association between positive BNP and postoperative ischemia was not significant ($p = 0.3023$). With BNP above 400 and with variation of + 50%

between 2 dosages, associations between positive BNP and ischemia were also not significant (p = 0.0808 & p=0.5056).
Conclusion(s): Changes in the rate of postoperative BNP does not predict the occurrence of PMI after noncardiac surgery. For lack of specificity, the extent of the BNP does not seem useful as a postoperative diagnostic tool.
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4AP4-5

Role of genetic polymorphism in hemodynamics in cardiac surgery with extracorporeal circulation

Diaz Garcia B., Darias B., Hernandez J., Perez N., Cabrera J., Arribas C.
Hospital Universitario de Canarias, Department of Anaesthesiology, San Cristobal de La Laguna, Spain

Background and Goal of Study: We have investigated genetic and clinical factors associated with hyperdynamic state (HS) after heart surgery with extracorporeal circulation (ECC).
Materials and Methods: We performed a prospective cohort study of consecutive patients who underwent elective heart surgery with ECC. HS was defined as hyperthermia (>38ºC), cardiac index (CI) >3.5 l/ min/m^2 and systemic vascular resistance index (SVRI) < 1600 dynes×s/cm^5×m^2. The study included demographic variables, gene polymorphisms (A/G) of tumor necrosis factor-beta (TNFb+250), G/A-1082 of interleukin-10 (IL-10), polymorphism of interleukin-1 receptor antagonist (IL-1ra), comorbidity, type of surgery, serum levels of interleukin-6 (IL-6), and postoperative course. We used Pearson χ^2 or Fischer exact test, and Student t-test for univariate analysis, with forward stepwise logistic regression for multivariate adjustment.
Results and Discussion: Eighty patients were studied, of whom 22 (27.5%) developed HS. The presence of allele G of TNFb+250 polymorphism was associated with an increased incidence of HS (68% vs 37%; *P*=0.011). In the multivariate analysis, a longer duration of ECC, and the presence of the G allele, were associated with the development of HS.
Conclusion(s): The G allele of TNFb+250 polymorphism, and prolonged extracorporeal circuit times, may favour the development of a hyperdynamic state after heart surgery with ECC.

4AP4-6

Perioperative complications in patients with coronary artery stents

Suarez de la Rica A., De Miguel Guijarro A.
La Paz University Hospital, Department of Anaesthesiology, Madrid, Spain

Background and Goal of Study: Dual antiplatelet therapy with aspirin and a thienopyridine is used for coronary stent thrombosis prevention. Drug-eluting stents were introduced in response to the high observed incidence of late stent re-stenosis with bare metal stents, but they are prone to thrombosis due to delayed re-endothelization.Then, a more prolonged period of this therapy is required. Premature discontination of dual therapy is the leading independent predictor for stent thrombosis. Besides, in the perioperative period, many patients develop a hypercoagulable state lasting for at least 7 days after major surgery. Recent clinical data show that the risk after antiplatelet drugs withdrawal is much higher than that of surgical bleeding if they are continued.
The main goal of this prospective study was to identify in our center, the number, the type, the severity and the time of ocurrence of adverse events in a group of patients with coronary artery stents undergoing non-cardiac surgery.
Materials and Methods: 55 patients with coronary artery stents undergoing non-cardiac surgery were enrolled in this prospective study. Main outcome was the complication rate (essentially bleeding and cardiac complications), in the perioperative period.
Results and Discussion: 22.6% had at least one drug-eluting stent. Only 20% of patients underwent non-cardiac surgery within the first year after stenting. 32.7% of patients underwent minor surgery (low haemorrhagic risk surgery) and 67.3 % major sugery. 85.5 % of all patients took aspirin, and 32.7% clopidogrel.78.7% of patients who took aspirin discontinued it during the perioperative period, and 95% discontinued clopidogrel. 20 % suffered any complication after surgery (essentially bleeding). 5 patients died. Two patients suffered coronary thrombosis (they discontinued antiplatelet agents in the perioperative period). Bleeding is not statistically different between patients with and without discontinuation of antiplatelets (p=0.44 for aspirin, p=0.6 for clopidogrel), but it is in different kinds of surgery (major or minor, p=0.01)
Conclusion(s): It is imperative to consider continuation of antiplatelets in low haemorrhagic risk surgeries, essentially in high thrombotic risk patients, as haemorrhagic events basically depend on type of surgery, and not on antiplatelet agents regimens . There were no more coronary events probably due to the long period between stent reception and surgery.

4AP4-7

Preoperative dipping status is predictor of intraoperative haemodynamic oscillations and intraoperative use of vasoactive non-anesthetic drugs

Kvolik S., Steiner R., Lehner V., Pinotic K., Kristek J., Rakipovic-Stojanovic A.
Clinical Hospital Osijek, Department of Anaesthesiology and Intensive Care, Osijek, Croatia

Background: Dipping status is a ratio of night-time blood pressure (BP) decrease as compared to daytime. Night-time values in a healthy person are 10 -20% lower as compared to day-time (dipper). Non-dippers have either no change (night-time decrease ≤10%), or significant night time deviation in BP (>20%). In this study we compared patient's preoperative dipping status with intraoperative BPs.
Materials and Methods: Institutional approval and informed consent were obtained. Two groups of 20 consecutive patients undergoing carotid endarterectomy (CE), 65±5.9 years, BMI 26,8±4,1, or total thyroidectomy (TT) (62.5 ± 14.8 years, BMI 29.1) in general anesthesia were involved in a pilot study.
Preoperative BP values were recorded with Mobil-O-Graph portable device and computed using Hypertension Management Software. Intraoperative BP values were recorded continuously via arterial line placed in the radial artery. BP was registered before anesthesia, after anesthetic induction with propofol, and every subsequent minute after induction. Intraoperative mean systolic BP (SBP) >30% as compared to preoperative values was considered as critical, both for SBP increase and decrease. Minimal, and maximal BP values, BP standard deviation, intraoperative dipping status, consumption of nonanesthetic drugs used for BP regulation during anesthesia were registered and compared to preoperative.
Statistical analysis was performed using ANOVA, chi-square test, and Pearson correlation.
Results: Only 3/20 CE and 7/20 TT patients had normal preoperative dipping status (ns), with more critical BPs in CE group (p< 0.05). Maximal 24-hour SBP (163±14.4 mmHg in CE and 147±15.3 in TT patients) significantly correlated with intraoperative SBP after intubation (168.3±37mmHg in CE and 145±12.6 in TT patients, p< 0.05). An increased number of preoperative night-time critical SBP values (>125 mmHg) significantly correlated with increased BMI (p>0.05), with BP values before induction into anesthesia, BP after intubation (p=0.036; r=0.739) and with the use of nonanesthetic drugs for the BP regulation during anesthesia (p=0.03, r=0.756) in CE group. A ratio of 24-hour critical BP measurements was predictive fotr intraoperative BP oscillations and maximal intraoperative BP in both groups (p< 0.001).
Conclusion: Preoperative dipping status was an indicator for increased intraoperative hemodynamic oscillation. It is a significant predictor for the use of vasoactive drugs during anesthesia for CE and TT.

4AP4-9

The benefit of "multimarker" approach in prognosis assessment after cardiac surgery

Kallel S., Ben Soltana M.H., Akrout S., Triki Z., Chaari M., Karoui A.
Academic Medical Center Habib Bourguiba of Sfax, Department of Anaesthesiology and Intensive Care, Sfax, Tunisia

Background and Goal of Study: The superiority of a multi-biomarker approach combining troponin I (cTnI), B-type natriuretic peptide (BNP) and C-reactive protein (CRP) on a traditional mono-marker approach has been demonstrated in acute coronary syndromes. The objective of this study is to evaluate the benefit of the same approach in cardiac surgery.
Materials and Methods: This is a prospective study focused on patients who underwent cardiac surgery with cardiopulmonary bypass (CPB). The exclusion criteria were: urgent surgical intervention, infective endocarditis, age less than 18 years old and/or bacteriologically documented infection. Assays of the Procalcitonin (PCT), BNP and CRP were performed before and after CPB, in the fourth postoperative hour and every day during the first four days. PCT measurements were performed by enzyme immunoassay method based on Elecsys2010.
Results and Discussion: In total, 40 patients were selected. The average age was 56.1 ± 15 years, a sex ratio of 1.3 and the distribution by type of surgery was as follows: 23 coronary artery bypass graft, 17 valve replacements and 4 combined surgeries.Stays in intensive care unit predicted by each biomarker alone or in combination with other markers calculated by linear regression are summarized in the table (I).

Conclusion(s): A multi biomarker approach combining PCT, CRP and BNP predicts the stay in intensive care unit after a scheduled cardiac surgery and is superior to a traditional monomarker approach. Addition of cTnI does not seem necessary.

4AP5-1

Serum from cardiac surgery patients undergoing remote ischemic preconditioning mediates cytoprotective effects *in-vitro*: Investigations employing a CaCo-2 cell hypoxia model

Zitta K., Meybohm P, Lauer F, Peters S., Bein B., Albrecht M.
University Hospital Schleswig Holstein, Department of Anaesthesiology and Intensive Care, Kiel, Germany

Background: Remote ischemic preconditioning (RIPC) can be induced by transient occlusion of blood flow to a limb with a blood-pressure cuff and exerts multiorgan protection from ischemia/reperfusion (I/R) injury. I/R-injury in the intestinal tract leads to intestinal barrier dysfunction, translocation of bacteria and can result in multiple organ failure[1,2]. Goal of the study was to establish a culture model of epithelial colonic cells (CaCo-2) to evaluate the effects of RIPC conditioned serum on hypoxia-induced cell damage *in-vitro*.
Materials and Methods: Using our recently described *in-vitro* model[3,4] hypoxic conditions (pO_2< 5mmHg) were induced for 1h by the addition of 12U/ml glucoseoxidase and 120U/ml catalase. Patient serum (n=8) was derived before RIPC (T0), directly after RIPC (T1) and 1h after RIPC (T2). In all experiments 5% of the respective serum was added to the culture medium at the onset of hypoxia until 24h after hypoxia. Brightfield microscopy, lactate dehydrogenase (LDH) assays and RT-PCRs were performed to evaluate the hypoxia-induced cell damage and influence on gene expression as well as the effects of the sera T0, T1 and T2.
Results: Hypoxic conditions led to morphological signs of cell damage such as cell rounding and detachment from the growth surface. These findings were accompanied by statistically increased LDH levels ($LDH_{hypoxia}/LDH_{normoxia}$) in cultures containing serum T0 (3.81 ± 0.80; P< 0.01 vs. normoxia = 1) and T1 (2.298 ± 0.49; P< 0.05 vs. normoxia = 1), but not T2 (2.08 ± 0.46; ns vs. normoxia = 1). Serum T2 significantly reduced the hypoxia-mediated LDH release compared to serum T0 (P< 0.05). Similar effects were observed for serum T1, however statistical significance was not reached. Analysis of gene expression revealed a reduction of hypoxia-induced pro-apoptotic bax-2 expression by serum T1 and T2 75min after the onset of hypoxia and an attenuation of hypoxia-mediated reduction of anti-apoptotic bcl-2 expression by both sera 90min after the onset of hypoxia.
Conclusion: Human serum derived 1h after RIPC reduces hypoxia-induced cell damage in an *in-vitro* model of CaCo-2 cells. The described system may facilitate the search for currently unknown protective factors released by RIPC.
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4AP5-2

Ethyl pyruvate has anti-apoptotic and myocardial protective effects after regional ischemia-reperfusion injury in an in vivo rat heart model

Shin I.W., Jang I., Park M.Y., Sohn J.-T., Lee H.K., Chung Y.K.
Gyeongsang National University, Department of Anaesthesiology and Pain Medicine, Jinju, Korea, Republic of

Background and Goal of Study: Ethyl pyruvate has anti-apoptotic properties and protect organs from ischemia-reperfusion induced injury. The aim of this study was to determine 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-apoptotic effect is related at the protective effect of heart.
Materials and Methods: Rats were randomized to receive lactated Ringer's solution or ethyl pyruvate dissolved in Ringer's solution, which was given by intraperitoneal injection 1 hour prior to ischemia. Rats were subjected to 30 minutes ischemia followed by reperfusion of the left coronary artery territory. After a 2 hours reperfusion, the hemodynamic function and myocardial infarct size were evaluated. Apoptosis was assessed by measuring caspase-3 activity, western blot of cleaved caspase-3, DNA laddering, and TUNEL staining.
Results and Discussion: Ethyl pyruvate significantly improved cardiac function and reduced infarct size after regional ischemic-reperfusion injury. Ethyl pyruvate increased Bcl-2 expression but decreased Bax and cleaved caspase-3 expression. Ethyl pyruvate decreased the appearance of DNA ladders and TUNEL positive cells by myocardial ischemia-reperfusion 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 ethyl pyruvate is related to its anti-apoptotic effect.

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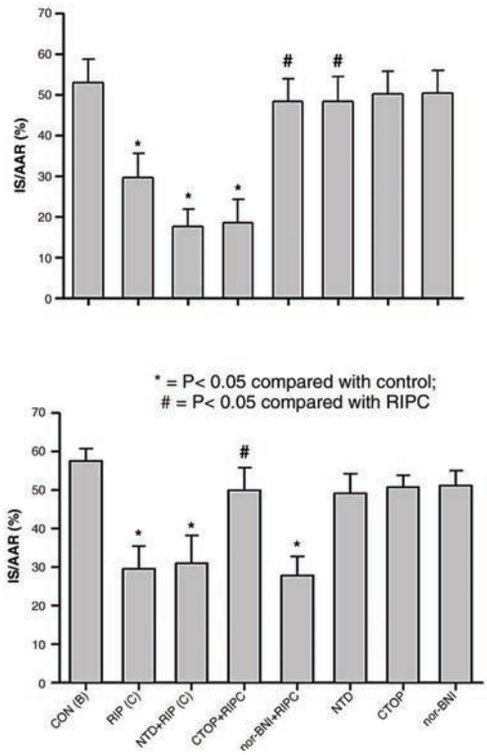
4AP5-3

Spinal mu opioid receptor activation is required in remote ischaemic preconditioning of the heart

Wong G.T.C., Lu Y., Xia Z., Irwin M.G.
University of Hong Kong, Department of Anaesthesiology, Hong Kong, Hong Kong

Background: The mechanisms underlying remote ischaemic preconditioning (RIPC) are not fully elucidated, although neural and humoral pathways have been implicated. Activation of spinal opioid receptors (OR)[1] and stimulation of small pain fibres by abdominal incision[2] have both been shown to be remotely cardioprotective and are likely to be neurally mediated. We hypothesised that these modes of remote preconditioning share similar efferent pathways to RIPC and that spinal opioid receptors are important in this process.
Materials and Methods: Using an open chest model in anaesthetised rats, saline (Control), the non specific OR antagonist naloxone methiodide (NM) and specific δ, κ and μ OR antagonists (NTD, nor BNI & CTOP) were respectively introduced into the intrathecal space through a chronic indwelling polyethylene catheter. The autonomic ganglion blocker hexamethonium (HEX) was given intravenously (IV) to evaluate the role of neural singalling in this porcess. RIPC and classical ischaemic preconditioning (IPC) was achieved using 3 cycles of 5 mins arterial occlusion alternating with 5 mins reperfusion of the right femoral and left coronary arteries (LCA) respectively. Thereafter, myocardial ischaemia reperfusion injury was induced by 30 mins of LCA occlusion followed by 120 mins reperfusion. The infarct size expressed as a percentage of area at risk (IS/AAR) was determined using triphenyltetrazolium staining.
Results: Both NM and IV HEX abolished the cardioprotective effects of RIPC but not IPC. In the OR subtype analysis, only the μ but not the δ or κ OR antagonist, block the protective response.



[Effect of intrathecal opioid antagonists on RIPC]

Conclusions: Spinal mu opioid receptors play a role in the relaying signals in RIPC. The spinal cord can therefore be considered both as an initiator and intermediary of remote cardioprotection and may have potential therapeutic implications.

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4AP5-4

Helium-induced conditioning of the hypertensive rat heart

Oei G.T., Huhn R., Hollmann M.W., Schlack W., Preckel B., Weber N.C.
University of Amsterdam, Department of Anaesthesiology, Amsterdam, Netherlands

Background and Goal of Study: Administration of 70% helium before or after prolonged coronary occlusion reduces infarct size, and is referred to as pre- or postconditioning, respectively [1]. Cardioprotective effects are diminished in diseased states, such as diabetes [2]. From a clinical point of view the question arises whether the hypertensive heart can also be protected by helium-induced conditioning.

Materials and Methods: Male, chloralose-anaesthetised Spontaneously Hypertensive 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 70% helium reduced myocardial infarct size from 53±8% in CON to 39±10% in LPC+EPC+PostC ($p < 0.05$). PostC alone (48±10%) or PostC with LPC (44±13%) was not protective in comparison to control.

Conclusion(s): These results show that a triple intervention of helium conditioning is cardioprotective in the hypertensive rat heart *in vivo*. Helium-induced PostC alone or the combination of LPC and PostC was not protective.

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4AP5-5

Mitochondrial-directed therapy to reduce cardiac ischemia-reperfusion injury

Riess M.L., Gadicherla A., Yang M., Camara A.K.S., Aldakkak M., Stowe D.F.
Medical College of Wisconsin, Department of Anesthesiology, Milwaukee, United States

Background and Goal of Study: Mitochondria can contribute or cause ischemia-reperfusion (IR) injury. A deficit of O_2 and substrates (e.g. ischemia) inhibits the proton pumps and the orderly flow of electrons through the mitochondrial (m) respiratory complexes for developing the membrane potential to drive ATP synthesis. Ranolazine (RAN), a late Na^+ current blocker and antianginal drug, is cardioprotective against experimental IR injury; part of this protection may derive from mitochondrial mechanisms.

Materials and Methods: We used spectrophotofluorimetry of isolated hearts with dihydroethedium (DHE, a marker for superoxide) and indo 1 (a marker of $m[Ca^{2+}]$), as well as electron paramagnetic resonance (EPR), blue native polyacrylamide gel electrophoresis (BN-PAGE), and Na-dodecyl-SO_4 (SDS) PAGE plus 3-nitrotryosine antibody (3-NT), to examine how RAN preserves mitochondrial function and thus cell viability. Guinea pig hearts were isolated, perfused with crystalloid solution (97% O_2) and treated with 10 μM RAN for 10 min before 30 min global ischemia followed by reperfusion. A trifurcated fiberoptic probe was placed against the LV free wall to excite and emit filtered light to assess $m[Ca^{2+}]$ and superoxide.

Results and Discussion: RAN improved contraction (73% of control) vs. ischemia alone (50% of control) and reduced superoxide levels by 30% on reperfusion. Mitochondria isolated at 10 min reperfusion underwent several tests: EPR spectral changes at 10ºK showed that RAN protected against oxidative damage to specific mitochondrial Fe-S clusters in complex I and reduced superoxide. Western blotting showed RAN restored the integrity of respiratory supercomplexes (BN-PAGE) and reduced nitrative damage (e.g. nitration of tyrosine residues by peroxynitrite) of several mitochondrial proteins (SDS-PAGE, 3-NT antibody). RAN also preserved cardiolipin integrity and increased the amount of matrix $[Ca^{2+}]$ required to induce permeability transition pore opening and apoptosis.

Conclusions: RAN treatment before IR injury protects mitochondria and cardiac function in a number of ways to reduce injury induced by Ca^{2+} and free radicals. Identification of selective sites of mitochondrial damage during cardiac IR injury may furnish more rational approaches to selectively treat mitochondria with drugs that will have specific beneficial effects on mitochondria, and therefore, on cell function.

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4AP5-7

Genome-dependent cardioprotection is linked to preservation of mitochondrial function

Riess M.L., Nabbi R., Aldakkak M., Lazar J., Kersten J.R., Stowe D.F.
Medical College of Wisconsin, Department of Anesthesiology, Milwaukee, United States

Introduction: Protection against myocardial ischemia-reperfusion (IR) injury may be genome-dependent since, e.g., the degree of IR injury in Brown Norway (BN) rats differs remarkably from Dahl Salt Sensitive (SS) rats, with BN being more resistant to IR injury than SS.[1] Yet, the exact mechanisms have not been elucidated. Functional and structural myocardial damage is associated with mitochondrial (m)Ca^{2+} overload.[2] In addition, better preserved mCa^{2+} retention capacity[3] on reperfusion has been shown to be linked to cardioprotection. We hypothesized that preservation of mitochondrial function and tolerance to IR injury correlates with protection of global myocardial function and viability and therefore may be genome-dependent in this genetic rat model.

Methods: Langendorff-prepared hearts from eight week old male BN and SS rats were subjected to 30 min global no-flow ischemia. After 30 min of reperfusion, mitochondria were isolated and mCa^{2+} retention capacity was assessed by measurement of m membrane potential (ψ_m) using rhodamine 123 fluorescence. 10 μM $CaCl_2$ were added every 60 sec until ψ_m was completely depolarized indicating mitochondrial dysfunction.

Results: We found that mitochondria from reperfused SS hearts tolerated fewer $CaCl_2$ pulses to induce ψ_m collapse, thus having lower mCa^{2+} retention capacity compared to BN hearts.

Conclusion: Myocardial ischemia increases mCa^{2+} due to cytosolic Ca^{2+} increase which is one of the major factors of IR injury.[4] Our data indicates that BN mitochondria have a greater resistance to mCa^{2+} overload and ψ_m collapse and thus are more IR tolerant than the ones from the less protected SS hearts. This differential mitochondrial protection suggests that protection of mitochondrial function during IR is genome-dependent and plays a pivotal role for cardioprotection in this genetic rat model.

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4AP5-8

Remote ischaemic preconditioning regulates protein expression in the myocardium

Bauer I., Romanski P., Dyballa N., Heinen N.M., Pannen B.H., Metzger S.
University Hospital Duesseldorf, Department of Anaesthesiology, Duesseldorf, Germany

Background and Goal of Study: Remote ischaemic preconditioning (RIPC) by limb ischaemia reduced infarct size and troponin T release after myocardial ischaemia in the rat *in vivo* (1). The exact molecular mechanisms of cardiac protection by RIPC are unclear. Goal of the study was to identify differentially expressed proteins in myocardial tissue after RIPC.

Materials and Methods: After approval of the local animal use and care committee male Wistar rats were randomised into 4 groups.

Group 1: sham-operated controls (Sham; n=6).

Group 2: RIPC was induced by 4x5 minutes tourniquet ischaemia of both hind limbs (RIPC; n=6).

Group 3: Animals were subjected to 30 minutes myocardial ischaemia by coronary artery occlusion followed by 2 hours of reperfusion (I/R; n=8).

Group 4: Animals underwent RIPC followed by I/R (RIPC-I/R; n=8). Hearts

were excised immediately after the RIPC stimulus or sham operation (groups 1 and 2) or at the end of the reperfusion phase (groups 3 and 4). Subcellular fractions of proteins (cytosolic, mitochondrial, membrane, and nuclear fraction) were obtained by differential lysis and centrifugation. Cytosolic proteins were separated with 2D-gel electrophoresis using different pH ranges (pH 4-7; pH 6-11).
Differentially expressed proteins were detected with computer-assisted analysis of coomassie stained gels and identified with mass spectrometry.
Results and Discussion: First results show that RIPC significantly reduced the expression level of three proteins in the cytosolic fraction in the pH range 4-7 compared to sham-operated controls [$p < 0.05$ (ANOVA)].
Conclusion(s): Immediately after the RIPC stimulus a differential protein expression is observed in myocardial tissue. After analysis of the different subproteome fractions and identification of the proteins further studies are required to clarify whether the observed regulation contributes to the cardioprotective effect of RIPC.
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4AP5-9

Interaction between microRNA-1 and brain derived neurotrophic factor in the context of remote ischemic preconditioning

Grievink H., Stachuletz F., Heinen N., Bauer I., Brandenburger T.
University Hospital Duesseldorf, Department of Anaesthesiology, Duesseldorf, Germany

Background and Goal of Study: Micro-RNAs (miRs) are small noncoding RNAs that regulate gene expression by targeting mRNAs by partial sequence matching resulting in translational inhibition or directing their degradation. MiRs have been reported to have important roles in a variety of biological and pathlogical processes, including ischemic heart disease. Remote ischemic preconditioning (RIPC) has been shown to protect the heart against subsequent ischemia. However, the exact molecular mechanisms remain to be elucidated. We recently found the most abundant cardiac miR-1 being significantly down regulated by RIPC.
One of the in this study identified miR-1 target genes is the Brain Derived Neurotrophic Factor (BDNF). Whether or not BDNF plays a role in RIPC is currently unknown. Interestingly, the application of BDNF together with the basic fibroblast growth factor has been shown to improve angiogenesis and cardiac function in the ischemic heart[1]. In this study the interaction between BDNF, and mature miR-1 was investigated.
Materials and Methods: Potential targets of miR-1 were identified using TargetScan (www.targetScan.org). The sequences containing the potential miR-1 target sites were introduced into the multiple cloning site (MCS) of the pMIR-REPORT Luciferase miRNA Expression Vector. PCR amplified rat miR-1 cDNA fragments were introduced into the MCS of pcDNA3.1(+) vector. Both plasmids were co-transfected into HEK293 cells. The pMIR-REPORT -galactosidase vector was added as an internal control. Activities of firefly luciferase were measured and normalized against a control of which the putative miR-1 binding region was disrupted by site-directed mutagenesis.
Results and Discussion: Three separate regions in the 3' untranslated region (3'-UTR) of the BDNFmRNA were identified by TargetScan as potential miR-1 targets. Co-transfection of the putative miR-1 target regions together with miR-1 into HEK293 cells revealed a significant reduction in luciferase activity compared to the control.
Conclusion(s): The results presented here show that miR-1 interacts with the 3'-UTR of BDNF. Decreasing the miR-1 levels after RIPC could lead to increasing amounts of BDNF in rat cardiomyocytes, thereby contributing to cardiac protection. Future experiments have to be conducted to confirm a potential role of BDNF in cardiac protection.
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4AP6-1

Prognostic value of the intraoperative tissue doppler-derived index E/e' after non- cardiac surgery

Cabrera Schulmeyer M.C., Arriaza N., De la Maza J.
Universidad de Valparaiso, Department of Anaesthesiology, Santiago, Chile

Background and Goal of Study: Intraoperative transoesophageal echocardiography (TEE) is one of the most important advances in cardiovascular monitoring in the last few years. Intraoperative TEE is useful for the assessment of diastolic function of the left ventricle (LV). However, mitral flow depends on multiple factors, including the ventricular relaxation, atrial suction, ventricular compliance and left atrial pressure. Tissue Doppler imaging (TDI) is a relatively new ultrasound tool that measures regional myocardial velocities in systole and diastole.
TDI focuses on the high-intensity, low- velocity echoes of the myocardium and could be a valuable addition to mitral inflow as it can overcome these limitations. This has been shown to be a predictor of diastolic filling.
Recently, the ratio of the early transmitral flow velocity and the early mitral annular velocity (E/e') by the TDI technique has been proposed as a more accurate index of LV filling pressure and therefore a stronger predictor of complications. The purpose of this study was to investigate the relationship between intraoperative E/e' and postoperative cardiovascular complications and length of ICU and hospital stays in high risk cardiovascular patients.
Materials and Methods: Diastolic function was evaluated by conventional pulsed-wave Doppler and pulsed wave TDI. Peak early (E) and late (A) LV inflow velocities, were measured at the mid-esophageal four-chamber view. Peak early diastolic myocardial velocity (e'), peak late diastolic myocardial velocity (a') and systolic velocity (s') were obtained from the mid-esophageal four-chamber view with the pulsed-wave TDI placed in the septal and lateral mitral annular sites. A total of 42 patients were enrolled and divided into three groups: E/e' < 8 (normal LV filling pressure= 12 patients), E/e' 8-15 (moderately increased =18 patients) and E/e' > 15 (severely increased = 11 patients).
Results and Discussion: An elevated E/e' ratio was significantly associated with increased postoperative cardiovascular events, such as hypotension, pulmonary congestion arrhythmias and with longer ICU and hospital stays.
Conclusions: These data suggest that the tissue Doppler index E/e' may be a useful indicator for predicting morbid events after a non-cardiac surgery. Furthermore, patients with an elevated intraoperative E/e' may need more careful postoperative management.

4AP6-2

Intraoperative ejection fraction: Comparison of Simpson method and Tissue Doppler Imaging

Cabrera Schulmeyer M.C., Farias J., Arriaza N., Semertzakis I., Labbé M., De la Maza J.
Universidad de Valparaiso, Department of Anaesthesiology, Santiago, Chile

Background and Goal of Study: Transoesophageal echocardiography (TOE) allows an adequate intraoperative hemodynamic monitoring. A parameter frequently used for the assessment of systolic function is the ejection fraction (EF) measured by Simpson method. This method is dependent on the quality of images and left ventricular (LV) geometric shapes.
With the advent of tissue Doppler imaging (TDI) and measurement of the longitudinal systolic function (s') velocity, ejection fraction could be estimated more quickly and easily during anesthesia, since s' is not affected by the quality of the images or geometric shape.
Objectives: To research the relatioship between systolic myocardial velocity (s') obtained by TDI and LVEF calculated with Simpson's method.
Material and Methods: Patients with chronic cardiovascular disease (previous myocardial infarction; positive preoperative exercise or stress testing; moderate or severe aortic stenosis; history of left ventricular failure and pulmonary hypertension) undergoing cardiac and noncardiac surgery were studied.
Patients in non sinus rhythm and with mitral disease were excluded. End diastolic volume (VFD) and end systolic volume (ESV) were measured in 4 and 2 chamber to calculate the FE with the method of Simpson. This group was divided into those with normal EF (> 50%) and a second group with decreased EF (EF < 49%). Then TDI cursor was placed at the septal and lateral side of the mitral annulus and an average value of both sites represented the velocity of the wave s'. To estimate FE using s' ,the following formula was applied: $EF = 5.5 \times s' + 8$.
Results and Discussion: 92 patients (298 measurements) were studied, 51(55%) cases with normal EF and 41 (45%) with reduced EF. The group with EF < 50% had a strong correlation with the EF calculated with Simpson method and s' ($r = 0.91$, $p < 0.01$)).
Instead the group with normal EF the correlation was lower ($r = 0.61$, $p > 0.5$). The cutoff value of s' < 4.1 cm/s for identifying patients with LVEF < 30% had a sensivity of 94%, a specificity of 86%, a positive predictive value of 75%, a negative predictive value of 95% and an accuracy of 88%.
Conclusion: The estimated EF with TDI technique is easily obtained, reproducible and practical. It's usefulness could be increased especially in patients who have an altered VI. As EF is one of the most important determinant of prognosis and treatment strategy, it can be very useful during anesthesia.

4AP6-3

Acute normovolemic hemodilution during CABG induces diastolic dysfunction: A perioperative transesophageal echocardiography study

Momeni M., Van Dyck M., Aranda F, Watremez C.
Cliniques Universitaires St Luc, Department of Anaesthesiology, Brussels, Belgium

Background and Goal of Study: A previous study has shown that Acute Normovolemic Hemodilution (ANH) during CABG improves diastolic function.[1] It is however based on transmitral doppler indices that are preload dependent.[2] Tissue doppler imaging (TDI) could overcome this problem.
Materials and Methods: After Ethical approvement and informed consent, 51 patients (subgroup of another study) with normal systolic function and hemoglobin values were prospectively randomized to ANH group or C (control) group. In ANH group, a precalculated amount of blood was withdrawn and replaced with colloids after the induction of anesthesia. Hemodynamic and echocardiographic parameters were recorded after anesthesia induction (T0), after ANH (T1) and 15 minutes post sternotomy (T2). After the confirmation of normal distribution, student t-test was used.
Results and Discussion: The demographic data of the patients are shown in table 1.

	ANH(N=30)	C(N=21)	P
Age(Y,mean±SD)	66±8	59±8	0,007
SEX:Male/Female(N)	29/1	17/4	0,06
Previous myocardial infarction(N)	6	1	0,14
Hypertension(N)	25	15	0,48
Diabetes(N)	10	6	0,81
Hypercholesterolemia(N)	26	18	0,72

[Characteristics of both groups]

There were no significant differences between both groups regarding the hemodynamic and echocardiographic parameters at T0, as demonstrated in table 2.There was no correlation between the total number of distal anastomoses, the hemoglobin change and diastolic parameters in ANH group. P< 0,05 within group compared to baseline was considered statistically significant (*). Data are expressed as mean±SD.

	ANH T0	T1	T2	C T0	T2
Cardiac Index (L/min/m2)	1,9±0,4	2,2±0,5*	2,4±0,6*	1,9±0,3	2,2±0,6
Pulmonary Venous Ar duration(ms)	122±30	151±34*	141±29*	129±39	133±48
E'(cm/s):Mitral inflow tissue doppler	6,5±2,5	7,4±2,5*	7,4±2,6*	6,4±2,4	7,3±2,7
E/E'	8,3±3,8	9,7±4,1*	9,5±4,6*	9,8±4,8	9,2±3,3
Propagation Velocity(cm/s)	42±21	49±27	42±21	48±19	52±24
E/Vp	1,51±0,92	1,77±1,24*	1,87±1,12*	1,45±0,64	1,55±1,01

[Hemodynamic and echocardiographic parameters]

Conclusion(s): Our preliminary data show that, in contrast to a previous study, ANH induces diastolic dysfunction as assessed by preload independent diastolic indices.This raises questions about the safety of ANH in patients with coronary artery disease, despite the observed improvement in systolic function.
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4AP6-4

Myocardial contrast echocardiography for the study of perioperative myocardial perfusion

Bulte C.S.E., Slikkerveer J., Kamp O., Loer S.A., Boer C., Bouwman R.A.
VU University Medical Center, Department of Anaesthesiology, Amsterdam, Netherlands

Background: General anesthesia is associated with an increased activity of the sympathetic nervous system, which may lead to alterations in myocardial blood flow (MBF). Historically, the lack of a suitable, intraoperative imaging technique impeded investigation of the influence of general anesthesia on MBF. Myocardial contrast echocardiography (MCE) is a noninvasive, bedside method for assessment of MBF using ultrasound contrast agents consisting of gas-filled microbubbles.
It is unclear whether this technique is applicable in the intraoperative setting, since positioning of the anesthetized patient and mechanical ventilation may influence the quality of transthoracic images necessary for quantification of flow. Therefore, the aim of this study was to investigate the feasibility of MCE for intraoperative measurement of MBF and to study the effect of general anesthesia on myocardial perfusion.
Methods: Eight cardiovascular healthy patients (3 women, 5 men; age 33-68 years) scheduled for general anesthesia were included. MCE was performed before and during the administration of 1.0 MAC sevoflurane and included MBF measurements at rest and during adenosine-induced hyperemia. MCE provides absolute quantification of MBF in ml/min/g tissue by analysis of replenishment curves obtained during continuous contrast infusion (Sonovue, Bracco, Switzerland). Flow reserves were calculated by $MBF_{hyperemia}/MBF_{rest}$. Data are presented as mean ± SD. Paired t-tests were used for comparison of dependent samples. A p-value < 0.05 was considered to reflect a significant difference.
Results: In the preoperative setting, basal MBF was 1.13 ± 0.38 ml/min/g and increased to 3.38 ± 0.73 ml/min/g during adenosine-induced hyperemia (p< 0.0001). In all patients intraoperative opacification of the myocardium was feasible resulting in a basal MBF of 1.17 ± 0.30 ml/min/g, which increased to 2.18 ± 0.41 ml/min/g during hyperemia (p=0.001). Alterations in MBF in response to adenosine-induced hyperemia were comparable for the preoperative and intraoperative measurements, indicated by flow reserves of 3.5 ± 2.1 and 2.0 ± 0.9 respectively (p=0.07).
Conclusion: Quantification of myocardial blood flow using myocardial contrast echocardiography is safe and feasible in the intraoperative setting. These preliminary data show no significant difference in flow reserve for the preoperative and intraoperative setting. However, more measurements should be performed to confirm this observation.

4AP6-5

Predicting fluid responsiveness by echocardiography: A comparison between experienced and novice users

Gruenewald M., Meybohm P., Broch O., Renner J., Caliebe A., Bein B.
University Hospital Schleswig Holstein, Campus Kiel, Department of Anaesthesiology and Intensive Care, Kiel, Germany

Background and Goal of Study: Predicting fluid responsiveness is a major issue in the therapy of high-risk patients. Eyeballing long axis views obtained by transoesophageal echocardiography (TEE) has shown to provide helpful information concerning fluid responsiveness following resuscitation from cardiac arrest (1). The aim of the present study was to evaluate and compare the performance of either experienced (certified) or inexperienced (novice) echocardiographers to predict fluid responsiveness in the post-cardiac arrest period.
Materials and Methods: TEE was performed and recorded using mid-oesophageal long-axis views in pigs before a 5 ml/kg fluid bolus at baseline, and both 1 and 4 hours after cardiopulmonary resuscitation (CPR) (1). TEE loops were presented in a randomized order to 7 TEE-experts (certified by the German Society of Anaesthesiology and Intensive Care [DGAI]) and 14 inexperienced TEE novices who were asked to predict whether the ventricle displayed on the loop increased stroke volume ≥15% after fluid administration, which was further determined by transpulmonary thermodilution. Statistics were performed calculating Cohen's Kappa and concordance rates of the two groups.
Results and Discussion: A total of 882 ratings of 21 echocardiographers was included into analysis. Overall, best prediction of fluid responsiveness was recorded 1 hour after CPR with median sensitivity (95% CI) of 100% (89 - 100%) and specificity of 67% (61 - 72%). No significant difference was determined between ratings of experienced and inexperienced echocardiographers. The concordance rate in the two groups was comparable. Results are presented in Table 1.

	Experienced raters	Inexperienced raters
Baseline - Kappa (CI)	0.20 (0.092-0.31)	0.37 (0.32-0.43)
concordance rate	0.70	0.74
1h after CPR - Kappa (CI)	0.60 (0.49-0.71)	0.45 (0.40-0.50)
concordance rate	0.80	0.73
4h after CPR - Kappa (CI)	0.33 (0.21-0.44)	0.27 (0.22-0.33)
concordance rate	0.69	0.65

Cohen's Kappa and concordance rate of experienced and inexperienced echocardiographer

[Table 1]

Conclusion(s): Experienced are not superior to inexperienced echocardiographers in terms of evaluating a single long-axis TEE loop for prediction of fluid responsiveness.

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4AP6-6

Impact of intraoperative transesophageal echocardiography in cardiovascular and thoracic surgery

Tresandí Blanco D., Oyola J.C., Gómez I., Magaldi M., Fita G., Matute P.
Hospital Clinic de Barcelona, Department of Anaesthesiology, Barcelona, Spain

Introduction: The intraoperative transesophageal echocardiography (TEE) allows to identify undiagnosed conditions, monitor preload and ventricular function and control the surgical results .

Objective: Assessment of the impact of intraoperative TEE in cardiac, vascular and thoracic surgery.

Patients and Methods: Prospective study of 630 patients undergoing cardiovascular and thoracic surgery. The TEE examination was performed at the following times:

(1) - TEE basal: before entering cardiopulmonary bypass (CPB), which compared with previous echocardiographic reports,

(2) - post-CPB TEE after disconnection from CPB, to assess possible residual defects after surgery.

The term "New finding" has been defined as any structural or functional alteration that had neither been described in the pre-surgery echocardiography, nor diagnosed when leaving the CPB.The term "Change in the surgical procedure" has been defined as those cases where:

(1) - as a consequence of the baseline examination with TEE changes were made to the initial surgical plan,

(2) - The TEE examination post-CBP resulted in CBP reentering for the correction of residual defects.

Results: Out of 630 patients:

61 patients (9.6%) were diagnosed with "new findings".

- 24 patients (3.8%) were subject to changes in the surgical treatment before the CBP.
- 22 patients (3.4%) were diagnosed with post-surgical residual defect at the exit of CBP, leading to reenter CBP. [Incomplete mitral valve repair being the most common defect (11/22 patients, 50%)]
- Overall, the use of intraoperative TEE resulted in changes to the surgical treatment of 46 (7.3%) patients.

Conclusions: As a result of our study, we concluded that the use of Intraoperative TEE not only helped to identify "new findings" with regard to the patients but also resulted in changes in the surgical procedure.

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4AP6-7

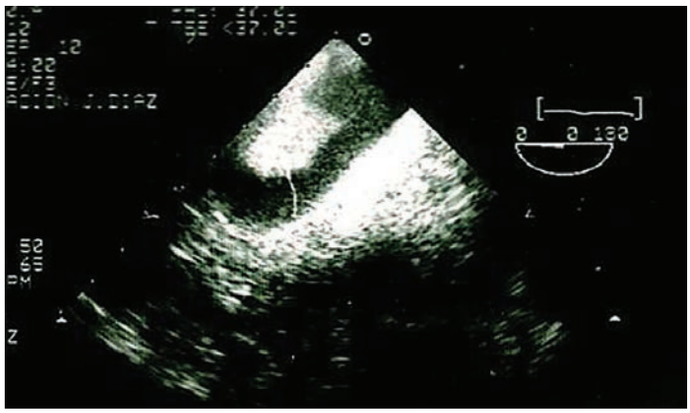
Floating thrombus in the aortic arch and hyperhomocysteinemia: A rare case of renal embolia

Alvarez Rementería R., Masip N., Jiménez Pancho A.I., Calderón P., Heredero A., Muñoz Alameda L.E.
Fundación Jiménez Díaz Capio, Department of Anaesthesiology, Madrid, Spain

Background and Goal of Study: A giant floating thrombus in the aortic arch in an apparently normal thoracic aorta with no other disease is a rare condition that is generally detected after cerebral, visceral, or peripheral embolization.

Materials and Methods: We report a case of a 45 year-old male, smoker, drinker, who presented with acute lumbar pain. A multislice computed thomography revealed a pedunculated mass in the aortic arch and an image compatible whit an embolic event in the left kidney. Emergency surgery for resection of the aortic mass was indicated. Transoesophageal echocardiography was performed and shows an image suggestive of a large floating thrombus in arch aortic and apparent normality of the rest of aorta (fig1).

Resection was performed through a longitudinal aortotomy during deep hypothermic circulatory arrest. Postoperative course was uneventful. Histology revealed thrombus material. Thrombophilia study showed high plasma values of homocysteine (75,8 mmol/l; normal values 6,6-14,8 mmol/l) being the patient homozygous carrier of the mutation C677T on the MTHFR gene. The patient was discharged on oral anticoagulation, folic acid, vit B and statins theraphy. On 3 months follow-up the patient had returned to normal activity.



[Fig 1]

Results and Discussion: Coagulation abnormality have been associated with aortic mural thrombi. Homocysteine has been associated with a higher risk of clots formation and vascular disease. Deficiencies folic acid, pyridoxine or cyanocobalamin can lead to high homocysteine levels. In the literature there is no general consensus how to treat a symptomatic floating aortic thrombus. Surgery should be considered in gigant mobile thrombi in order to avoid systemic embolization.

Conclusion(s): Reviewed the literature, this is the first reported case describing the association between homocysteina and giant thrombus in the aortic arch and renal embolsm. Urgent surgical remove can be performed safely.

4AP6-8

Perioperative atrial fibrillation in cardiac surgery patients: Echocardiographic findings

Darias Delbey B., Hernandez Beslmeisl J., Raja L., Arribas C., Diaz B., Llanos C.
Hospital Universitario de Canarias, Department of Anaesthesiology, San Cristobal de La Laguna, Spain

Background and Goal of Study: Postoperative atrial fibrillation (AF) is one of the most frequent complications after cardiopulmonary bypass (CPB).

The aim of the present study was to investigate the correlation between preoperative left atrial dysfunction assessed by tissue Doppler and postoperative new-onset atrial fibrillation (NOAF) after coronary artery bypass grafting (CABG).

Materials and Methods: Preoperative transthoracic echocardiography Doppler was performed to elective cardiac surgery patients. Left atrial function was evaluated with tissue Doppler imaging of the mitral annulus (TDIm).

Results and Discussion: We studied 92 patients, 73 (79%) males and 19 (21%) females, mean age 67 ±10 years, in preoperative sinus rhythm who underwent elective CABG surgery under CPB. Nineteen patients (20.6%) developed NOAF at 34±12 postoperative hours. Patients with NOAF were older (71±7 vs 66±10, $P=0,034$), had a larger left atrial diameter (LAD), lower peak atrial systolic mitral annular Doppler velocity (A'm) and higher E'/A' ratio in a bivariated analysis. Stepwise logistic regression analysis showed that LAD [OR 2,23, 95%CI: 1,05-4,76; $P=0,033$] and lower (A'm) [OR 0,70, 95%CI: 0,55-0,99; $P=0,034$], were independently associated with postoperative NOAF

Conclusion(s): A preoperative left atrial dysfunction assessed by tissue Doppler imaging may identify the patients at risk of postoperative NOAF.

4AP6-9

Milrinone improves left internal thoracic artery spasm after coronary revascularization intraoperatively diagnosed by transesophageal echocardiography

Kumemura M., Omae T., Imakiire N., Kanmura Y.
Kagoshima University, Graduate School of Medical and Dental Sciences, Department of Anaesthesiology and Intensive Care, Kagoshima, Japan

Background: Perioperative spasm of the left internal thoracic artery (LITA) is a life-threatening complication after coronary revascularization that can lead to circulatory collapse. However, intraoperative diagnosis of LITA spasm after coronary revascularization has not been reported.

Here, we describe three patients in whom transesophageal echocardiography (TEE) confirmed spasm of the LITA during cardiac surgery and milrinone, a

novel phosphodiesterase-3 inhibitor (PDE-3 inhibitor), alleviated the spasm and improved hemodynamics.

Case:

Case 1: A 68-year-old man developed dyspnea upon exertion, and preoperative coronary angiography revealed advanced mid-left anterior descending coronary artery (LAD) disease and confirmed moderate mitral regurgitation (MR). Thus, coronary revascularization and mitral valve plasty (MVP) were indicated. The operation was performed from the LITA to the LAD, and then the patient was weaned from extracorporeal circulation (CPB). Diastolic-dominant LITA flow without asynergy of the left ventricle was confirmed by TEE. Circulatory failure developed after sternal closure and electrocardiography revealed ST-segment elevation. Milrinone (50 μg/kg) were administered i.v. as the MAP declined to 40 mmHg. Five minutes later, TEE confirmed diastolic-dominant flow in the LITA.

Case 2: A 76-year-old woman exhibited a cardiac murmur and thorough testing confirmed MR, thus indicating a need for mitral valve replacement. Five years before, she had undergone coronary revascularization from the LITA to the LAD. Preoperative coronary angiography revealed that all grafts were patent.

The mitral valve was replaced and the patient was weaned from CPB, but circulatory failure developed. TEE confirmed diastolic-dominant flow in the LITA.. Milrinone (50 μg/kg) was administered i.v. Four minutes later, TEE confirmed diastolic-dominant LITA flow.

Case 3: A 73-year-old mandeveloped substernal chest pain and dyspnea on exertion. We confirmed unstable angina and preoperative CAG showed stenosis of coronary artery, indicating a need for urgent coronary artery bypass surgery. When coronary revascularization was completed, TEE showed absent diastolic flow in the LITA. Milrinone (50 μg/kg) was administered i.v. Four minutes later, TEE confirmed diastolic-dominant LITA flow.

Conclusion(s): TEE assessment of LITA flow is a clinically feasible method of detecting spasm of the LITA, while milrinone helps to alleviate such spasm.

4AP6-10

Is exacerbation of mitral regurgitation during OPCAB anastomosis due to leaflet tethering?

Imakiire N., Omae T., Matsunaga A., Kanmura Y.
Kagoshima University, Graduate School of Medical and Dental Sciences, Department of Anaesthesiology and Intensive Care, Kagoshima, Japan

Background and Goal of Study: Off-pump coronary artery bypass surgery (OPCAB) is becoming more frequently performed. However, exacerbated mitral regurgitation (MR) plays an important role in worsening hemodynamics. We postulated that exacerbated MR during OPCAB is due to ischemic mitral regurgitation (IMR), and we compared exacerbated MR between inferior and anterior infarctions.

Materials and Methods: This study included 56 and 131 patients without and with prior myocardial infarction (MI), respectively, who underwent elective surgery. Those with prior MI included 63 and 68 patients with anteroseptal and inferior MI, respectively, who underwent OPCAB. The severity of MR was determined as the effective regurgitant orifice area (EROA). Tenting area, tenting height, tethering distance and hemodynamic variables were compared between baseline and during anastomosis OPCAB.

Results and Discussion: Patients with both inferior and anterior MIs had significantly lower ejection fraction (EF) than those without prior MI, and the reduction in EF was significantly greater in patients with anterior than inferior MI.The tenting area was significantly increased in patients with both anterior and inferior MI (P = 0.003) and the increase was significantly greater in patients with inferior than with anterior MI. The tethering length was significantly increased in patients with inferior than anterior MI (P = 0.02).

Patients with both inferior and anterior MIs had a significantly larger EROA than patients without prior MI during anastomosis (P = 0.0004), and the increase in EROA was significantly greater in patients with inferior than anterior MI (P = 0.01).

No significant differences were identified in patients with no prior MI.The increase in tenting height, tethering length, and tenting area were significantly greater in patients with anterior and inferior MIs during anastomosis, especially the latter.

The present study proved that tethering exacerbates MR during OPCAB anastomosis. The effects of posterior papillary muscle displacement on IMR are significant in patients with inferior MI. Our data also support the notion that papillary muscle displacement is important for exacerbating IMR during anastomosis.

Conclusion(s): Mitral regurgitation was significantly exacerbated during OPCAB anastomosis in patients with posterior MI. The cause of exacerbated MR during OPCAB is tethering due to IMR.

4AP7-1

Ability of non invasive and continuous arterial pressure monitoring (Nexfin) to improve intraoperative hemodynamic management

Chen G., Meng L., Alexander B., Kain Z.N., Joseph R., Cannesson M.
University of California Irvine, Department of Anaesthesiology, Orange, United States

Background and Goal of Study: Nexfin HD (BMEYE B.V, Amsterdam, Netherlands) allows for non-invasive and beat-to-beat blood pressure (BP) monitoring. Because this monitoring is continuous, it may have the ability to detect significant changes in BP (BP_{nxf}) earlier than conventional BP cuff monitoring (BP_{cuff}) (every 5 minutes). Since the duration of intraoperative hypotension and hypertension has been linked to postoperative outcome, this feature may improve the clinical management of patients. The goal of the present study was to assess the ability of this device to decrease the duration of significant intraoperative hypo- or hypertension compared to a BP_{cuff}.

Materials and Methods: We studied 25 patients (ASA I-III) undergoing either abdominal or orthopedic surgery. BP_{cuff} was monitored every 5 minutes from the beginning of the surgery. BP_{nxf} was monitored continuously on the opposite arm. When Systolic BP_{nxf} (SBP_{nxf}) decreased or increased more than 20%, this change in BP was checked using the SBP cuff. The time interval between the >20% change in SBP_{nxf} and the next BP_{cuff} measurement was recorded for each event.

Results and Discussion: We enrolled 25 patients (age 47±15 yrs, weight 86±20 kg and height 170±17cm). The mean length of surgery was 3.0±0.25 hours. Significant hemodynamic changes in BP_{nxf} were confirmed by BP_{cuff} in 81.9% of the cases. On average, patients presented with 11 ± 4 episodes of hypotension and 12 ± 4 episodes of hypertension during the surgery. The average time it itook for both devices to detect hypotension or hypertension is shown in Table 1. If BP_{cuff} had been used, this would have resulted in 22 ± 10 min of hypotension per case and 25 ± 9 minutes of hypertension per case. If BP_{nxf} had been used instead, the times would have been 3 ± 1 minutes of hypotension per case ($p < 0.001$) and 3 ± 1 minutes of hypertension per case ($p < 0.001$).

	Nexfin	Cuff	P-value	Difference (Cuff-Nexfin)
Hyper- or Hypotension (seconds) (n=580 pairs)	18.4±4.0	124.0±41.5	<0.001	95.5±45.5
Hypertension (seconds) (n=302 pairs)	18.9±3.9	125.3±41.8	<0.001	97.3±50.0
Hypotension (seconds) (n=278 pairs)	18.1±4.2	121.9±42.0	<0.001	92.4±51.3

[Time Before Devices Detected Hypo- or Hypertension]

Conclusion(s): The Nexfin BP device has the ability to decrease the intraoperative duration of hypotension and hypertension compared to conventional intermittent BP_{cuff} monitoring. Therefore, this device has the potential to positively impact clinical outcomes.

4AP7-2

Goal-directed therapy guided by transpulmonary thermodilution or pulmonary artery catheter in combined valve surgery

Lenkin A., Kuzkov V., Smetkin A., Paromov K., Slastilin V., Kirov M.
Northern State Mediacl University, Department of Anaesthesiology and Intensive Care, Arkhangelsk, Russian Federation

Background and Goal of Study: Combined valve surgery represents a high-risk cardiac intervention frequently accompanied by hemodynamic disorders and deterioration of oxygen transport. The aim of our study was to find out whether treatment algorithms guided either by transpulmonary thermodilution or by pulmonary artery catheter (PAC) influence perioperative hemodynamic management and outcome after combined valve surgery.

Materials and Methods: We enrolled 40 patients who underwent elective complex valve replacement/repair (2 or more valves) with total intravenous anaesthesia (propofol and fentanyl). The adequacy of valve repair was confirmed by intraoperative echocardiography. The patients were randomized into two groups of hemodynamic monitoring: pulmonary thermodilution (PAC) group (n=20) and transpulmonary thermodilution (TPT) group (n=20). The PAC group was monitored by LifeScope (Nihon Kohden, Japan) with measurements of heart rate (HR), mean arterial pressure (MAP), cardiac index (CI), pulmonary artery occlusion pressure (PAOP) and hemoglobin (Hb). In the TPT group, therapy was guided by HR, MAP, CI, Hb, global end-diastolic vol-

ume (GEDV), extravascular lung water (EVLW), central venous oxygen saturation and oxygen delivery ($PiCCO_2$, Pulsion Medical Systems, Germany). The hemodynamic measurements were performed after induction of anaesthesia, at the end of surgery, and during 24 hrs postoperatively. The data were assessed using ANOVA and presented as mean±SD. The discrete data were analyzed by chi-square test or Fisher's exact test.

Results and Discussion: At the end of surgery, MAP and systemic vascular resistance were higher in the patients monitored by transpulmonary thermodilution ($p < 0.05$). After valve surgery, in the TPT group EVLW reduced followed by the increment in GEDV whereas in the PAC group PAOP decreased ($p < 0.05$). Postoperatively, the TPT group received more fluids by 33% that was accompanied by increased stroke volume index, oxygen delivery and consumption as compared to the PAC group ($p < 0.05$). Duration of mechanical ventilation was higher in the PAC group (19.4±5.8 hrs *vs.* 14.3±5.1 hrs; $p = 0.04$).

Conclusion(s): Compared with PAC-guided treatment algorithm, goal-directed therapy based on PiCCO-derived parameters changes the strategy of fluid management, improves hemodynamics and oxygen transport, and reduces the duration of postoperative respiratory support after combined valve surgery.

4AP7-3

Arterial and plethysmographic waveform variables as predictors of hypotension during hypovolemia in anesthetized patients

Bystritski D., Eden A., Kalina E., Tamir A., Gelman S., Pizov R.
Carmel Lady Davis Medical Center, Department of Anaesthesiology and Intensive Care, Haifa, Israel

Background and Goal: Low arterial blood pressure (BP) may result in impaired vital organ perfusion. Respiratory induced arterial blood pressure and plethysmographic waveform changes in ventilated patients have been shown to be sensitive predictors of cardiac output response to fluid loading. Our previous study demonstrated that increased arterial and plethysmographic waveform values reflect increased degree of hypovolemia[1]. We hypothesized that waveform variables would be able to predict arterial hypotension during progressive hypovolemia

Materials and Methods: Patients scheduled for elective surgery with planned autologous blood donation were eligible for study. After IRB approval and signed informed consent, and standard general anesthesia blood was withdrawn by steps of 2% of estimated circulating blood volume (ECBV) up to 20% (10 steps). Blood withdrawal discontinued earlier if systolic BP decreased to < 80 mmHg or by >20% from baseline. Arterial and plethysmographic waveforms were recorded at baseline and after each step of blood withdrawal and analyzed offline. Systolic pressure variations (SPV), pulse pressure variations (PPV), plethysmographic waveform variations (PWV) and delta pulse oximetry plethysmographic waveform amplitude (dPOP) were calculated as described previously[1]

Results and Discussion: Thirty-four (29%) of 118 participants tolerated 20% ECBV reduction without significant hypotension. Older age, hypertension and chronic drug therapy were associated with early hypotension during blood withdrawal (table1). There was no difference in any hemodynamic variable at baseline between patients who tolerated 20% ECBV reduction and those who did not (table 2). There also was no correlation between hemodynamic variables at baseline and number of steps tolerated during blood withdrawal Table 1. Demogr... Table 2. Hemody...

Conclusion: Respiratory induced arterial and plethysmographic waveform variables are reliable indicators of changes in blood volume during stepwise hypovolemia, but are weak predictors of hypotension. Older age and comorbidities are more sensitive predictors of developing hypotension during gradual blood withdrawal in anesthetized patients

References:

Pizov et al.Anesthesiology 2010;113:83

4AP7-4

Incidence of cardiac output monitoring in high risk surgery patients: A survey among european society of anaesthesiologists members and american society of anesthesiology members

Cannesson M., Ricks C., Meng L., Kain Z.
University of California Irvine, Department of Anaesthesiology, Orange, United States

Background and Goal of Study: Several studies have suggested that cardiac output (CO) and oxygen delivery optimization improve postoperative outcome in patients undergoing high risk surgery. However, it is not known wether clinicians apply cardiac output monitoringin their daily clinical practice and how they conduct hemodynamic optimization in this setting. The goal of this survey conducted among European Society of Anaesthesiologists (ESA) and American Society of Anesthesiology (ASA) members was to assess the incidence of cardiac output monitoring in patients undergoing high risk surgery.

Materials and Methods: After IRB approval we sent an email survey containing 30 questions to randomly selected ESA and ASA members. The surveys were sent directly by the membership committee of the ASA and of the ESA to randomly selected members (2,500 members overall).

Results and Discussion: We got 463 responses (190 from the ESA, 273 from the ASA). Thirty percent of respondents from the ESA have protocols for hemodynamic management of these patients while only 5 % of respondents from the ASA do. Hemodynamic parameters monitored in this setting are shown in Table 1.

	ESA Members	ASA Members
Invasive Arterial Pressure	90%	95%
Central Venous Pressure	83%	72%
Cardiac Output	35%	35%
Pulse Pressure Variation	24%	20%
Plethysmographic Waveform Variation	17%	17%

[Hemodynamic Monitoring Routinely Used]

Interestingly, CO is monitored in only 35 % of the cases. The main reasons for not monitoring CO are: 1)the use of dynamic parameters of fluid responsiveness as surrogate for CO (58%), and 2) the invasiveness of CO monitoring devices (42%). Devices used for CO monitoring are shown in Table 2.

	ESA Members	ASA Members
Swan Ganz Catheter	55%	85%
Esophageal Doppler	17%	2%
PiCCO	44%	1%
Vigileo	32%	15%
LiDCO	10%	4%

[Devices Used for CO Monitoring]

Conclusion(s): Despite evidence showing that CO optimization can improve postoperative outcome, CO is rarely monitored during high risk surgery. There is a need for education on this topic.

Acknowledgements: The authors wish to thank Dr Celeste Kirschner (American Society of Anaesthesiology) and Sandrine Damster (European Society Anaesthesiology) for their help and assistance during this study.

4AP7-5

Impact of right ventricular pacing on pulse pressure variations

Keller G., Desebbe O., Lehot J.-J., Cannesson M.
Hospices Civils de Lyon Hopital L Pradel, Department of Anaesthesiology and Intensive Care, Lyon, France

Background and Goal of Study: Pulse pressure variations (PPV) have been shown to be the best predictors of fluid responsiveness in mechanically ventilated patients under general anaesthesia and mechanical ventilation. Right ventricular (RV) pacing is frequently used after cardiac surgery and in patients with conduction disorders. This pacing mode induces a ventricular dyssynchrony and impacts ventricular function. The goal of this study was to assess the effects of RV pacing on PPV in mechanically ventilated patients under general anaesthesia.

Materials and Methods: We studied 15 patients in the postoperative period following CABG. Patients were equipped with a pulmonary artery catheter for cardiac output (CO) measurements. Central venous pressure (CVP) and mean arterial pressure (MAP) were measured at each step of the protocol. Ventricular dyssynchrony was assessed using Tissue Doppler and expressed as the Ventricular Dyssynchrony Index (VDI). All patients were studied in sinus rythm (SR), and during RV pacing using a RV epicardial lead placed during the surgery.

Results and Discussion: RV pacing induced significant decreases in CO and MAP compared to SR (Table 1). At the same time, RV pacing was responsible for a significant ventricular dyssynchrony as demonstrated by the significant

increase in the ventricular dyssynchrony index (Table 1). PPV was significantly impacted by RV stimulation and we observed an increase in PPV from 6 ± 6 % to 10 ± 9 % (p=0.01) (Table 1).

	Sinus Rythm	Right Ventricular Pacing	P Value
MAP (mmHg)	81 ± 15	71 ± 13	<0.001
Heart rate (BPM)	80 ± 14	84 ± 14	< 0.001
CO (L/min)	4.6 ± 1.1	3.7 ± 0.9	< 0.001
CVP (mmHg)	8 ± 5	8 ± 5	0.11
VDI (ms)	4 ± 27	81 ± 42	< 0.001
PPV (%)	6 ± 6	10 ± 9	0.01

[Hemodynamic Data During Protocol]

Conclusion(s): RV pacing has a significant impact on hemodynamic parameters including Pulse Pressure Variations. This may affect the predictive value of this index in this setting.

4AP7-6

The effects of position changes and respiratory maneuvers on internal jugulary vein cross sectional surface area in healthy volunteers

Araz C., Pirat A., Kayhan Z., Arslan G.
Baskent University, Faculty of Medicine, Department of Anaesthesiology, Ankara, Turkey

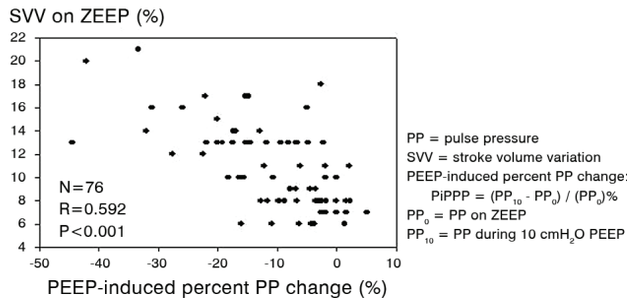
Background and Goal of Study: Increase in fullness and size of the internal jugular vein (IJV) provides an easier central venous catheterisation. For this purpose, several techniques such as, Trendelenburg position, leg elevation, liver massage or Valsalva maneuver are used. The aim of the study was to identify position changes and respiratory maneuvers induced cross sectional surface area changes of right IJV in healthy volunteers.
Materials and Methods: After obtaining approval from the Ethical Committee and written informed consent of all subjects, 20 adult volunteers were subjected to the measurements.
All measurements were performed on the right IJV and cross sectional surface area values were noted. Measurements were made at six different positions (supine, 20° Trendelenburg position, 30° elevation of legs, 45° elevation of legs, 20° Fowler position and 20° sitting position) and four different respiratory conditions (spontaneous, Valsalva maneuver, and 10cmH_2O and 20 cmH_2O of CPAP). The cross sectional surface area of IJV that was measured at supine position and during spontaneous breathing served as the control value.
Results and Discussion: Compared to the control values, Valsalva maneuver provided the greatest increase in IJV cross sectional surface area (93±53mm² vs 122±51mm², p=0.001). None of the studied positions or 10 and 20 cmH_2O CPAP caused a significant increase in IJV cross sectional surface area from the baseline (p>0.05 for all values). Among all studied positions, respiratory maneuvers, and their combinations, the largest cross sectional surface area of IJV was measured during a combination of Trendelenburg position and Valsalva maneuver (93±53mm² vs 136±58mm², p=0.001). Additionally, it was found that Fowler position and sitting position significantly decreased the cross sectional surface area of the IJV ((93±53mm² vs 61±45mm² and 37±25mm² , respectively, p< 0.001).
Conclusion: In conclusion, Valsalva maneuver caused the largest increase in cross sectional surface area of IVJ in healthy volunteers in this study. When combinations of respiratory maneuvers and position changes were evaluated Valsalva maneuver during Trendelenburg position induced the largest increase in cross sectional surface area of IJV.

4AP7-7

Positive end expiratory pressure induced pulse pressure changes predict stroke volume variation in anesthetized patients

Yogo H., Isono S., Ikeda A., Kasuya Y., Nishino T.
Chiba University, Department of Anaesthesiology, Chiba, Japan

Background: Application of positive end expiratory pressure (PEEP) is known to induce hemodynamic instability particularly in patients with hypovolemia. Under constant elastic wall properties of large arteries, pulse pressure (PP) changes predominantly reflect stroke volume changes. Accordingly, we hypothesized that PEEP-induced percent changes of PP (PiPPP) predict circulatory volume (CV) conditions determined by the stroke volume variation (SVV).
Methods: We recruited 42 adult patients without cardio-pulmonary disease undergoing major surgeries requiring continuous arterial pressure monitoring with a Vigileo/FloTrac™. All patients were mechanically ventilated under general anesthesia and paralysis (tidal volume =10 ml/kg, respiratory rate = 10 breaths/min, I/E ratio = 1:2). Hemodynamic parameters including SVV and PP were measured during ZEEP and 10 cm H_2O PEEP application. PiPPP was calculated as $(PP_{10} - PP_0) / (PP_0)$ %. Correlation analysis between SVV on ZEEP and PiPPP was performed by Spearman rank order test and $P < 0.05$ was considered significant.
Results and Discussion: We observed variable hemodynamic changes in response to PEEP application and significant dependence of PiPPP on CV conditions as shown by the Figure. For different CV conditions determined by the SVV values on ZEEP (non-normovolemia: SVV > 10 %, severe hypovolemia: SVV > 13%), we found a high positive predictive value for non-normovolemic condition (82%) and a high negative predictive value for severe hypovolemic condition (93%) when PiPPP > 15% is considered positive.



[PiPPP dependence on circulatory volume conditions]

	SVV > 10	SVV ≤ 10	SVV > 13	SVV ≤ 13
PiPPP > 15	18	4	10	12
PiPPP ≤ 15	17	37	4	50

[Predictive values of PiPPP for circulatory volume]

Our results suggest potential usefulness of pulse pressure measurements before and during 10 cm H_2O PEEP for determining CV conditions.
Conclusion: PEEP-induced pulse pressure changes non-invasively predict stroke volume variation and possibly serve to optimal fluid management.

4AP7-8

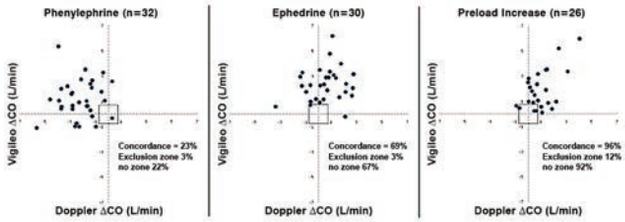
Effects of phenylephrine, ephedrine, and increased preload on the ability of third generation Vigileo-Flotrac and esophageal doppler to measure trends in cardiac output

Alexander B.S., Rinehart J., Tran P. N., Laning K., Cannesson M., Meng L.
University of California Irvine, Department of Anaesthesiology, Orange, United States

Background and Goal of Study: Cardiac output (CO) monitoring based on pulse contour analysis (Vigileo-FloTrac) has the potential to be used for goal directed fluid therapy in the perioperative setting. However, factors such as vasopressor usage may impact Vigileo-FloTrac's reliability in tracking CO changes. Our goal was to test the 3rd generation Vigileo-FloTrac system's ability to accurately measure the changes in CO induced by pressor administration and increased preload in comparison with esophageal Doppler measurements.
Materials and Methods: CO was monitored simultaneously by Vigileo-FloTrac (CO_{FT}) and esophageal Doppler (CO_{ED}). Hemodynamic challenges included: phenylephrine (to increase vasomotor tone), ephedrine (to increase myocardial contractility and heart rate), and whole body tilting (to increase preload). Measurements were performed before and after each intervention. Exclusion criteria for this observational study were cardiovascular disease, cerebrovascular disease, or poorly controlled diabetes mellitus.
Results and Discussion: Thirty one ASA I-III patients were studied (22 males and 11 females) with an age of 59±13. Overall, 176 pairs of CO measurements were obtained. The mean CO_{ED} was 5.4±1.9 L/min, and the mean CO_{FT} was 5.3±1.9 L/min (p=0.37). The agreement between CO_{ED} and CO_{FT} was

0.14±2.13 L/min while the mean percent error was 66%. The trending ability of CO_{FT} versus CO_{ED} was 23% (concordance) after phenylephrine treatment, 69% (concordance) after ephedrine treatment, and 96% (concordance) after whole body tilting.

Conclusion: In comparison to the esophageal Doppler, the 3rd generation Vigileo-FloTrac tracks CO well after preload changes. However, it tracks phenylephrine-induced CO change poorly and ephedrine-induced CO change marginally. Also, the overall agreement between the absolute values measured by Vigileo-FloTrac and esophageal Doppler is poor.



[Doppler vs Vigileo]

4AP7-9

Relations between respiratory changes in Rwave amplitude and fluid responsiveness

Benaissa M., Keller G., Desebbe O., Lehot J.J.
HCL, Hôpital Louis Pradel, Department of Anaesthesiology and Intensive Care, Lyon, France

Introduction: Blood volume influences the amplitude of R wave of the electrocardiogram (ECG) (1). A relationship between respiratory variations of the R wave and changes in pulse pressure has recently been highlighted (2).

The purpose of this study was to determine whether the respiratory changes of R wave amplitude in the ventilated patient were predictive of fluid responsiveness.

Materials and methods: 21 patients in sinus rhythm were included after cardiac surgery. They were in sinus rhythm. Cardiac output was assessed by a Swan Ganz catheter.

Both respiratory variations of pulse pressure (deltaPP) and R wave amplitude (deltaRDII) in lead DII of ECG were assessed.

DeltaRDII = 100 x (RDIImax -RDIImin) / ((RDIImax + RDIImin) /2).

A 15% increase in cardiac output defined responders to volume expansion.

Results: Respiratory variations of the R wave amplitude were not predictive of fluid responsiveness (area under ROC curve: 0.56). Respiratory variations in pulse pressure are predictive of a response to the fluid expansion (area under ROC curve: 0.92). We find a significant increase in R wave after volume expansion.

The R wave significantly increased in patients: 0.68 mV to 0.76 mV (p=0.01) after volume expansion.

Conclusion: The respiratory variations of the R wave amplitude in mechanically ventilated patients are not predictive of fluid responsiveness.

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4AP8-1

Amiodarone prophylaxis for ventricular arrhythmias duriung aortic valve replacement

Attaallah A.F, Hosny H., Abuldahab M., Salah T.
Cairo University, Department of Anaesthesiology and Intensive Care, Cairo, Egypt

Introduction: Ventricular fibrillation accounts for 20% of mortality after aortic valve replacement and the second most common cause of death. Several studies have shown reduction in the incidence of atrial fibrillation with prophylactic amiodarone. This study examines the role of amiodarone prophylaxis for ventricular arrhythmias during aortic valve replacement.

Methods: 30 patients were randomly assigned to two groups; patients in the first group received a 2.5 mg/kg of amiodarone and the other group were control. The number of ventricular arrhythmias, number of shocks and total energy for cardioversion, and length of ICU stay were recorded.

Results: There were no differences in age, sex, ventricular function, cross-clamp time, or bypass time between the two groups. 4 patients in the amiodarone group returned to spontaneous sinus rhythm during separation from the cardiopulmonary bypass compared to only 1 patient in the control group. Although the incidence of ventricular arrhythmias in the patients who received a prophylactic dose of amiodarone was less than controls, yet establishment of statistical significance was not achieved (p=0.165). The patients in the amiodarone group responded to a lesser number of cardioversion shocks (p=0.033) and needed less total energy dose (p=0.013).

All patients in the amiodarone group did not experience any ventricular arrhythmias during the ICU period, while 5 patients in the control group did (p=0.021). Patients in the amiodarone group had an almost statistically significant shorter ICU stay (p=0.05).

Discussion: Amiodarone improved ventricular arrhythmias response to cardioversion and decreased their incidence postoperatively.

Although a trend was shown, larger studies are needed to establish its role for ventricular arrhythmias prevention intraoperatively and in decreasing ICU length of stay.

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4AP8-2

Effect of epinepherine and phenylepheine pretreatments to prevent the postreperfusion syndrome during liver transplantation surgery

Jang Y.-E., Lee H.-C., Ryu H.-G., Jung C.-W.
Seoul Naional University College of Medicine, Department of Anaesthesiology and Pain Medicine, Seoul, Korea, Republic of

Background and Goal of Study: Postreperfusion syndrome (PRS), acute hypotension after reperfusion of the liver graft, occurs frequently during liver transplantation surgery. Cardiac dysfunction and/or extensive systemic vasodilation are suspected causes. We tested the effect of epinephrine and phenylephrine pretreatments to attenuate PRS during liver transplantation surgeries in adults.

Materials and Methods: Ninety-three adult liver recipients were randomized to receive an intravenous bolus of 10 mcg of epinephrine (EPI group, n = 31), 100 mcg of phenylephrine (PHEN group, n = 31), or normal saline (control group, n = 31) at the time of reperfusion of the liver graft. Occurrence of PRS, use of vasoactive drugs, and postoperative course were compared among the three groups.

Results and Discussion: The EPI and PHEN groups showed less frequent PRS compared to the control group (39% vs 48% vs 81%, *P* = 0.002). Both EPI and PHEN groups showed faster recovery of mean arterial pressure with minimal heart rate change compared to control group. The EPI and PHEN groups required less vasoactive drugs in total. Perioperative changes of lab data were similar among three groups.

Conclusion(s): Pretreatment with 10 mcg of epinephrine or 100 mcg of phenylephrine significantly reduced the occurrence of PRS and vasopressor requirements during the liver transplantation surgery. In addition, changes in hemodynamic profile after pretreatment of each drug suggest that vasodilation is the primary mechanism of PRS.

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4AP8-3

Vasopressin receptor blockade suppresses the hypercapnia induced increase in gastric mucosal oxygenation

Schwartges I., Vollmer C., Beck C., Bauer I., Schwarte L.A., Picker O.
University Hospital Duesseldorf, Department of Anaesthesiology, Duesseldorf, Germany

Background and Goal of Study: Hypercapnia improves systemic oxygen delivery (DO_2) and microvascular oxygenation of the gastric mucosa (μHbO_2) [1]. Simultaneously hypercapnia increases plasma levels of vasopressin[2]. Albeit vasopressin is generally regarded a potent vasoconstrictor particularly

in the splanchnic region its effects on splanchic microcirculation are recently controversially discussed[3]. Thus, the impact of vasopressin on splanchnic oxygenation during hypercapnia is unclear.

Materials and Methods: Chronically instrumented dogs were repeatedly anesthetized to study the effects of vasopressin receptor blockade during normocapnia (i. e. 35 mmHg end tidal carbon dioxide tension, $etCO_2$) (VB) and during hypercapnia (i. e. 70 mmHg $etCO_2$) (HCVB) as well as the effects of hypercapnia per se (HC) on DO_2 and μHbO_2.

Systemic hemodynamics and gastric mucosal microvascular oxygenation (reflectance spectrophotometry) were recorded continuously. Arterial blood was sampled intermittently for blood gas analysis and calculation of DO_2. Data are presented as means±SEM.

Results and Discussion: HC increased DO_2 (12.3±0.5 to 16.1±0.5 ml/kg/min) and μHbO_2 (70±4 to 80±2%). Subsequent vasopressin receptor blockade (HCVB) resulted in an even more pronounced increase in DO_2 (12.4±1.5 to 19.1±2.4 ml/kg/min) but abolished the hypercapnia induced increase in μHbO_2 (68±3 vs. 69±2%).

In contrast VB during normocapnia had no effect on DO_2 (13.3±0.9 vs. 14.0±0.9 ml/kg/min) nor on μHbO_2 (75±3 vs. 71±5%).

Conclusion(s): Vasopressin receptor blockade during hypercapnia suppressed the hypercapnia induced increase in μHbO_2 despite an even more pronounced increase in systemic oxygen delivery, suggesting a vasopressin mediated redistribution of cardiac output [4] in favour of gastric mucosa during hypercapnia.

During hypercapnia and vasopressin receptor blockade the increased systemic oxygen delivery does not seem to reach the gastric mucosal microcirculation.

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4AP8-4

Involvemento MRP4 inhibition in β adrenergic dysfunction in the diabetic cardiomyopathy

Carillion A., Hara Y., Balse E., Riou B., Amour J.
CHU Reims/Inserm U956 GH Pitié-Salpétrière, Department of Anaesthesiology and Intensive Care, Reims, France

Background and Goal of Study: Positive inotropic and lusitropic effects of the β-adrenergic stimulation is a crucial adaptive system for maintaining cardiac output which is altered in diabetic cardiomyopathy partly because of the excessive catabolism of cAMP by the overexpressed β_3-adrenoceptor.

Because the active AMPc efflux pump Multidrug Resistance Protein 4 (MRP4) may contribute to the β-adrenergic dysfunction as well,[1] we tested the hypothesis that MRP4 is implicated in the β-adrenergic dysfunction in diabetic cardiomyopathy.

Materials and Methods: The β-adrenergic responses have been explored *in vivo* (echocardiography) and *in vitro* (isolated cardiomyocyte, Ionoptix®) in healthy and diabetic Wistar rats (streptozotocin). *In vivo,* left ventricle ejection (LVEF) and shortening (LVSF) fractions were assessed before and after isoproterenol injection (IVSE, 5$\mu g.kg^{-1}$), a specific agonist of β-adrenoceptors. *In vitro,* isolated cardiomyocytes pretreated or not by MK 571 (10^{-6}M), an inhibitor of MRP4, were exposed to isoproterenol (10^{-6}M). Inotropic parameters, maximal peak shortening (PS) and maximal shortening velocity (+dL/dt), and lusitropic parameter, maximal relengthing velocity (-dL/dt), were investigated. In addition, MRP4 protein expression was assessed by Western Blot in left ventricle homogenates.

Results and Discussion: The positive inotropic effect of the β-adrenergic stimulation was significantly altered in diabetic compared with healthy rats both *in vivo* (LVEF: 115±3 *vs* 134±7% and LVSF: 130±17 *vs* 169±5% of baseline values respectively, $p< 0.05$) and *in vitro* (PS: 106 vs 145% and +dL/dt: 128 vs 155% respectively, $p< 0.05$). In contrast, in diabetic cardiomyocytes, MRP4 inhibition partly restored both positive inotropic (PS: 131% vs 106% and +dL/dt: 167% vs 128% respectively, $p< 0.05$) and lusitropic effects (-dL/dt: 145% vs 112%, $p< 0.05$) of the β-adrenoceptor stimulation in parallel to the MRP4 overexpression in left ventricular homogenates.

Conclusion(s): Overexpressed MRP4 is partially involved in the β-adrenergic dysfunction in the diabetic cardiomyopathy. These findings may contribute to new therapeutics in the perioperative management of diabetic patients.

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4AP8-5

Treatment of hypertension during carotid endarterectomy under cervical block: Urapidil or labetalol?

Maes S., Verborgh C., Flamee P., Bhutia J.T., Poelaert J.
UZ Brussel - Vrije Universiteit Brussel, Department of Anaesthesiology, Jette, Belgium

Background and Goal of Study: Hypertension is a common event during carotid endarterectomy under cervical plexus block. Left untreated, it poses a considerable risk for bleeding or even stroke (1). However, active treatment may endanger the brain due to lack of perfusion in ischaemic zones, especially during carotid clamping. This study was therefore undertaken to assess the effects on regional cerebral oxygen saturation, of urapidil and labetalol, two drugs commonly used to treat peri-operative hypertension (2, 3).

Materials and Methods: The study protocol was approved by the Ethics Committee. Twenty-two patients, ASA II-III agreed to take part in the study. A cervical plexus block was performed on the affected side. Standard monitoring included, heart rate (HR), invasive blood pressure (MAP), cardiac output (CO) measured non-invasively (Vigileo (R), Edwards Lifesciences) and cerebral oximetry (SrO2) at the surgical and non-affected side (Invos (R), Somanetics). Observations were made before incision (CTRL), after incision (INCIS), before carotid clamping (PRECL), after clamping (POSTCL), 20 min after injection of either urapidil 10 mg or labetalol 10 mg prepared by a third party and properly blinded (TMT20), during closure (CLOS) and after the intervention (POST). MWU-test for between groups comparison, Wilcoxon's test for intragroup comparison.

Results and Discussion: Both urapidil and labetalol resulted in a significant decrease in MAP. However, at CLOS, MAP was significantly lower in the urapidil group. HR decreased without affecting CO in the labetalol group, contrary to the significant drop of CO observed after urapidil. SrO2 diminished in both groups in the non-affected side, even to a significant level in the urapidil group. At the affected (clamped) side, SrO2 rose in the labetalol group, while SrO2 dropped briefly. None of these changes are significant.

Conclusion(s): Both drugs are effective in controlling MAP during carotid endarterectomy. However, labetalol is the better choice, because of the maintained CO and the lack of further decrease in SrO2 after carotid clamping at the affected side.

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4AP8-6

Influence of central sympathicolysis with clonidine on anemia tolerance in anesthetized pigs

Kertscho H., Lauscher P., Haberichter B., Zacharowski K., Habler O., Meier J.
University Hospital of Frankfurt/Main, Department of Anaesthesiology and Intensive Care, Frankfurt/Main, Germany

Background and Goal of Study: Clonidine decrease perioperative oxygen consumption effectively, which may be of benefit in patients with decreased oxygen supply (1)(2). Clonidine attenuate sympathetic tone and has been shown to reduce perioperative catecholamine concentrations and promote perioperative hemodynamic and adrenergic stability. Therefore the influence of short-term central sympathicolysis on anemia tolerance and hemodynamic compensation of acute blood losses has been first-time investigated in an animal model.

Materials and Methods: After government approval 14 anesthetized pigs (BW 24.1 ± 2.4 kg) were randomly assigned to placebo or clonidine treatment (20 $\mu g*kg^{-1}$ iv. at the beginning of the experimental protocol and 15 $\mu g*kg*h^{-1}$ iv. for maintenance of sufficient plasma levels). Thereafter all animals were hemodiluted by exchange of whole blood for 6% hydroxyethyl starch (MW 130.000/0.4) until the individual critical hemoglobin concentration (Hb_{crit}) was reached. Primary outcome parameters were Hb_{crit} and the exchangeable blood volume until Hb_{crit} was reached (EBV).

Results and Discussion: Hb_{crit} did not differ between the placebo and the clonidine group (2.2 [2.0/2.5] g/dl vs. 2.1 [2.1/2.4] g/dl; n.s.). Furthermore there was no difference of EBV between the two study groups (placebo vs. clonidine; 87 [72/106] $ml*kg^{-1}$ vs. 92 [85/95] $ml*kg^{-1}$; n.s.).

Conclusion: Despite massive dosed iv. clonidine resulting central sympathicolysis has no impact on acute anemia tolerance in healthy anesthetized pigs. However clonidine significantly reduced heart rate during general anesthesia and extreme anemia without apparent adverse events. As a consequence clonidine administration can be considered a safe and effective measure for the optimization of oxygen supply and economization of heart work.

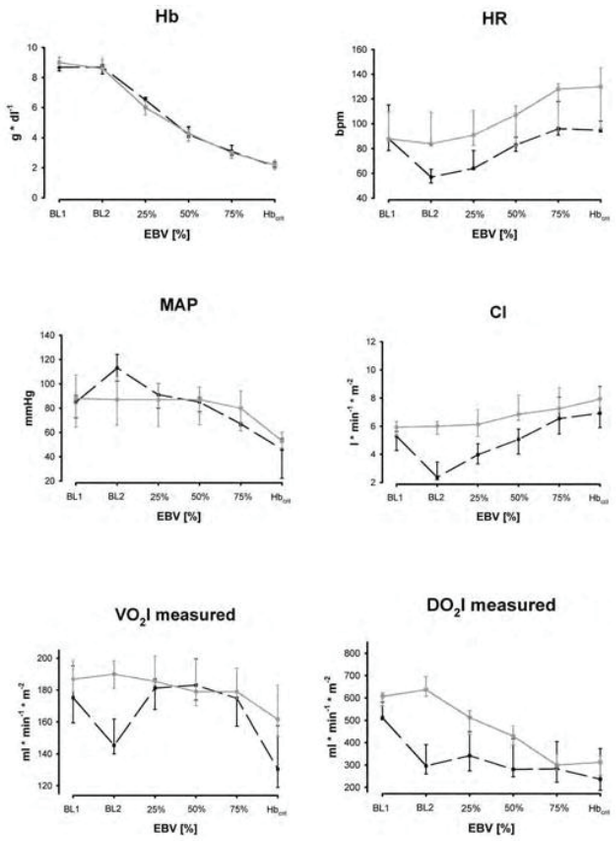

Figure: Single experiment depiction of oxygen transport and cardiovascular parameters: hemoglobin concentration (Hb); heart rate (HR); mean arterial pressure (MAP); cardiac index (CI); total oxygen consumption index (VO_2I) and total oxygen delivery index (DO_2I) for the control group (placebo, colored in light grey) and the study group (clonidine, colored in black) during baseline (BL1), medication (BL2) and hemodilution steps (25%, 50%, 75%, Hb_{crit}). The results are presented pairwise as median and descriptive quartiles [Q_1/Q_3], (p<0.05, placebo vs. clonidine).

[Single experiment depiction of parameters]

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4AP8-7

Levosimendan in patients requiring postoperative continuous renal replacement therapy

Filipescu D., Luchian M.M., Marinica I., Paunescu A., Ghenu O., Marin S.
"Prof. Dr. C.C. Iliescu" Emergency Institute for Cardiovascular Diseases, Department of Anaesthesiology and Intensive Care, Bucharest, Romania

Background and Goal of Study: Levosimendan is a new ino-dilator drug with a special pharmacokinetics. The half-life is approximately 1 hour. However, its metabolites have a long half-life explaining the hemodynamic effects after the administration of the drug. In contrast to levosimendan, the metabolites are dialyzable[1]. Data on the use of levosimendan in patients requiring continuous renal replacement therapy (CRRT) are scarce.
Materials and Methods: We present our experience with levosimendan (0.1 μg/kg/hour over 24 hours without bolus) in 15 consecutive patients with refractory cardiogenic shock after ST-elevation myocardial infarction (4 patients) or after cardiac surgery (11 patients), who developed multi-organ dysfunction syndrome and also required CRRT. CRRT was performed concomitently with levosimendan administration.
Hemodynamic data were registered invasively and monitored over 72 hours post infusion. Measured parameters were: cardiac output/index (CO/CI), pulmonary artery occlusion pressure (PaOP), left ventricular ejection fraction (LVEF), mixed venous oxygen saturation (SvO_2) and cardiac power (CPO). Length of stay (LOS) in cardiac intensive care (CICU) and in-CICU mortality were also registered. Data were expressed as mean ± standard deviation (SD). Fisher's exact test and non-paired t-test were used when appropriate. P-value < 0.05 was considered significant.
Results and Discussion: The addition of levosimendan significantly improved CI [from 2.10±0.7 L min^{-1} m^{-2} to 2.96±0.9 L min^{-1} m^{-2} at 12 hours (P< 0.001) and 2.87±0.7 L min^{-1} m^{-2} at 48 hours (P< 0.05)]. PaOP decreased significantly only in the first 6 hours from 20±6 mmHg to 14±4 mmHg (P< 0.05). CPO increased significantly (baseline 0.62 W vs 0.9 W after 24 h, P< 0.05 and 1.2 W after 48 hrs; P< 0.02) after levosimendan infusion. SvO2 increased from 53±7% to 67±5% after 72 hrs after infusion. LVEF increased from 27±8% to 37±7% at 48 hours (P< 0.01). Mean LOS in CICU was 14±8 days. In CICU mortality in this case-series was 20% (3 patients) and reflects severe comorbidity or complex cardiac surgical procedures.
Conclusion(s): It seems that CRRT does not affect negatively hemodynamic effects of levosimendan infusion. Utilization of levosimendan perfusionas an adjunctive, rescue therapy in patients with severe cardiogenic shock on CRRT is safe with beneficial effects on hemodynamic parameters.

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4AP8-8

Cerebral oxygenation during blood pressure elevation with phenylephrine versus vasopressin in patients on cardiopulmonary bypass

Evers V.M., Jöbsis D.A., Brevoord D., Preckel B., De Hert S.G., Immink R.V.
Academic Medical Center (AMC) at the University of Amsterdam (UvA), Department of Anaesthesiology, Amsterdam, Netherlands

Introduction: Cerebral autoregulation implies a constant cerebral blood flow and cerebral tissue oxygenation during fluctuations in blood pressure. Therefore, cerebral resistance vessels constrict during pressure elevation and dilate during pressure decline. Several studies have observed that an increase in blood pressure induced with the α1-receptor agonist phenylephrine (PE) causes a small but significant decrease in regional cerebral tissue oxygenation (cO2). However, it is unknown whether the decrease in cO2 with PE is related to cerebral vasoconstriction due to activation of α1-receptors, known to be localized in the brain, or is the mere consequence of CA.
Methods: After ethical approval and written informed consent, blood pressure in 7 cardiac surgery patients was increased while on cardiopulmonary bypass (CPB). PE and vasopressin (a V1-receptor agonist inducing α1-receptor independent increment in blood pressure) were randomly administered. After a washout and stabilization period the other drug was administered in the same patient. BP and near infrared spectroscopy derived cO2 were continuously monitored. To exclude possible changes in cardiac output as confounding factor, CPB flow was clamped at 2.6 L·min-1·m2. The cO2 at matched increases in pressures with the two interventions were compared using a paired Student's t-test
Results: A 17±4 mmHg increase in mean BP elicited either with PE or with vasopressin resulted in a similar reduction in cO2 of -2±2 % with both interventions.
Conclusion: These similar changes at constant flow on CPB suggest that an α1-receptor mediated vasoconstriction is probably not the cause for the decrease in cO2 observed with PE.

4AP8-9

The effect of esmolol on the hemodynamic, QTc interval and Qtc dispertion changes during anesthesia induction in hypertensive patients

Çeker M.Z., Akın Takmaz S., Baltacı B., Başar H.
Ankara Training and Research Hospital, Department of Anaesthesiology and Intensive Care, Ankara, Turkey

Background and Goal of Study: Laryngoscopy and tracheal intubation have been shown to prolong the QT interval and QT dispersion (QTD) due to increased sympathetic activity and plasma catecholamine concentrations. Vagal modulation decreases and sympathetic activity increases as a result of the disturbed cardiovascular homeostasis in hypertensive patients. The importance of minimizing the exaggerated sympatho-adrenergic responses and QT interval and QTD changes that may develop due to laryngoscopy and tracheal intubation during anesthesia induction in the hypertensive patient group is therefore clear. It is known that esmolol decrease the hemodynamic response to laryngoscopy and intubation. However, the results of the limited number of studies where the effect of esmolol in decreasing the prolonged QT interval and QTD as induced by laryngoscopy and intubation are controversial. We investigated the effect of esmolol on the hemodynamic, and QTc and QTcD changes seen during anesthesia induction in hypertensive patients using ACE inhibitors.
Materials and Methods: Sixty ASA I-II patients, with essential hypertension using ACE inhibitors were included in the study. The esmolol group received esmolol at a bolus dose of 500 mcg/kg followed by a 100 $mcg.kg^{-1}.min^{-1}$ infu-

sion which continued until the 4th minute after intubation. The control group received 0.9% saline similar to the esmolol group. The mean BP,HR values and the ECG records were obtained as baseline values before the anesthesia, 5 minutes after esmolol and saline administration, 3 minutes after the induction and 30 seconds, 2 minutes and 4 minutes after intubation.

Results and Discussion: The QTc interval was shorter in the esmolol group ($p=0.012$), the QTcD interval was longer in the control group ($p=0.034$) and the mean HR was higher in the control group ($p=0.022$) 30 seconds after intubation. The risk of arrhythmia frequency was higher in the control group in the 4-minute period following intubation ($p=0.038$).

Conclusion(s): The QTc and QTcD prolongation following intubation was kept under control with 500 mcg/kg bolus esmolol followed by a 100 $mcg.kg^{-1}.min^{-1}$. infusion. Blood pressure control was achieved in both groups and esmolol also stopped the increased heart rate following intubation. During induction, the BP tends to decrease with esmolol where care is needed.

4AP8-10

Association between intraoperative tissue oxygenation, arterial blood pressure and noradrenaline use in urological patients

Spruit R.J., Schwarte L.A., Hakenberg O.W., Scheeren T.W.L.
University Medical Center Groningen, Department of Anaesthesiology, Groningen, Netherlands

Background and Goal of Study: Inadequate tissue oxygenation should be prevented during surgery as it might cause postoperative morbidity. In this observational study we looked at factors that might influence tissue oxygenation (S_tO_2) such as blood pressure and use of vasoactive drugs.

Materials and Methods: In 159 urological patients receiving balanced anaesthesia and mechanical ventilation, we measured S_tO_2 intraoperatively on the thenar eminescence (InSpectra, Hutchinson Tech., USA) along with (non)invasive blood pressure and recorded the use of noradrenaline. We correlated S_tO_2 and MAP as recorded at defined moments during surgery.

In addition, we looked at the effects of low blood pressure (as defined by the areas under the curve (AUC) while MAP was < 65 mmHg) on S_tO_2. Furthermore, we related S_tO_2 to different noradrenaline (NA) dosages: none, low (< 0.03 mg/kg/min) and high dose (≥0.03 mg/kg/min).

Results and Discussion: At the start and end of surgery, there was no correlation between S_tO_2 and MAP. However, the lowest recorded MAP per patient did correlate with the corresponding S_tO_2 ($R=0.206$, $R^2=0.043$, $p< 0.01$; Pearson's correlation, 2-tailed). Similarly, a higher MAP AUC < 65 mmHg was associated with a lower average S_tO_2 ($R=-0.189$, $R^2=0.036$, $p< 0.05$; Spearman's correlation, 2-tailed).

These results support the hypothesis of intact autoregulation of tissue blood flow to preserve S_tO_2 in the normal range of blood pressure, whereas this autoregulation fails during lowest pressures.

Furthermore, S_tO_2 was higher without noradrenaline (no NA) (88.4%) than during high dose noradrenaline (85.2%) ($p< 0.001$; ANOVA, Bonferroni post hoc analysis). Possibly, the vasoconstrictive effect of noradrenaline decreases blood flow through the observed tissue (peripheral muscle).

Conclusions: Tissue oxygenation is not influenced by blood pressure in the normal blood pressure range during anaesthesia, whereas it becomes dependent when MAP drops below the clinically relevant threshold of 65 mmHg. Noradrenaline use is associated with a decreased tissue oxygenation in the thenar eminescence. Further studies should identify other factors that may influence tissue oxygenation and assess the impact of tissue hypoxia on postoperative patients' outcome.

4AP9-1

Changes of the perioperative glucose level and plasma lactate concentration in pediatric cardiac surgery and the relation with postoperative early outcome

Ando S., Ito R., Watabe A., Morimoto Y.
Hokkaido University, Department of Anaesthesiology, Sapporo, Japan

Background and Goal of Study: It has been reported that perioperative hyperglycemia was associated with poor outcome in the pediatric cardiac patients. It was also reported that perioperative plasma lactate concentration predicted the outcome in the pediatric cardiac surgery. However, the relation between the glucose level and plasma lactate concentration seems still unclear during the perioperative period in pediatric cardiac surgery.

In this study, accordingly, we measured and compared the changes of glucose level and plasma lactate concentration simultaneously in pediatric cardiac surgery. We also evaluated the relation between these variables and early postoperative outcome.

Materials and Methods: With IRB approval and parental informed consent,49 children less than 10 kg who underwent congenital cardiac surgery with cardiopulmonary bypass (CPB) in our university hospital were evaluated. The glucose level and plasma lactate concentration were measured after induction of anesthesia (T1), after end of CPB (T2), at the admission of intensive care unit (ICU) (T3), and 6 hours after the admission of ICU (T4). As early postoperative outcome, length of intubation, ICU and hospital stay and mortality within one month after surgery were evaluated.

Results and Discussion: Median age was 7 months and mean body weight was 6.2 ±2.2 (standard deviation) kg. The mean glucose level and plasma lactate concentration at T1 were 103 ±19 mg/dl and 0.9 ± 0.3 mmol/l respectively. The glucose level at T2 significantly increased to 216 ±55 mg/dl by paired t-test ($p< 0.01$) and remained high at T4 (196 ±66 mg/dl). The mean plasma lactate concentration at T2 also significantly increased to 1.9 ±0.6 mmol/l ($p< 0.01$) and remained high at T4 (1.7 ±1.0 mg/dl).

Significant correlation was seen between the glucose level and plasma lactate concentration at T3 and T4, however, correlation coefficient (r) was not so high (0.48 at T3 and 0.41 at T4).All the r values were below 0.3 between two these variables at each time point and length of intubation, ICU and hospital stay. All the patients survived 1 month after surgery.

Conclusion(s): In pediatric cardiac surgery, the glucose level and plasma lactate concentration increased after CPB, however the changes of these two variables were independent. Both glucose level and plasma lactate concentration in perioperative period were not associated with early outcome.

4AP9-2

Impact of enhanced recovery programme on length of stay following elective abdominal aortic aneurysm repair

Martindale T.G., Morton H., Hafez H.H., Margarson M.P.
St Richard's Hospital, Departments of Anaesthesia and Vascular Surgery, Chichester, United Kingdom

Background and Goal of Study: Over the last six years, our vascular unit has instituted the core elements of an enhanced recovery programme. We have performed a retrospective analysis to assess the impact of these changes.

Materials and Methods: The ICU database was cross referenced to a surgical database to identify all elective Abdominal Aortic Aneurysms (AAA) performed.

For each patient, demographics, APACHE II score, ICU and hospital length of stay and outcome were recorded. Data were grouped into five periods of two years each for trend analysis and statistical significance tested using the Kruskal-Wallis and Dunn's multiple comparison test.

Results and Discussion: Between January 2001 and December 2010, 443 elective infra-renal AAA repairs were performed. All were admmitted onto the ICU after surgery. The APACHE scores for each two year period were not significantly different. The median length of hospital stay was reduced from 10 days to 4 days over the period 2001-2010 (highly significant, $p< 0.0001$).

[Reduction in length of stay]

This reduction in length of stay is due to a combination of surgical and anaesthetic factors. Our enhanced recovery programme includes increased use of small transverse incisions, the use of a bowel bag intra operatively, routine epidural (and more recently spinal opiod) analgesia, modest intra-operative fluids, in-theatre extubation and early mobilisation and enteral feeding. Invasive monitoring and critical care support by the multi-disciplinary team in the first twenty-four hours post surgery are integral to achieving these aims. Our mortality over the last four years is 2.4%.

Conclusion: The routine use of a multi-modal enhanced recovery programme has reduced length of hospital stay in our regional vascular unit from a median of 10 to a current 4 days.

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4AP9-3

Prophylactic use of pentoxifylline on cognitive function and biochemical markers for brain demage in on-pump CABG patients

Sayilgan C., Erdoğan C., Yuceyar L., Erolçay H., Çağlar S., Konukoğlu D., Ömeroglu S., Fırtına S., Balcıoğlu İ., Ipek G.
Istanbul University Cerrahpasa Medical Faculty, Department of Anaesthesiology, Istanbul, Turkey

Background and Goal of Study: Neurocognitive dysfunction is a well-known complication of cardiopulmonary bypass(CPB). Parmacological manuplations to attenuate CPB- associated organ dysfunction have received some attention. With its beneficial reological and anti-inflammatory properties pentoxifylline (PTX) appears to be an interesting agent in cardiac surgery patients.[1] Thus the present study was designed to evaluate the influence of prophylactic use of PTX on cognitive function and S-100 ß and NSE in on-pump coronary artery bypass grafting (CABG) patients.
Materials and Methods: In this prospective, double -blind and randomized study 40 patients aged between 50-79 years, undergoing on-pump CABG received either PTX (n=20)(bolus of 5 $mgkg^{-1}$) after induction of anesthesia or saline as plasebo (control group n= 20). Exclusion criteria were myocardial infarction within 3 months, renal or liver insufficiency, REDO surgery, psychiatric or cerebrovascular disease, uncontrolled DM, and the use of antiinflammatory drugs. Neurological examination and a neuropsychologic test battery consisting of the mini mental state examination(MMSET) and Benton visual retention test(BVRT) were obtained preoperatively and on the seventh postoperative day. Blood samples for analysis of S-100ß and NSE were collected before anesthesia(T1), at the end of CPB(T2), at the 3rd hour(T3) and 24th hour(T4) postoperatively.
Results and Discussion: Demographic and perioperative data were similar for the two groups. Mean age of patients in PTX group was 60.31±7.69 yr. and in group C.was 61.48±8.14 yr. Mean cross-clamping times were 67.86±22.22 and 66.32 ±27.84 min respectively. In both groups S-100 ß and NSE increased significantly (P< 0.01) at the end of the CPB and remained slightly increased at T2 and T3 compared to preoperative levels (P>0.05). MMSET and BVRT performance of the two groups were found to be similar and unchanged comparing to preoperative scores.
Conclusion(s): CABG with CPB caused a significantly greater increase in NSE and S100 ß serum levels with no deterioration in neuropsychological outcome assesed in the first postoperative week. Despite it was reported that PTX can be a promising agent to prevent development of post -CPB organ disfunction in elderly cardiac surgery patients, prophylactic use of PTX appeared to offer no advantage for cerebral protection in the age group involved in this study.
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4AP9-4

Incidence and outcomes of relative adrenal insuficiency in cardiopulmonary bypass surgery patients

Hernandez Beslmeisl J., Darias Delbey B., Lorenzo L., Diaz B., Palmero S., Arribas C.
Hospital Universitario de Canarias, Department of Anaesthesiology, San Cristobal de La Laguna, Spain

Background and Goal of Study: The objective of this study was to determine the incidence and risk factors for relative adrenal insufficiency (RAI) in cardiopulmonary bypass (CPB) patients and the impact on postoperative hemodynamic status.
Materials and Methods: A prospective cohort study was performed on elective CPB patients on a 24-bed intensive care unit of tertiary university hospital. RAI was defined as a rise in serum cortisol ≤9 μg/dl after the administration of 250 μg of consyntropin. Plasma cortisol levels were measured preoperatively, immediately before and 30 minutes, 60 minutes and 90 after the administration of cosyntropin (250 μg).
Results and Discussion: We included 120 from 137 consecutive patients, of whom 17 met criteria for exclusion (8 off-pump, 2 surgical emergencies, 2 with endocarditis, 5 corticoid-dependency). We studied 84(70%) males and 36 (30%) females. Mean age 67 ±12 years. Plasma cortisol levels were measured preoperatively, immediately before, 30, 60, and 90 minutes after the administration of cosyntropin and 24 postoperative hours. RAI (Δcortisol ≤9 μg/dl) incidence was 77.5%. Etomidate was the only independent risk factor associated with RAI (OR 8.51, CI 95%, 3.09 to 23.42). RAI patients needed more vasopressor requirements just after surgery (P=0.04), and 4 postoperative hours (P=*0.01*). Pre and post-test plasma cortisol levels were inversely associated with maximum norepinephrine dose in the same time periods (ρ=-0.22, P=0.02; ρ=-0.18, P=0.05; ρ=-0.21, P=0.02; and ρ=-0.22, P=0.02, respectively).
Conclusion(s): Relative adrenal insufficiency and lower cortisol levels in CPB patients induce postoperative vasopressor dependency. Use of etomidate in these patients is a modifiable risk factor for the development of RAI that should be avoided.

4AP9-5

Postoperative acute coronary syndrome in patients undergoing noncardiac surgery

Gil S., Pascual J., Villazala R., Calatayud L., Gonzalez F, Leon A.
General Hospital of Ciudad Real, Department of Anaesthesiology and Intensive Care, Ciudad Real, Spain

Aim: The aim of this study is to determinate the incidence of acute coronary syndrome(ACS) with and without ST segment elevation, related factors, treatment, average length of stay and mortality in postoperative noncardiac surgery.
Methods: A total of 1919 patients undergoing noncardiac surgery, admitted in a Postoperative Care Unit (PCU) of the General Hospital of Ciudad Real from April 2006 to December 2009, were evaluated. The following variables were recorded: incidence of ACS, age, sex, cardiovascular disease history, type of surgery, bleeding, medical treatment, days in the PCU, and mortality.
Results: During the follow-up, 32 patients presented an ACS . The incidence of an ACS was 1.7% (95% CI 0.2 to 3.7). Both age and being male were related to the coronary event. The most common disease presented were hypertension (68.8%), and ischemic heart disease (34.4%) with a significant difference (p = 0.012 and p = 0.00) when compared with patients without ACS. The type of surery : general surgery in 37.5% of patients, orthopedic surgery in 28.1% of patients and vascular surgery in of 15.6%. The type of surgery showed a clear relationship with coronary events(p = 0.004). Major bleeding was presented in 20% of patients, and in this group, 50% of patients had suffered an ACS (p = 0.001). Treatment was medical in 87.5% of patients. The average stay was 2.96 ± 6.3 days (3.88 ± 5 days in patients with ACS) and the mortality was 5% (6% in patients with ACS) with no difference. In the multivariate analysis as independent variables of suffering an ACS in the postoperative period were: age (odds ratio (OR) = 1.5, 95% CI, 0.67 to 3.41), history of ischemic heart disease (OR = 4.59, 95% CI, 1.98 to 10.62), and surgical bleeding (OR = 3.18, 95% CI, 1.51 to 6.71). Gynecology sugery behaved as a protective factor of ACS(OR = 0.063, 95%, from 0.004 to 1.09).
Conclusion: Our incidence of ACS in the postoperative of non cardiac surgery is around 1.7%.Male sex, age more than 65 years, hypertension and type of surgery were associated with cardiac event. As independent factors of suffering an ACS found: age> 65 years, history of ischemic heart disease, and important surgical bleeding. Gynecology surgery behaved as a protective factor. Postoperative acute myocardial syndrome is a major cause of morbidity and mortality in patients undergoing noncardiac surgery .Emphasis should be given to preoperative clinical risk stratification of these patients for appropriate treatment.

4AP9-7

Effect of combined administration of magnesium sulfate and corticosteroids on the incidence of postoperative atrial fibrillation in coronary surgery with CPB

Kallel S., Ben Soltana M.H., Djemal W., Triki Z., Chaari M., Karoui A.
Academic Medical Center Habib Bourguiba of Sfax, Department of Anaesthesiology and Intensive Care, Sfax, Tunisia

Background and Goal of Study: Atrial fibrillation (AF) is the most frequent arrythmia in the waning of coronary surgery with cardiopulmonary bypass (CPB). Its incidence varies between 20 to 40% and it is associated with a longer stay in the ICU as well as an increased mortality. Several studies have reported the benefit of prevention of this complication by corticosteroids or magnesium sulfate (MS) administration, but there wasn't any study that evaluated the effect of their combined administration.The objective of this study is to evaluate the impact of a three-day hydrocortisone hemisuccinate (HCHS) and MS administration on the occurence of postoperative AF in coronary surgery with CPB.

Materials and Methods: This is a retrospective study that involved 129 patients aged over 18 years who underwent scheduled or semi-urgent coronary surgery with CPB and who have been supported in the postoperative ICU.
The patients were divided into 2 groups : Group 1 comprising those who didn't receive the study protocol and group 2 consisted of patients in whom we performed a combined administration of MS and HCHS. The study protocol consisted in the administration of 3 grams of MS and 100 milligrams of HCHS after induction of anesthesia. Postoperatively patients were given daily, during the first three days, 3 grams of MS and 300 milligrams of HCHS at the rate of 100 milligrams every eight hours. Postoperative AF was defined as any documented AF episode of a period not less than 15 min occurring in the ICU. The anesthesia protocol and CPB were the same for all patients in both groups.
Results and Discussion: There were no differences between the two groups in terms of demographics, comorbidities and preoperative treatment.Intraoperative data didn't differ between them. AF was higher in G1 (23% vs 6%). SIRS and severe SIRS were more often in G1 with respectively 62% vs 35% and 32% vs 16%.CRP levels were also higher in G1.Duration of stay > 5 days was more common in G1(57% vs 30%). We recorded a greater number of deaths in G1 without suggestive difference : 7 deaths vs 3. The postoperative AF has significantly been linked to the risk of death, Acute pulmonary edema, hypoxia and increased length of stay beyond five days.
Conclusion(s): Prevention of postopeartive AF by combined administration of magnesium sulfate and corticosteroids significantly decreased the incidence of this complication, the duration of ICU stay and the postoperative mortality.

4AP9-8

Type of anesthesia and postoperative delirium after vascular surgery

Katznelson R., Lee C., Wasowicz M., Carroll J., Lindsay T., Djaiani G.
Toronto General Hospital, Department of Anaesthesiology, Toronto, Canada

Background and Goal of Study: Delirium is common and devastating complication after vascular surgery. The role of local anesthesia with respect to postoperative delirium after vascular surgery has not been previously explored. The current study investigates an association between the general, regional, and local anesthetic techniques and postoperative delirium after vascular surgery.
Materials and Methods: After institutional ERB approval, data was collected from the perioperative Anesthesia and Vascular Surgery databases on all patients undergoing vascular surgery from June 2006 to December 2007. Patients with preoperative dementia, and/or abnormal level of consciousness were excluded. Based on the type of anesthetic technique, all patients were divided into general (GA), regional (RA), or local anesthesia (LA) groups. Postoperative delirium was assessed as previously described.[1] Assessments were performed daily until patients discharge from the hospital. The onset and duration of delirium were also measured.
Results and Discussion: A total of 500 patients were studied. Patients who underwent open abdominal aortic aneurysm repair were excluded. The overall delirium rate was 19.4%. Delirium rates were similar among the three groups.(Figure) Median onset of delirium was on day 1[1, 2] in the LA group, day 1[1, 2] in the RA group, and day 2[1, 4] in the GA group, p=0.04. Median duration of delirium was 6[3, 30] days in the LA group, 5[2, 8.5] days in the RA group, and 3[2, 6] days in the GA group, p=0.03. Patients in the LA group were more likely to undergo emergency surgery.(Table) Current study indicates that even with the higher prevalence of preoperative risk factors for delirium (history of CVA/TIA, and emergency surgery) in the LA group, postoperative delirium rates remained comparable to either RA or GA groups.
Conclusion(s): Delirium rates after vascular surgery were similar with either LA, RA, or GA techniques. In the presence of known preoperative risk factors for delirium, LA may be a technique of choice to offset the potentially higher postoperative delirium rates after vascular surgery.
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4AP9-9

Endovascular treatment of elective abdominal aortic aneurysms: Early and late mortality: Our experience

Moreno López E., Varela Durán M., Taboada Barja C.
Hospital Montecelo, Department of Anaesthesiology and Intensive Care, Pontevedra, Spain

Background and Goal of Study: Since the first clinical experience in Endovascular Aneurysm Repair (EVAR) in 1990, over 100.000 stents have been implanted in the Abdominal Aorta. The aim of this study is to review our results with patients who went under Elective EVAR, in order to detect intraoperative (IO) and postoperative (PO) complications, as well as early and late Mortality. A comparison with the EVAR 2 Study results has been made.
Materials and Methods: A retrospective study was performed between 2006 and 2010 in our Hospital. 34 patients with EVAR were recruited. The data were collected during their preoperative (PRE), IO and PO time. Mortality in the first 30 days and first year PO has been taken into account.
Results and Discussion: The results were: 1-PRE: The average age was 71 years. 84.85% were men and 15,15% were female. 85.29% ASA III, 8.8% ASA IV, and 2.9% ASA V. 69.70% were Hipertense, 12.12% were Diabethic, 58.83% had Dyslipemia, 18.18% were smokers, 24.24% suffered from Ischemic Cardiopathy, 11.1% Atrial Fibrillation, 8.8% Aortic Valve disease, 2.9% Stroke and Epilepsy. The average values of PRE Hb and Creatinine (Cr) were 13.4% and 1.08% mg/dl respectively. 2-IO: 29.41% were transfunded with blood products, IO Noradrenaline (NA) was used in a 5,8% of cases, furthermore IO Furosemide was used in an 11,76% of cases. 3-PO: The average values of Hb and Cr were 10,7 mg/dl and 0,94 mg/dl respectively . In 11% of cases PO transfusion was implemented. PO NA and Dobutamine were used in 17.6% and 5,8% respectively. Acute Myocardial infarction occurred in 8,8% of cases. PO Furosemide was used in 11.76% of cases. 8.8% required mechanically ventilation for more than 48 hours. 5.8% of patients were reoperated: a patient with Vascular esthenosis and a patient with an Scarf infection. The average stay in the Reanimation Unit (RU) was 2.5 days, while 73% of patients had a 24 hour stay. Mortality in the RU was 8.8%. All patients who died in this Unit had required the reconversion from EVAR into Open Surgery (OS). First year PO Mortality ocurred in 16,1% of cases.
Conclusion(s): The conversion from EVAR into OS and IO transfusion are found to be more related to mortality in the RU than any other considered variable. Previous Heart and Kidney diseases are the main causes of first year mortality. In our study mortality in the first 30 days was 8,8% whereas in the EVAR-2 Study had 9%.
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4AP10-1

Cerebral oxygenation depends on flow and not vascular resistance in patients on cardiopulmonary bypass

Brevoord D., Jöbsis D.A., Sperna Wieland N., De Hert S.G., Preckel B., Immink R.V.
Academic Medical Center, University of Amsterdam, Department of Anaesthesiology, Amsterdam, Netherlands

Background and Goal of Study: Treating hypotension can be accomplished by raising systemic vascular resistance (SVR) or systemic vascular flow, i.e. cardiac output (CO). Studies in healthy volunteers suggest that increasing CO might be more appropriate for maintaining cerebral perfusion. However, CO and SVR are intertwined and modifications to one also alter the other. To separate the effect of CO and SVR on cerebral oxygenation (cO_2), we independently modified these parameters in patients on cardiopulmonary bypass (CPB).
Materials and Methods: After obtaining informed consent, we monitored cO2 using near infrared spectroscopy (INVOS 5100) in 8 patients (4 men, 4 women), mean age 61 ± 5.5 (SD), during elective cardiac surgery on CPB (>33˚ C), excluding patients with diabetes, older than 70 years of age or known brain pathology. After stabilization on bypass, 4 interventions were done in random order to alter mean arterial pressure (MAP): a bolus injection of sodium nitroprusside (SNP) to decrease SVR and a bolus injection of phenylephrine to increase SVR, both during clamped CPB flow, and increasing or decreasing CPB flow by 0.5 L/min/m² to increase or decrease CO, respectively. Maximal changes from baseline are reported as mean±SD; a paired Student t-test was used for analysis of statistical significance.
Results and Discussion: Both, an increase in SVR and CPB flow resulted in a rise in MAP of 14±10 and 11±6 mmHg, respectively, while a decline in SVR and CPB flow caused a MAP decrease of 10±6 and 13±7 mmHg. cO_2 increased by 2.6±0.6 % ($p< 0.01$) during a CPB flow derived increase in MAP and decreased by 2±0.8 % ($p< 0.01$) during a CPB flow decline. Decreasing SVR, during clamped CPB flow, had no effect on cO_2, whereas increasing SVR resulted in a decrease of cO_2 by 1.5±2.1 % ($p=0.04$).
In patients on CPB, cerebral oxygenation is dependent on CPB flow, as flow-mediated variations in MAP produced a small, but concomitant effect on cO_2. During clamped CPB flow, SVR decrease did not affect cO_2 while an increase of SVR even reduced cO_2 slightly.
Conclusion(s): The data of this study suggest that in the hypotensive patient on CPB, correction of blood pressure with vasoconstriction decreases cerebral oxygenation while increasing CPB flow enhances cO_2, although the effects are small. The potential clinical implications of these alterations remain to be established.

4AP10-2

Pulsatile flow during cardiopulmonary bypass preserves postoperative microcirculatory perfusion

Koning N.J., Vonk A.B., Van Barneveld L.J., Beishuizen A., Van den Brom C.E., Boer C.
VU University Medical Center, Departments of Anesthesiology, Cardio-Thoracic Surgery & Intensive Care Medicine, Amsterdam, Netherlands

Background and Goal of Study: Cardiopulmonary bypass (CPB) is associated with a transition of pulsatile to non-pulsatile flow generated by the heart-lung machine. Non-pulsatile flow may deteriorate postoperative organ perfusion, but this has only scarcely been investigated on a microcirculatory level. We therefore hypothesized that non-pulsatile flow negatively influences microcirculatory perfusion in cardiac surgery, and this is prevented by pulsatile flow during extracorporeal circulation.
Materials and Methods: Patients undergoing coronary artery bypass graft (CABG) surgery were randomized into a non-pulsatile (n=15) or pulsatile (n=15) CPB group. Sublingual mucosal microvascular function was measured at preoperative, intraoperative and postoperative time points using sidestream dark field imaging and quantified as the level of perfused vessel density (PVD) and microvascular flow index (MFI). Microcirculation measurements were paralleled by hemodynamic and inflammatory parameter analysis.
Results and Discussion: The observed reduction in PVD during aorta cross-clamping was only restored in the pulsatile flow group and increased from 15.5±2.4 mm/mm^{22} upon intensive care unit admission (P< 0.01). The median postoperative MFI was higher in the pulsatile group (2.8 (2.7-2.9)) than in the non-pulsatile group (2.5 (1.9-2.7); P< 0.05).
There was no association of preserved microcirculatory vessel perfusion with inflammatory parameters. Pulsatile flow was associated with improved oxygen consumption from 71±14 to 85±14 ml/min/m^2 (P< 0.05) during aorta cross-clamping, which was not found for non-pulsatile flow.
to 20.3±3.7 mm/mm
Conclusion: Pulsatile CPB preserves microcirculatory perfusion throughout the early postoperative period. Improved oxygen consumption during pulsatile flow suggests decreased microcirculatory shunting during CPB, which may contribute to the observed preservation of microcirculatory function in the perioperative period.

4AP10-3

Pressure support ventilation and intestinal microcirculation in experimental sepsis

Schuster H., Henzler D., Hoffmann F, Chankalal R., Ismaiel N., Lehmann C.
Dalhousie University, Department of Anaesthesiology, Halifax, Canada

Background and Goal of Study: Positive pressure ventilation during sepsis may impair abdominal perfusion and intestinal microcirculation. We investigated, whether preserved spontaneous breathing could mitigate inflammatory response and compromised microcirculation in experimental sepsis.
Materials and Methods: After approval by the animal care committee, male SD rats were anesthetized and tracheotomized. Sepsis was induced in 20 animals by Colon Ascendens Stent Peritonits (CASP) surgery using aseptic technique 15 h prior to the start of an experiment and 20 animals served as controls. Animals in each group were randomized to pressure support (PSV) or volume controlled ventilation (CMV). After 4 hours of ventilation intestinal microcirculation in the terminal ileum was visualized using intravital fluorescence microscopy. Leukocyte adhesion (n/mm^2) and functional capillary density (mm/mm^2) were analyzed.
Results and Discussion: There were no differences in baseline hemodynamics and gas exchange. Although CASP animals appeared sick, macrocirculatory parameters remained stable and septic acute lung injury did not occur. In septic animals breathing PSV the functional capillary density in the longitudinal muscularis layer remained significantly higher than dysfunctional and nonfunctional capillary density (p=0.006), but not in animals ventilated in CMV. The same trend was observed in the circular layer and mucosa, but failed significance.
Leukocyte adhesion in submucosal collecting venules during CMV increased from 121±24 (controls) to 301±100 (sepsis). In PSV it increased from 89±37 (controls) to 237±81 (sepsis), which was significant for both ventilation groups (p< 0.0001). The differences between CMV and PSV were not significant (p=0.14).
Conclusion(s): Sepsis caused severe impairment of intestinal microcirculation despite preserved hemodynamics. The deleterious effects were less pronounced with PSV, although the differences between CMV and PSV were not significant in direct comparison.

	Experimental Group	baseline	1hr	4hr
MAP [mmHg]	CMV Controls	145±34	127±38	150±28
	CMV Sepsis	137±19	122±23	155±20
	PSV Controls	146±26	141±12	134±20
	PSV Sepsis	130±32	128±29	121±34
Cardiac index [mlkg-1min-1]	CMV Controls	248±63	353±169	248±110
	CMV Sepsis	267±36	303±52	334±77
	PSV Controls	340±146	362±159	301±124
	PSV Sepsis	261±61	270±48	377±48

[Table 1]

4AP10-4

Effects of experimental acute lung injury and mechanical ventilation on the intestinal microcirculation

Hoffmann F, Henzler D., Schuster H., Chankalal R., Ismaiel N., Lehmann C.
Dalhousie University, Department of Anaesthesiology, Halifax, Canada

Background and Goal of Study: The activation of inflammation during mechanical ventilation in acute lung injury (ALI) can lead to injury of distant organs by multiple mechanisms. The influence of ventilation mode on the intestinal microcirculation during ALI has not been investigated. We studied the effects of controlled vs. assisted ventilation on intestinal microcirculation during ALI.
Materials and Methods: After approval by the animal care committee, male SD rats were anesthetized and tracheotomized. 20 animals served as controls and ALI was induced in 20 animals by intratracheal instillation of 2.5 ml/kg HCl (pH 1.25). Animals were randomized to either pressure support (PSV) or volume controlled ventilation (CMV) with lung protective settings. CMV animals were paralysed. After 4 hours of ventilation intestinal microcirculation in the terminal ileum was visualized using intravital microscopy. Adhering leukocytes (n/mm^2) and functional/ nonfunctional capillary density were analyzed.
Results and Discussion: There were no differences in baseline hemodynamics and gas exchange. After induction of lung injury elastance of the respiratory system increased by 65% in both ventilation groups and wet/dry ratio was increased as compared to controls. In ALI, the functional capillary density was reduced in the longitudinal and circular layers of the muscularis as well as the mucosa (p< 0.0001). The pattern of a shift to nonfunctional and dysfunctional capillary density was similar whether animals were ventilated in PSV or CMV. During CMV, the leukocyte adhesion in submucosal collecting venules increased from 121±24 (controls) to 219±83 (ALI). In PSV it increased from 89±37 (controls) to 181±73 (ALI), which was significant for both ventilation groups (p< 0.0002). The differences between CMV and PSV were not significant (p=0.29).

	Experimental Groups	baseline	1hr	4hr
PaO2 [mmHg]	CMV Controls	498±44	491±43	485±71
	CMV ALI	475±98	401±97	395±93
	PSV Controls	442±89	467±48	434±112
	PSV ALI	499±53	422±53	363±120
PaCO2 [mmHg]	CMV Controls	58±8	62±9	56±4
	CMV ALI	65±13	69±7	63±9
	PSV Controls	61±10	63±17	66±12
	PSV ALI	62±10	67±13	65±6

[Table 1]

Mean ± SD values

Conclusion(s): ALI causes an inflammatory reaction in the small intestine and impairs microcirculation. ALI, but not the ventilation mode, was indicative of the observed changes.

4AP10-5

Changes in cerebral blood flow in two different pulsatile ventricular assist devices: Experimental study in pigs

Rodriguez-Bernal G., Sanchez Hernandez J.J., Heredero Jung A., Perez-Caballero R., Del Cañizo J.F, Quintana Villamandos B.
Hospital General Universitario Gregorio Marañon, Department of Anaesthesiology and Intensive Care, Madrid, Spain

Background and Goal of Study: To date, no studies have demonstrated which mechanical circulatory assist device is better to maintain adequate ce-

rebral blood flow. The goal of this study is to measure cerebral blood flow in two different left ventricular pulsatile assist devices (LVAD), in both total support and partial support conditions.

Materials and Methods: Ten healthy minipigs were used for this study. A 25 cc Berlin Heart Excor (BH) VAD (n=5) and a new device (CC) with an input compliant chamber (n=5) were implanted. LVAD was instituted by cannulation of the apex of the left ventricle (inflow cannula) and the ascending aorta (outflow cannula). Once the LVAD is established, a first (basal) injection of yellow microspheres in the left atrium is performed. Then the LVAD is initiated and working parameters adjusted to achieve a maximum pump flow (total support). These conditions are maintained during 30 minutes and afterwards a second injection of eosin microspheres is performed. Then the pump flow is reduced to a half of the maximum flow (partial support) and maintained during another 30 minutes; after that, a third injection of violet microspheres is performed. Finally, the animal is sacrificed and tissue samples of both cerebral hemispheres are obtained to measure cerebral blood flow based on the number of microspheres counted in each sample. The value of the microspheres was expressed as a percentage compared to baseline.

Results and Discussion: During total support no statistically significant changes of cerebral blood flow were seen between both LAVD (BH vs CC) in either right (108±29 vs 88±30; p=0,35) or left (120±47 vs 67±17; p=0,07) frontal lobes. However, a lower cerebral blood flow was observed with BH LVAD during partial support in right (85±28 vs 188±37; p=0,002) and left (92±23 vs 172±51; p=0,01).

Conclusion: Cerebral blood flow is higher during partial support when using a new LVAD with a compliant chamber compared with another pulsatile LVAD (Berlin Heart Excor).

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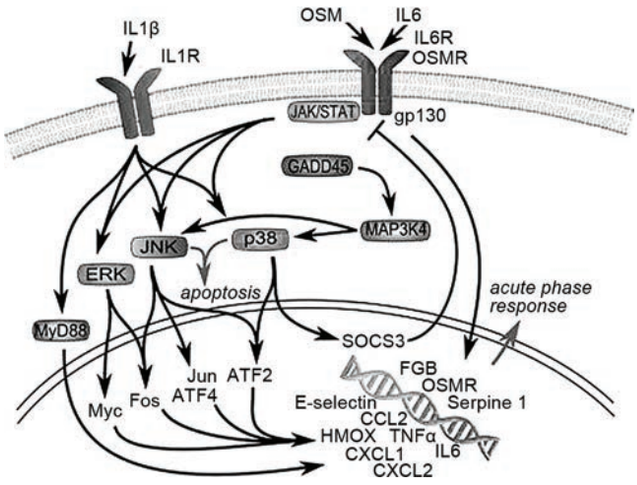
4AP10-6

Microarray analysis reveals a local inflammatory response induced by cardiopulmonary bypass in rat kidney

Bouma H.R., Samarska I.V., Struys M.M.R.F., Henning R.H., Epema A.H.
University Medical Center Groningen, Departments of Clinical Pharmacology and Anesthesiology, Groningen, Netherlands

Background and Goal of Study: Cardiopulmonary bypass (CPB) is a commonly used technique in cardiac surgery. However, CPB is associated with acute renal dysfunction. Also, a temporary peri-operative decrease of renal function negatively influences long-term survival. To obtain an insight into the pathogenesis of renal dysfunction following CPB, we performed a microarray analysis of kidney gene expression in rat.

Materials and Methods: Rats underwent CPB or Sham procedure and were sacrificed at 60 min, 1 and 5 days following the procedure. Microarray analysis was used to determine expression changes in the kidney following CPB and Sham.



[(Renal) signal transduction induced by CPB in rat.]

Results and Discussion: Expression of 421 genes was significantly altered in CPB as compared to Sham, of which 407 genes in the acute phase (60 min) following CPB. Gene-ontology analysis revealed 28 of these genes involved in inflammatory responses, with major activation of mitogen activated protein-kinase (MAP-kinase) signaling pathways. Potent inducers identified constitute of the interleukin-6 cytokine family that consists of interleukin-6 (IL6) and oncostatin M (OSM), which signal through the gp130-cytokinereceptor. Downstream signaling leads to production of chemokines, adhesion molecules and molecules involved in coagulative pathways. Production of chemokines and adhesion molecules stimulate early influx of monocytes/macrophages, neutrophils and lymphocytes, thereby augmenting the renal inflammatory response.

Conclusions: CPB induces an acute and local inflammatory response in the kidney, which might contribute to the induction of renal injury. The signaling pathways identified by microarray analysis of renal gene expression may represent pharmacological targets to limit renal injury following CPB.

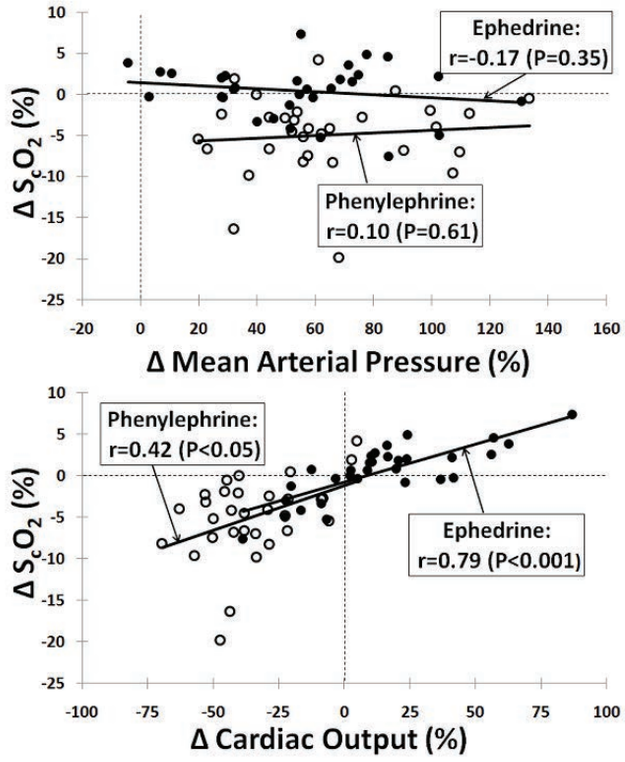
4AP10-7

Cardiac output and not blood pressure correlates with cerebral oxygenation after phenylephrine and ephedrine treatment of anesthesia-induced hypotension

Meng L., Alexander B.S., Rinehart J., Kain Z., Mantulin W., Cannesson M.
University of California Irvine, Department of Anaesthesiology, Orange, United States

Background and Goal of Study: Phenylephrine and ephedrine are commonly used to treat anesthesia-induced hypotension in order to increase cerebral perfusion pressure. However, recent evidence demonstrated decreased cerebral tissue oxygen saturation (S_cO_2) after phenylephrine treatment and relatively unchanged S_cO_2 after ephedrine treatment. Both pressors are known to affect cardiac output in addition to blood pressure. However, the correlation between these changes and the change in cerebral oxygenation is not well understood.

Materials and Methods: ScO2, mean arterial pressure, and cardiac output were measured with frequency domain near-infrared spectroscopy (Oxiplex TS, ISS), esophageal Doppler (CardioQ, Deltex), and arterial catheter (Vigileo FloTrac, Edwards Lifescience) before and after phenylephrine and ephedrine bolus treatment of anesthesia-induced hypotension. All measurements were done before surgical incision. Exclusion criteria for this observational study were cardiovascular disease, cerebrovascular disease, or poorly controlled diabetes mellitus.



[Cardiac Output vs ScO2]

Results and Discussion: Thirty one ASA I-III patients were studied (22 males and 11 females) with an age of 59±13. S_cO_2 decreased (5±4.8%; P< 0.001) after phenylephrine treatment (100-200mcg) and was sustained (0.5±3.2%;

P=0.45) after ephedrine treatment (5-10mg). Changes in S_cO_2 correlated with changes in cardiac output after both phenylephrine (r=0.42, P< 0.05) and ephedrine (r=0.79, P< 0.001) treatment, but did not correlate with changes in mean arterial pressure after either phenylephrine (r=0.1, P=0.61) or ephedrine (r=-0.17, P=0.35) treatment.
Conclusion: Changes in cerebral oxygenation correlated with changes in flow, but not pressure, after bolus pressor treatment. Even though pressor administration increased mean arterial pressure and cerebral perfusion pressure, the decrease in cardiac output lowered cerebral oxygenation.

4AP10-8

Altered expression in pituitary adenylate cyclase-activating polypeptide and its receptors in monocrotaline-induced pulmonary hypertension in rats

Mizuno Y., Koga M., Irie T., Goto T.
Yokohama City University, Department of Anaesthesiology, Yokohama, Japan

Background and Goal of Study: Pituitary adenylate cyclase-activating polypeptide (PACAP) and vasoactive intestinal polypeptide (VIP) are neurotransmitter associated with numerous physiological functions and clinical conditions. They share G protein-coupled receptors and 68% homology in amino acid sequence. Although the ligands and receptors are abundantly distributed in respiratory systems, little is known about their role in the lung. Recently, PACAP/VIP have been reported to have protective effect on vascular diseases including cerebral ischemia and coronary disease. We previously showed that right ventricular hypertrophy induced with monocrotaline (MCT) was associated with altered expression of VIP and its signaling system. Yet, involvement of PACAP/VIP and their receptors in development of pulmonary hypertension (PH) has not been fully elucidated. Thus, in this study, we investigate the relation of PACAP/VIP and their receptors to PH using MCT-treated rat model.
Materials and Methods: Male rats were divided into following two groups: Group M was given 60mg/kg of MCT 4weeks before experiments. Group C was control. Rats were anesthetized for hemodynamic studies. The lung and heart were isolated for following experiments. Right ventricle (RV) and left ventricles with intraventricular septum (LV+IVS) were weighed separately. Protein expression of common receptors for VIP and PACAP, (VPAC1 and VPAC2) and specific receptor for PACAP, (PAC1) were measured by western blot analysis. VIP and PACAP in the lung and serum were measured by ELISA or western blot. mRNA of VIP and PACAP were quantified by real-time reverse transcription PCR.
Results and Discussion: RV/(LV+IVS) and RV/BW in group M were significantly higher than those in group C. Protein expression of VPAC1, VPAC2 and PAC1 in the lung in group M increased significantly accompanied with a decrease of PACAP compared to those in group C. Similar results were obtained from right cardiac ventricle. VIP and PACAP concentrations in serum did not differ between the groups. A decrease in PACAP expression in the lung and heart might result in compensatory increase in expression of PAC1, VPAC1 and VPAC2. However, further investigations are required to better understand the role of PACAP/VIP in development of PH.
Conclusion: We demonstrate for the first time that decrease in PACAP is associated with increase in its receptors in the lung and heart in the model of MCT -induced pulmonary hypertension.

4AP10-9

Acute hypercapnia counteracts the microcirculatory deterioration in septic rats

Stuebs C., Obermiller K., Schwartges I., Bauer I., Picker O., Beck C.
University Hospital Duesseldorf, Department of Anaesthesiology, Duesseldorf, Germany

Background and Goal of Study: Acute hypercapnia induces a macro-haemodynamic improvement comparable to catecholamine infusion, enhances global oxygen delivery[1] and increases microcirculatory oxygenation[2]. Our aim was to investigate the protective microcirculatory effects of acute hypercapnia in a septic animal model.
Materials and Methods: 24hours prior to experiments 33 male Wistar rats (350±20g) were either laparotomized (sham) or underwent a laparotomy followed by a colon ascendens stent peritonitis (CASP) surgery (stent). CASP surgery was performed according to a previously reported method[3]. The stent-animals developed a polymicrobial sepsis through constant fecal leakage into their peritoneal cavity. All animals were then anaesthetized with pentobarbital for 120min and received ongoing fluid replacement. The pressure-controlled ventilation either maintained a target pCO_2 of 35-40mmHg in the normocapnic group or induced moderate hypercapnia (pCO_2 65-75mmHg) through exogenous CO_2 with otherwise unaltered ventilator settings. Systemic macro-haemodynamics, ventilation pressure and microcirculatory oxygenation of the colonic wall (tissue reflectance spectrophotometry) were recorded continuously and arterial blood was analyzed intermittently.
Data are presented as means ± SEM. ANOVA, post-hoc Fisher's, p< 0.05
Results and Discussion: In septic animals microcirculatory oxygenation (μHbO_2) significantly deteriorated under normocapnia (61±4% to 52±5%, p=0.003), despite macrocirculatory stability. This negative effect was fully reversed in the septic group when treated with hypercapnia (68±3% to 71±3%), maintaining the μHbO_2 at a similar level to that of the non-septic sham groups (normocapnic-sham (65±4% to 66±4%) and hypercapnic-sham (66±6% to 70±5%)).
The mean arterial pressure was stable over time within all four groups.
Conclusion(s): Moderate acute hypercapnia maintains the splanchnic microcirculatory oxygenation, while counteracting the adverse effects induced by sepsis, regardless of the macrocirculation. Thus, the protective effect of hypercapnia might help to maintain the splanchnic mucosal barrier function in compromised patients. Further research is needed to investigate the effect of hypercapnia on bacterial translocation and multiorgan failure.
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4AP11-1

Continuous monitoring of glucose levels in the hepatic vein and systemic circulation during Pringle maneuver in beagles

Yatabe T., Fukunaga K., Hirohashi M., Tamura T., Hamaguchi M., Yokoyama M.
Kochi Medical School, Department of Anaesthesiology, Nankoku, Japan

Background and Goal of Study: Although continuous intraoperative glucose monitoring revealed that liver ischemia/reperfusion causes rapid and profound changes in glucose concentration, the mechanism is unknown. We hypothesized that liver ischemia-induced glycogenolysis increases liver glucose levels during total liver ischemia, namely, the Pringle maneuver. After restoring hepatic circulation, the washout of glucose stored in the liver is believed to lead to rapid and profound changes in systemic blood glucose concentration. Therefore, we investigated the effect of glucose washout after liver ischemia in dogs by continuously monitoring the glucose levels in different veins, namely, the portal, hepatic, and internal jugular veins.
Materials and Methods: Six female beagles were studied. A portosystemic shunt was established and glucose levels in the jugular, hepatic, and portal veins were continuously monitored using the STG-22 system (Nikkiso Inc., Tokyo, Japan). All beagles were stabilized for 30 min, and subsequently the hepatic artery and portal vein were clamped (the Pringle maneuver). After 30 min of warm hepatic ischemia, the clamp was removed to initiate hepatic reperfusion. The experimental endpoint was 60 min after the onset of reperfusion. The glucose levels in the abovementioned veins were recorded continuously.
Results and Discussion: The glucose level in the hepatic vein (84 ± 40 mg/dl) increased 10 min after starting the Pringle maneuver and was significantly higher than that in the jugular vein (56 ± 6 mg/dl; P = 0.02) and the portal vein (56 ± 5 mg/dl; P = 0.02) just before unclamping. The glucose level in the hepatic vein peaked at 2 min after unclamping (330 ± 302 mg/dl) and that in the portal and jugular veins started to increase after reperfusion. The glucose level in the hepatic vein was significantly higher than that in the jugular and portal veins between 9 min after clamping and 8 min after reperfusion. Our results suggest that glucose stored in the hepatic vein and the sinusoid was released into the systemic circulation after restoration of hepatic circulation, leading to a rapid elevation of glucose levels in the portal and jugular veins.
Conclusion: Our study on beagles shows that glucose release from the hepatic vein and sinusoid leads to a rapid elevation in systemic blood glucose levels after liver ischemia/reperfusion. This knowledge may contribute to developing new strategies for blood glucose management during hepatectomy.

4AP11-2

Impact of NOTES surgery on intra-abdominal blood flow microcirculation: An experimental study

Vendrell M., Tejedor Navarro A., Adelsdorfer Orellana C., Ibarzábal Olano A., de Lacy Fortuny A.M., Taurà Reverter P.
Hospital Clínic Barcelona, Department of Anaesthesiology and Pain Medicine, Barcelona, Spain

Background and Goal of Study: Natural orifice translumenal endoscopic surgery (NOTES) has evolved considerably. Pneumoperithoneum for NOTES

is created via endoscopic insufflation. Unchecked intra-abdominal pressure (IAP) might induce severe intraabdominal blood flow microciruculation changes.
The aim of this experimental study was to analyze blood flow microcirculation (BFM) redistribution during CO2-pneumoperithoneum created by NOTES versus conventional laparoscopy.
Materials and Methods: Fourteen Yorkshire female pigs, weighing 20-25 kg, were randomized to undergo either laparoscopic cholecystectomy (LG, n=7) maintaining IAP at 15 mmHg, or NOTES cholecystectomy (NG, n=7) allowing variability of IAP (maximum of 30mmHg). Procedures lasted 1 hour. Cortical and medullar kidney, colon, and lung BFM (expressed in $ml \cdot g^{-1} \cdot min^{-1}$), was measured by spectophotometry analyisis using coloured microspheres, before pneumoperithoneum (T0), at end of surgery (T1) and 30 minutes after abdomen deflation (T2). Systemic hemodynamic variables were also recorded using PICCO® system. Results were analyzed using the Mann-Whitney test and two-way ANOVA.
Results and Discussion: No differences in hemodynamic variables were found. There were no differences in BFM between groups at any time or tissue (Table 1), except in lung at T2. BFM evolution was significantly different in medullar kidney (#) and lung (##) between groups.

	Cortical Kidney	Medullar Kidney(#)	Colon	Lung(##)
T0	LG.....1.23±0.6 NG.....1.57±0.8 p=0.53	LG.....0.74±1 NG.....0.53±0.4 p=0.9	LG.....0.25±0.2 NG.....0.38±0.3 p=0.46	LG.....1.09±0.9 NG.....1.22±0.6 p=0.71
T1	LG.....1.72±1.04 NG.....2.36±1.1 p=0.32	LG.....0.51±0.4 NG.....0.54±0.1 p=0.46	LG.....0.32±0.2 NG.....0.49±0.2 p=0.16	LG.....1.22±0.9 NG.....1.73±0.5 p=0.26
T3	LG.....3.26±2 NG.....3.11±2.3 p=0.9	LG.....1.32±1.1 NG.....1.08±0.7 p=0.62	LG.....0.61±0.4 NG.....0.71±0.6 p=0.9	LG.....1.29±0.7 NG.....2.2±0.5 p=0.02*

[Table 1: (Two-ways ANOVA: #p=0.016; ##p=0.038)]

Conclusions: This data suggests the viability of using NOTES as an alternative surgical approach. Fluctuations of intra-abdominal pressure, with peaks of up to 30mmHg, do not seem to affect intra-abdominal blood flow microcirculation, allowing for more permissive limits when using NOTES. It must be remembered that results seen in animal models may not correspond to the human situation.

4AP11-3

Comparative experimental study of hemodynamics and respiratory function changes during three different natural orifice transluminal endoscopic surgery (NOTES) accesses

Navarro-Ripoll R., Martinez-Palli G., Fernandez-Esparrach G., Guarner-Argente C., Cordova H., Rodríguez de Miguel C.
Hospital Clínic de Barcelona, Department of Anaesthesiology and Intensive Care, Barcelona, Spain

Background and Goal of Study: the aim was to investigate whether different accesses during natural orifice transluminal endoscopic surgery (NOTES) peritoneoscopy are safe and associated or not to haemodynamic and respiratory effects different from those observed during laparoscopic peritoneoscopy.
Materials and Methods: fourty swine (33±5kg) were randomized to transgastric (TG, n=10), transcolonic (TC, n=10), transvaginal (TV, n=10) and laparoscopic (LP, n=10) groups. A peritoneoscopy of 30 minutes under general anesthesia with endotracheal intubation and controlled ventilation was done. Invasive systemic and pulmonary arterial pressures, cardiac output by thermodilution, airway pressures and blood gas analysis were recorded before, at 15 minutes, at the end of the peritoneoscopy and 20 min after desufflation. The peritoneal cavity was insufflated with CO_2 from an endoscopic light source/insufflator (NOTES groups) or standard laparoscopic insuflattor. Intraperitoneal pressures (IP) were monitored through a transabdominal Veress needle and maintained below 15 mm Hg
Results and Discussion: All experimets except for one TC animal which had a massive bleeding during the procedure and received euthanasia were completed.. IP was significantly lower in all NOTES groups (TG: 10±4, TC: 9±3, TV: 6±4 mmHg) compared to LP in which IP was maintained around a predertermined value (14mmHg). Mild increase in mean systemic arterial blood pressure was observed in LP animals at 15 and 30 min of peritoneoscopy (p< 0,005) whereas it remained unchanged during all NOTES procedures No other hemodynamic changes were observed... Whereas an increase in airway pressures was observed at 15 and 30 min of peritoneoscopy in LP animals, those parameters remained unchanged in NOTES groups. However, no pulmonary gas exchange disturbances were found in any group during the procedure.
Conclusion(s): different NOTES accesses induce similar haemodynamic and pulmonary changes that are slighter than those observed during standard laparoscopy, likely due to a lower IP. Then, probably, NOTES could be better tolerated than laparoscopy in seriously ill patients with severe respiratory or cardiovascular impairment.
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4AP11-4

Hyperoxia changes heart rate variability of healthy volunteers and anaesthetized patients

Lauscher P., Kertscho H., Enselmann P., Lauscher S., Habler O., Meier J.
Goethe University Clinic Frankfurt, Department of Anaesthesiology and Intensive Care, Frankfurt, Germany

Background and Goal of Study: Ventilation with pure oxygen (hyperoxic ventilation, HV) alters autonomic cardiovascular regulation resulting in increased vagal tone with a concomitant fall of heart rate. The aim of the study presented is to validate this effect of HV on cardiovascular neuroregulation in awake volunteers as well as anesthetized patients by means of heart rate variability (HRV) analysis.
Materials and Methods: After IRB approval and written informed consent 14 healthy volunteers ("volunteers") and 14 anesthetized, ventilated patients ("patients", propofol, remifentanil, ASA I) sequentially breathed room air (FiO_2 0.21, NOX1), pure oxygen (FiO_2 1.0, HOX) and room air (FiO_2 0.21, NOX2) again. During each episode standardized parameters of time- and frequency domain analysis of HRV were calculated from short term (5min) ECG recordings. SDNN, standard deviation of normal RR-Intervals; RMSSD, root mean square of successive differences; HFnu, high frequency, in normalized units; LFnu, low frequency, in normalized units; TP, total power.
Measurements and Main Results: HV significantly reduced heart rate and increased time domain (SDNN, RMSSD) and frequency domain parameters (HFnu, TP), whereas LFnu and LF/HF ratio of HRV were reduced in both groups. All HV induced changes were completely reversible.
Conclusion: In healthy volunteers as well as in anesthetized patients HV resulted in comparable and reversible changes of relevant parameters of HRV. These changes can be interpreted as anesthesia independent increase of vagal activity during HV.

4AP11-5

PEEP improves cardiopulmonary function during laparoscopic surgery

Russo A., d'Este G., Viviani D., Di Stasio E., Marana E.
Policlinico Casilino, Department of Anaesthesiology and Intensive Care, Rome, Italy

Goal of Study: To evaluate the effects of 5 and 10 cmH_2O of positive end-expiratory pressure (PEEP) on cardiac function and gas exchange in mechanically ventilated patients during capnoperitoneum.
Methods: We studied 60 healthy women scheduled for laparoscopic surgery. We randomly created three groups: group A, B and C. PEEP was adjusted in a stepwise fashion for group B and C. PEEP 5 cmH_2O for group B and PEEP 10 cm_2HO for group C was applied 15 (T2), 30 (T3) and 45 minutes after pneumoperitoneum (T4). We measured PaO_2, $PaCO_2$ and the $EtCO_2$. Furthermore all patients underwent transthoracic echocardiography in order to assess the Right Ventricular Fractional Area Change (FAC), the systolic pulmonary arterial pressure (sPAP), the left ventricular stroke work (SW) and the fractional shortening (FS).
Results: At T0 (basal) all parameters were similar for all groups. We did not observe any variation at T1 (after pneumoperitoneum) and T2. At T3 and T4 we found that for groups B and C PaO_2 increased, $PaCO_2$ and $EtCO_2$ decreased; these changes appeared more evident for group C. For group A from T1 to T4 PaO_2decreased, $PaCO_2$ increased as well as the $EtCO_2$. Important results derived from the cardiac evaluation. For group A we found that gas insufflation affected right and left cardiac function: at T3 and T4 FS was shortened, SW significantly increased, sPAP slightly increased at T3 and T4, while FAC has not undergone major changes. For group B our data demonstrated that 5 cmH_2O of PEEP had minimal effects on the heart as we observed a slight lowering of sPAP, at T3 and T4. For group C we found that from T2 to T4 sPAP was remarkably reduced in respect to T1; right ventricular FAC has not significantly changed. SW significantly decreased at T3 and T4, while FS remained unchanged

Conclusion: Our results confirmed that gas insufflation had important effects on respiratory and cardiac function. 5 and 10 cmH_2O produced improvements on pulmonary system probably due to the recruitment of ipoventilated areas such the basal zones of lung. Moreover 10 cmH_2O of PEEP diminishes left ventricular work but did not affect right ventricular systolic function. This work suggests that PEEP could contrast, reducing the hypoxic vasoconstriction mechanism, thus concurring to lower the vascular resistances thence sPAP. We could conclude that during laparoscopic procedures it might be useful to apply PEEP to antagonize the effects of intraabdominal pressure on the cardiopulmonary system.

4AP11-6

Autonomic response to pneumoperitoneum and head-down position during laparoscopic gynecological surgery

Suzuki H., Terada T., Yamagata A., Kogawa R., Nakao A., Ochiai R.
Toho University, Medical Center, Omori Hospital. Department of Anesthesiology, Tokyo, Japan, Department of Anaesthesiology, Tokyo, Japan

Background and Goal of Study: A sudden hemodynamic change during laparoscopic gynecological surgery is one of the major concerns during pneumoperitoneum and head-down position. The mechanism to induce such hemodynamic instability should be clarified for optimal anesthetic care during laparoscopic surgery. The present study was conducted to elucidate the response of autonomic nervous system to pneumoperitoneum and head-down positioning by means of heart rate variability (HRV) and baroreceptor sensitivity (BRS) .
Materials and Methods: HRV and BRS were evaluated by using Task Force Monitor (TFM) in 12 healty patients who underwent elective laparoscopic gynecological surgery were evaluated for cardiac autonomic nervous activity with written informed consent. General anesthesia was induced with propofol (-2mg/kg) and rocuronium (-0.6-0.9mg/kg) and maintained with 1.5-3 % sevoflurane in oxygen and air to maintain BIS at 40 - 60. Spectral analyses of HRV was described as low frequency (-LF, 0.04-0.25 Hz-) and high frequency (-HF, 0.15-0.40Hz-) bands which were calculated by the power spectra of R-R intervals. HF represents parasympathetic nervous activity, and LF/HF ratio represents sympathetic nervous activity. Baroreceptor sensitivity, defined as the change in R-R interval in response to either the increase in blood pressure as BRS-up or blood pressure decrease as BRS-down. HRV and BRS were evaluated at 4 different timing : before induction of general anesthesia, before and after pneumoperitoneum, and after head-down position.
Results: After induction of anesthesia, LF/HF ratio significantly decreased as compared with pre-induction values. It stayed also low after pneumoperitoneum. After head-down positioning, LF/HF ratio increased to the pre-induction level. On the other hand, BRS-down increased significantly after head-down positioning.
Conclusion and Discussion: In this present study, the sympathetic cardiac activation was confirmed by head-down positioning, but no significant change in autonomic nervous system by pneumoperitoneum. During general anesthesia with sevoflurane and remifentanil, the hemodynamic instability should be of attention even pneumoperitoneum pressure as low as 10 cmH2O.

4AP11-7

Changes in the velocities of the middle cerebral artery and the regional brain oxygen saturation (rSO2) in hyperoxia, hypocapnia and hypercapnia in supine, sitting and standing position: Study in healthy volunteers

Tercero F.J., Gracia I., Valero R., Rios J., Carrero E., Fabregas N.
Hospital Clinic, Department of Anaesthesiology, Barcelona, Spain

Background and Goal of Study: Hyperoxia, hypocapnia and hypercapnia cause changes in the cerebral blood flow (CBF). The intensity of the response can vary depending on gravitational shifts. Transcranial Doppler (TCD) and regional brain oxygen saturation (rSO2) show CBF variations and self-regulation.
Materials and Methods: Once the ethics committee approval was obtained, 10 healthy volunteers were studied. Monitored parameters: Transcutaneous capnography; transcranial doppler (middle cerebral artery velocity) and rSO2 (bifrontal, in deltoids and quadriceps). In supine position (SP), in sitting position up to 50º (S) and standing position (ST): T0(Basal) T1(Hyperoxia); T2 (Hypocapnia); T3(Hiypercapnia). The variables were described using standard descriptive statistics. The possible influence of different experimental situations was analyzed using appropriate longitudinal linear models (GLM). Results expressed as percentage change respect to basal values.
Results and Discussion: 5 men and 5 women between the ages of 25-38 years old, an average weight of 69kg and average height of 174 cm.

	rSO2R	rSO2L	rSO2 arm	rSO2 leg	TDC max/mean	CO2transcut
SP. hyperoxia	+8.4%	+8.3%	+1.7%	+2.21%	+3.09% /+6.65%	+0.54%
SP.hypocapnia	-4%	-2.1%	+15.4%	+4.66%	-31.4% / -43.5%	-31.31%
SP.hypercapnia	+18.6%	+19.1%	+3.9%	+0.81%	+43.31%/+49.16%	+26.38%
S.hyperoxia	+6.3%	+7.1%	+1.7%	+2.4%	+0.15%/-2.56%	-3.59%
S.hypocapnia	-4.4%	-3.7%	+16.2%	+5.39%	-24.64%/-45.16%	-26.68%
S.hypercapnia	+17%	+18.8%	+4.6%	+0.73%	+33.02%/+33.76%	+22.31%
ST. hyperoxia	+11.4%	+10%	+1.4%	-2.84%	+1.25%/-2.56%	NO shift
ST.hypocapnia	-3.1%	-2.7%	+15.1%	+4.6%	-24.12%/-42%	-29.75%
ST.hypercapnia	+18%	+18.2%	+3.5%	-0.59%	+39.48%/+42.63%	+24.87%

[Table 1: results]

Conclusion(s): Every manoeuvre produced significant changes in the analyzed data. Hyperoxia reduces the TCD slightly but an increase of the cerebral rSO2, greater in standing position, can be observed. Hypocapnia causes -regardless the position- an important drop of the TCD with a mild decrease of the cerebral rSO2, being more affected the right hemisphere, together with a growth of rSO2 in the periphery being higher in arm than in leg. Hypercapnia makes the TCD velocities values be higher, having great repercussions on the bilateral cerebral rSO2 but scant peripheral repercussion, regardless the position. The brain seems to be, even in healthy patients and preserved cerebral self-regulation, less protected from CBF secondary changes of the hypercapnia than from hypocapnia.

4AP11-8

Changes in middle cerebral artery and cerebral regional oxygen saturation (rSO2) by Valsava manoeuvre in supine, sitting and standing position: Study in healthy volunteers

Tercero F.J., Gracia I., Pastor G., Valero R., De Riva N., Fabregas N.
Hospital Clinic, Department of Anaesthesiology, Barcelona, Spain

Background and Goal of Study: The Valsalva manoeuvre can produce cerebral hemodynamic alterations affecting, on one hand, the middle cerebral artery velocity observed by TCD and, on the other, the regional oxygen saturation in the brain and peripheral muscle values. Those values could vary according to position.
Materials and Methods: Once the ethics committee approval was obtained, ten healthy volunteers were studied. Monitored parameters: Transcutaneous capnography; TCD (maximum and mean velocity values of middle cerebral artery) and rSO2 (bifrontal, in right deltoids and quadriceps). In supine position (SP), in sitting position up to 50º (S) and standing position (ST): T0(Basal), T1(Valsalva). The variables were described using standard descriptive statistics. The possible influence of different experimental situations were analyzed using appropriate longitudinal linear models (GLM). Results expressed as percentage change respect to basal values.
Results and Discussion: 5 men and 5 women between the ages of 25-38 years old, an average weight of 69kg and average height of 174 cm.

Valsalva	rSO2 R	rSO2L	rSO2 Arm	rSO2 Leg	DTC Vmax/DTC Vmean	CO2 Transcuta
Supine position	-0.8%	-0.4%	+1.39%	-0.45%	-8.9% / -10.91%	-0.85%
Sitting position	-0.44%	+0.4%	+3.88%	-1.68%	-15.6% / -18.46%	-0.85%
Standing position	-3.1%	-0.77%	+3.65%	-0.15%	-20% / -22.72%	-0.28%

[Table 1: results]

Conclusion(s): Valsalva manoeuvre produced an important decrease of middle cerebral artery velocities with insignificant influence in bifrontal cerebral rSO2 values, in both supine and standing position. It appears a slight increase of peripheral oxygenation values more noticeable in arms in sitting and standing position. The hemodynamic changes related to this classic manoeuvre could affect the TCD but without cerebral repercussion, probably due to healthy patients self-regulation. Mainly we want to enhance from our investigation the drop of rSO2 values in right hemisphere obtained during the manoeuvre in standing position. According to other studies, right hemisphere seemed to be more vulnerable to hemodynamic alterations than dominant hemisphere.
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4AP11-9

Oral mucosal oxygenation predicts gastric microcirculation only under physiological conditions

Vollmer C., Schwartges I., Breul S., Behmke R., Bauer I., Picker O.
University Hospital Duesseldorf, Department of Anaesthesiology, Duesseldorf, Germany

Background and Goal of Study: Gastric microvascular mucosal oxygenation (μHbO_2) is of vital importance [1] but difficult to access. If the oral mucosal oxygenation could be used as alternative, the measurement and hence surveillance of the μHbO_2 could become a standard procedure. However, studies addressing this topic are contradictive [2,3]. Goal of the study was to evaluate the relationship between both measurement sites under physiological and pathological conditions.
Materials and Methods: In total 456 sets of data of oral and gastric μHbO_2 were obtained via repetitive experiments on four anaesthetized dogs. 92 measurements were performed under physiological conditions, 364 under pathological conditions known to influence gastric oxygenation: 1. moderate hypercapnia ($etCO_2$=70 mmHg) 2. sympathetic blockade (epidural anaesthesia) 3. inhibition of the renin-angiotensin-aldosterone-system (RAAS) 4. combination of hypercapnia and sympathetic blockade 5. combination of hypercapnia and RAAS-inhibition.
Oral and gastric microvascular mucosal oxygenation (tissue reflectance spectrophotometry) and systemic haemodynamics were continuously recorded. Data are presented in Bland-Altman plots.
Results and Discussion: Under physiological conditions oral oxygenation slightly overestimated gastric by 5.7 ± 13 % (bias and precision). This was not always the case during pathological conditions. Oral oxygenation likewise overestimated gastric oxygenation during hypercapnia (5.1 ± 15.1 %), sympathetic blockade (7.9 ± 16.4 %) and RAAS-inhibition (10.9 ± 15.6 %). However, during RAAS-inhibition in combination with hypercapnia oral oxygenation underestimated gastric oxygenation by -6.8 ± 15.7 %.
Conclusion(s): Under physiological conditions the oral microcirculation predicts the gastric oxygenation, although individual readings vary substantially. In contrast, under pathological conditions this relationship does not apply indicating that the use of oral mucosal oxygenation as a surrogate for gastric oxygenation is only applicable under physiological conditions.
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Respiration

5AP1-2

Effects of pneumoperitoneum on pulmonary mechanics during laparoscopic cholecystectomy

Skarpa N., Matala M.E., Makris A., Sarridou D., Spanomanoli A., Sgouromalli-Kostaki S.
Asclepieion Hospital, Department of Anaesthesiology, Athens, Greece

Background and Goal of Study: Laparoscopic cholecystectomy (LC) is now the treatment of choice for symptomatic cholelithiasis. It provides postoperative respiratory advantages over the open technique, mainly due to less intense postoperative pain.
Nevertheless many studies show that elevation of intraabdominal pressure caused by the intraperitoneal carbon dioxide (CO2) insufflation, has deleterious effects on respiratory mechanics during surgery. The aim of our study is estimation of these effects.
Materials and Methods: We studied 45 patients, 25-65 years old, ASA I-II, scheduled to undergo LC, after institutional approval and informed consent. Patients with cardio respiratory compromise or obesity were excluded. Anesthesia technique was similar in all cases, consisting of midazolam-ondansetron premedication, propofol-fentanyl induction, intubation after muscle relaxation with rocuronium and maintenance with desflurane-remifentanyl. Mechanical ventilation using air-oxygen mixture, with initial minute volume ventilation of 8ml/kg X 12 breaths/min was adjusted to a PetCO2 30-35 mmHg. Pneumoperitoneum up to an intraabdominal pressure of 12 mmHg was created.
Thereafter, patients were placed in a head-up tilt (15-20°) with a left side down lateral tilt (10-15°) position. Steady levels of anaesthesia (titrated according to normal haemodynamic parameters) and neuromuscular block (using train of four), as well as a constant tidal volume of ventilation, were maintained throughout the procedure. Besides routine monitoring of vital signs and lung volumes, respiratory mechanics (peak inspiratory pressure - PIP, plateau airway pressure - Pplateau, mean airway pressure - Pmean and compliance) were measured.
Data were recorded before (approximately 15 minutes after anesthesia induction) and 20min after pneumoperitoneum and after gas deflation.
Data analysis was made using one way ANOVA. $p < 0.05$ was considered significant.
Results and Discussion: 20 minutes after CO2 insufflation there was a 36.6±9.9% SD increase of PIP, a 37.5 ±11.3 % SD increase of Pplateau and a 34.2±8.9 %SD decrease in compliance, with no statistically important changes in Pmean. After deflation of pneumoperitoneum all values returned to baseline levels.
Conclusion: Our study shows that CO2 insufflation during LC causes significant changes in respiratory mechanics that are reversible after deflation. The anesthesiologist must be aware of these changes and ready to respond promptly and adequately.

5AP1-3

Ventilation strategies in obese patients undergoing surgery: Systematic review and meta-analysis

Aldenkortt M., Lysakowski C., Elia N., Tramèr M.R.
Hôpitaux Universitaires de Genève, Department of Anaesthesiology and Intensive Care, Genève, Switzerland

Background and Goal of Study: The most appropriate ventilation strategy to optimise intraoperative gas exchange and to prevent postoperative respiratory complications in obese patients undergoing surgery remains unknown.
Materials and Methods: We performed a comprehensive search (databases, bibliographies, all languages, to 3.2010) for randomised controlled trials comparing ventilation strategies and reporting on intraoperative gas exchange, pulmonary mechanics, or postoperative respiratory complications in surgical patients with a BMI ≥30 kg m^{-2}. We estimated weighted mean differences (WMD) with 95% confidence intervals (CI) using extracted data, or original data provided by authors, using a fixed effect model. Meta-analyses were performed when data from at least three studies or 100 patients could be combined.
Results and Discussion: Eleven studies (431 patients) were included. They tested ten different ventilation strategies: pressure controlled ventilation, volume controlled ventilation, pressure support ventilation, different levels of positive end-expiratory pressure (PEEP) with or without various alveolar recruitment manoeuvres, and a variety of recruitment manoeuvres with or without PEEP. Recruitment manoeuvre plus PEEP, compared with PEEP alone, improved the intraoperative PaO_2/FiO_2 ratio (WMD 91 mmHg; 95%CI, 55 to 128) without any impact on mean arterial blood pressure. There was no difference between pressure or volume controlled ventilation regarding PaO_2/FiO_2 ratio, mean airway pressure, or mean arterial blood pressure. For all other comparisons, combination of data from at least three studies or 100 patients was not feasible.
Conclusion(s): There is a large diversity in the designs of trials investigating the impact of ventilation strategies in obese patients undergoing surgery. There is some limited evidence that alveolar recruitment manoeuvres may improve intraoperative oxygenation without adverse hemodynamic effects. The difference between pressure and volume controlled ventilation is unclear, the benefit of PEEP remains unproven in this context, and data on postoperative outcome are lacking.

5AP1-4

Effects of pressure control ventilation on gas exchange and airway pressures during one lung ventilation anaesthesia

Poulou S., Pavlidis M., Pagkalou E., Pantazopoulos C., Halas I., Tsinari K.
Laiko General Hospital, Department of Anaesthesiology, Athens, Greece

Background and Goal of Study: The potential benefits and limitations of ventilation mode during one lung ventilation (OLV) is not clearly defined. The aim

of our study is to investigate the effects of pressure control ventilation (PCV) on gas exchange and airway pressures during OLV in patients undergoing thoracic surgery compared to volume control ventilation (VCV).
Materials and Methods: 24 patients with normal preoperative pulmonary function scheduled for thoracic surgery with OLV anaesthesia were included in our study. The induction and maintenance of anaesthesia was standardized in all cases. Using as starting measuring point 10 min after initiation of OLV, we implemented at first VCV for 30 min (period T_1) with the following parameters: inspired oxygen fraction 1,0, tidal volume (Vt) 8 ml/kg and respiratory rate (f) adjusted to achieve an end tidal carbon dioxide ($EtCO_2$) of 33-38 mmHg, inspiration to expiration ratio (I/E) 1/2. At the end of T_1 period we switched to PCV for 30 min (period T_2) with following parameters: inspired oxygen fraction 1,0, the airway pressure was set to allow a Vt as before, f was adjusted to keep $EtCO_2$ between 33-38 mmHg, I/E ratio 1/2. No positive end expiratory pressure was applied throughout the entire study. At the end of each period blood gases were obtained and the following parameters were recorded and compared: pH, PaO_2, $PaCO_2$, airway pressures (peak, plateau,mean), heart rate and mean arterial pressure.
Results and Discussion: There were no statistically important differences during OLV in arterial oxygenation responses between VCV (PaO_2 = 210,2 ± 58,5 mmHg) and PCV (PaO_2 = 204,3 ± 61,2; p = 0,73). Significant differences were observed in peak pressure. Peak pressure in VCV was 38,12 ± 5,34 cmH_2O compared to 28,44 ± 3,28 cmH_2O ($p \leq 0,0001$) in PCV. There were no significant differences in plateau and mean airway pressures during OLV with VCV than with PCV.
Conclusion(s): PCV does not improve the arterial oxygenation compared to VCV during OLV anesthesia in patients undergoing thoracic surgery. The advantage of PCV is that it achieves ventilation with lower pressures and reduces the risk of barotrauma.
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5AP1-5

Is the hybrid mode of ventilation better choice for weaning after prolonged ventilation?

Grigolia G., Lominadze S., Gvelesiani L., Kitiaschvili G., Chokhonelidze I., Pruidze H.
Cardiac Surgery Clinic ‚Open Heart', Department of Anaesthesiology and Intensive Care, Tbilisi, Georgia

Background and Goal of Study: Weaning from prolonged mechanical ventilation is an important problem in intensive care medicine [1]. Despite a lot of weaning criteria and different modes of ventilation, it is usually conducted in an empirical manner, because a standardized approach has not been developed until this time [2]. Goal of study was a comparison of effectiveness of two different mode of ventilation during weaning processes.
Materials and Methods: We carried out a prospective, randomized study involving 94 adult patients after cardiac operations, who head received mechanical ventilation for more than 72 hours and who were considered to be ready for weaning. These patients were randomly assigned to undergo one of two weaning techniques: BIPAP (Biphasic Intermittent Positive Airway Pressure) and hybrid mode of ventilation - BIPAP+ASB (Assisted Spontaneous Breathing) (47 patients in each group). All patients before extubation were on CPAP (Continuous Positive Airway Pressure) mode of ventilation for 1-1,5 hour. As additional weaning criteria was used the oxygen cost of breathing (which is the difference in oxygen consumption measured during controlled ventilation and during assisted or spontaneous breathing)[3]. Standardized protocols were followed for each technique.
Results and Discussion: The mean duration of weaning with BIPAP mode was 22±3,4 hour (including CPAP time), and 14±2,8 hour with BIPAP+ASB mode ($p < 0,05$) There was a significant positive exponential correlation between the oxygen cost of breathing and duration of weaning process ($r = +0,843$, $p < 0,02$). The use a BIPAP+ASB hybrid mode of ventilation means that the patients during weaning process spent less oxygen for breathing muscles and were ready for early extubation.
Conclusion(s): The use of hybrid mode of ventilation BIPAP+ASB for weaning after prolonged mechanical ventilation is the better option for patients then use of BIPAP mode alone.
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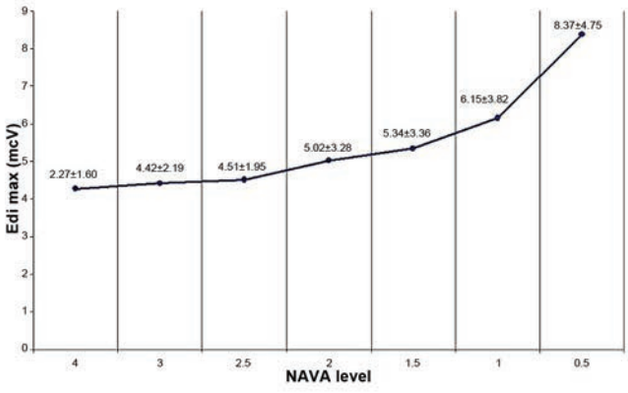
Acknowledgements: Staff of cardiac surgery ICU in Clinic "Open Heart", Tbilisi, Georgia

5AP1-7

What have we learnt about diaphragmatic activity during weaning?

Garzando M., Ferrandis R., Belda J., León I., López C., Garrigues B.
Hospital Clinico Universitario de Valencia, Department of Anaesthesiology and Intensive Care, Valencia, Spain

Background and Goal of Study: NAVA (Neurally Adjusted Ventilatory Assist) is an assisted ventilatory mode, which assists in a proportional and synchronous way to the patient's electrical diaphragmatic activity (Edi). Edi has been recorded in an exponential growth curve which represents the diaphragmatic contraction, with a peak of activity after whith the muscle relaxation occurs and the expiratory time starts. According to previous studies it isn't established yet, the goal of this study is to describe Edi at different NAVA levels during the weaning of postoperative patients without lung disease.
Materials and Methods: We planned a descriptive and prospective clinical study in patients admitted to the critical care unit, with less than 24 hours of mechanical ventilation. The study was approved by the ethical committee. The patient's weaning was made with a servo-i ventilator. Edi was obtained through a nasogastric tube (Edi catheter) with electromiographic (EMG) recording electrodes which was connected to the ventilator, the EMG signals were filtered, processed and used to provide the assistance. Weaning was performed in NAVA mode by the physician. Edi data were recorded at each NAVA level. The weaning started in the NAVA level decided by the physician and the level of support was decreased in changes from 0.5. For the statistical studies SPSS 17.0 Windows 7 has been used.
Results and Discussion: 15 cardiac surgery patients were included, they were from 33 to 79 years old. Edi max has been measured, at each NAVA level during the weaning. Figure depicts Edi mean and standard deviation values at each NAVA levels.



[Edi average and standard deviation]

Conclusion(s): Edi values obtained in this small group allow us to determine an average Edi max of 5.44μV, in contrast, another study on NAVA weaning in patients with chronic respiratory failure have shown Edi signals stronger than those. Edi values in healthy patients are needed as reference for future studies

5AP1-8

Effects of superimposed high frequency jet ventilation on oxygenation in one lung ventilation

Altinay E., Karabiyik L., Demircan S.
Gazi University School of Medicine, Department of Anaesthesiology and Intensive Care, Ankara, Turkey

Background and Goal of Study: Sufficient oxygenization must be sustained while lung immobility in the surgical area during thoracic surgery is achieved through one lung ventilation (OLV). In Superimposed High Frequency Jet Ventilation (SHFJV), carbondioxide retention can be prevented and this ventilation mode can be applied for an extended period, while oxygenation is achieved through simultaneous use of normal and high frequency ventilation models. The aim of this study is to investigate the effects of SHFJV on oxygenation in thoracic procedures that necessitate the use of one lung ventilation.
Materials and Methods: ASA I-II 40 patients were divided into two random groups. After patients received 2-2.5 mg/kg propofol, 0.6 mg/kg rocuronium, 0.2 μg/kg/min remifentanil, anesthesia was maintained with TIVA using propofol and remifentanil. Anesthesia was delivered through conventional ventilation in both groups until 15th minute of OLV. Respiration was set at V_t:8 ml/

kg, 12 breath/min, I:E ratio=1:2, FiO_2:0.6. At 15th minutes into OLV, Group I was ventilated with SHFJV, and Group II was ventilated with the conventional ventilation. Normal frequency unit was set at 12 breath/min, I:E ratio=1:2; and high frequency unit at 600/min, I:E ratio=1:2. Heart rate (HR), systolic arterial pressure (SAP), diastolic arterial pressure (DAP), mean arterial pressure (MAP), peripheric oxygen saturation (SpO_2), end tidal carbondioxide ($ETCO_2$) levels, PaO_2, $PaCO_2$, PH, SO_2, HCO_3, and peak inspiratory pressure (PIP) values were recorded at onset, induction, after intubation, during OLV and after OLV, after extubation, and postoperative 1st hour.
Results and Discussion: Whereas no significant difference was observed for PaO_2 between the two groups, it displayed high values in jet group at each recording. $ETCO_2$ was low in the control group between 30 and 90 mins for the duration of OLV. $PaCO_2$ values were significantly high in jet group between 30-90 mins of OLV, but the significant difference between the groups disappeared at 120 min of OLV and 15th min after OLV. Peak inspiratory pressure (PIP) was significantly high in the control group throughout OLV.
Conclusion(s): Sufficient oxygenation can be achieved in OLV with SHFJV application, and because it does not cause significant CO_2 retention, it can be sustained for an extended period. Also, a low inspiratory airway pressure is an important advantage to avoid lung injury.

5AP1-9

Patient-ventilator disharmony induces a pre-inspiratory cortical activation in mechanical ventilated patients

Kindler F, Raux M., Demoule A., Duguet A., Similowski T.
Pitié Salpêtrière Hospital, Department of Anaesthesiology and Intensive Care, Paris, France

Introduction: Inducing a disharmony during non-invasive ventilation in healthy subjects exlicits a pre-inspiratory electroencephalographic potential (PIP) that is concomitant for sensations of dyspnea. 50% of the patients in an intensive care unit receive mechanical ventilation and the half of them are presenting episodes of patient ventilator disharmony. This kind of episodes are associated with a longer ventilation time, a higher mortality and patient discomfort.
The primary objective of this study was to test whether PIP could be elicited in mechanically ventilated patients with inadequate settings. The secondary objective was to test whether PIP disappeared following optimization of the ventilator settings.
Methods: Invasive ventilated intensive care unit patients who experienced patient ventilator disharmony were included in this study. They were conscious, without any sedation, and received pressure support ventilation. Electroencephalography, electromyography of the scalenic muscles, airway pressure andflow were measured to determine an electroencephalographic pre-inspiratory potential:
1) During the disharmony condition,
2) After optimization of the ventilator settings by the responsible physician, independent of the study.
The incidence of PIP even as the area under the curve of the electromyographic signal was compared for the two conditions with a Fisher's exact test. Results are reported as median [interquartiles].
Results: Fifteen patients were included at the day of submission date. All patients exhibited PIP during the disharmony condition. In nine patients, the PIP disappeared following correction of the patient ventilator disharmony (p=0,0007). Respiratory values are reported in the table.

	Dysharmonie	Harmonie
Aide inspiratoire (cmH2O)	11 [7-15]	16 [12-23]
Trigger (l.min-1)	5 [3-5]	1 [1-2]
Pente (sec)	0,3 [0,2-0,4]	0,05 [0,05-0,05]
PEEP (cmH2O)	5 [4-5]	5 [5-5]
VT (ml)	390 [303-462]	429 [349-527]
FR (.min-1)	27 [20-35]	26 [17-32]

[Table1]

Conclusion: Respiratory related cortical electrical activity precedes inspiration in mechanically ventilated patients who experience patient-ventilator disharmony . This activity disappears after optimization of the ventilator settings. PIP could constitutes a neurophysiological index for respiratory discomfort independent from verbal or non-verbal communication.

5AP2-2

Incidence and prediction of difficult preoxygenation

Dépret F, Colegrave N., Glasman P, Lahmar M., Beloucif S., Baillard C.
Avicenne Hospital, Paris 13 University AP-HP, Department of Anaesthesiology and Intensive Care, Bobigny, France

Background and Goal of Study: Usual preoxygenation delay arterial desaturation during the apnea related to the induction of anaesthesia. The goal of obtaining expired fraction of oxygen (FeO2)>90% is strongly recommended. Numerous factors are involved in the oxygen loading process such as those interacting with the delivered inspired fraction of oxygen (FiO2). There are no existing data regarding the incidence and predictors for difficult preoxygenation (DiPreO2) in clinical setting.
Materials and Methods: During a 8 month period, 880 consecutive preoperative patients were prospectively recruted. The following information was collected: FiO2, FeO2, age, sex, ASA class and risk factors for difficult mask ventilation (body mass index (BMI) >26kg/m², presence of beard, lack of teeth, and an history of snoring). Preoxygenation (3 min of normal tidal volume ventilation) was performed with facial mask using machine circuit (Primus Dräger) and 12l/min oxygen flow during 3 minutes. An FeO2 < 90% after 3 min defined DiPreO2. The incidence as well as the independent (P< 0.05) predictors of DiPreO2 were identified by performing a logistic regression.
Results and Discussion: Patients characteristics were age 51±12 yrs; sex M/F : 415/463 ; BMI 26±5 kg/m² ; ASA score 2 [1-4]. FiO2 and FeO2 were (mean±SD) 96±3% et 92±7% respectively. The overall incidence of DiPreO2 was 54%. FiO2 was lower in patients with DiPreO2 than in those with effective PreO2 (FeO2 ³ 90%), 96±3% vs 98±2%, p< 0.0001. The difference between FiO2 and FeO2 (O2gradient) was higher in patient with DiPreO2 than in those with effective PreO2, 12±6% vs 6±3%, p< 0.0001. Sex Male 267/414 (64%) vs 212/462 (46%), odds ratio (OR) 1.9 [1.4-2.5] p< 0.001; ASA score IV 14/15 (93%) vs 452/848 (53%), OR 9.9 [1.3-79] p 0.03; age>55 yrs 250/388 (64%) vs 228/489 (46%), OR 1.5 [1.1-2.2] p< 0.015 ; lack of teeth 87/110 (79%) vs 394/770 (51%), OR 2.4 (1.4-4) p< 0.001 and the presence of beard 36/39 (92%) vs 445/841 (53%), OR 6.7 (2-22) p=0.002 were the independent predictors of DiPreO2.
Conclusion(s): In clinical setting, difficult preoxygenation defined as FeO2< 90% occurs in more than 50% of the patients. The FiO2 actually delivered is < 100% and may contribute to that result. Sex Male, ASA score IV, age>55 yrs, lack of teeth and the presence of beard are found to be independent predictors of difficult preoxygenation.

5AP2-3

Increased extravascular lung water associates with reduced response to alveolar recruitment maneuver in ARDS

Smetkin A.A., Kuzkov V.V., Kirov M.Y., Bjertnaes L.J.
Northern State Medical University; University of Tromsø, Department of Anaesthesiology and Intensive Care, Arkhangelsk, Russian Federation

Background and Goal of Study: The alveolar recruitment maneuver (RM) is a wide-spread technique improving oxygenation in 50-70% of patients with acute respiratory distress syndrome (ARDS). We hypothesized that pulmonary oedema may affect the response to RM. The aim of our study was to assess the efficacy of RM in patients with normal (< 10 mL/kg) and high (≥10 mL/kg) extravascular lung water (EVLW).
Materials and Methods: We enrolled 18 mechanically ventilated patients with ARDS into the prospective observational study. The EVLW was measured by transpulmonary thermodilution technique (PiCCO*plus*, Pulsion Medical Systems, Germany).
The patients were divided into two groups according to the value of EVLW. Alveolar RM was performed by setting continuous positive airway pressure at 40 cm H_2O for 40 sec followed by return to pressure-controlled ventilation with positive end expiratory pressure exceeding the lower inflection point of the pressure-volume curve by 2 cm H_2O. We determined the efficacy of RM as a relative increase in PaO_2/FiO_2 from baseline 5 min later. We counted RM as effective if PaO_2/FiO_2 rose by minimum 15%. The intergroup difference was evaluated by Mann-Whitney U-test. Data are presented as median [25^{th}-75^{th} percentile]. Value of $p < 0.05$ was considered as significant.
Results and Discussion: Thirteen patients presented with direct lung injury and five patients had indirect ARDS. We did not reveal any influence of the type of lung injury on efficacy of RM and the baseline EVLW value. The EVLW was increased in thirteen patients and was < 10 mL/kg in five patients. There was no difference in the baseline PaO_2/FiO_2 between the groups. None of the patients with high EVLW had effective RM, whereas recruitment was successful in 60% of patients with normal EVLW. The mean increase in PaO_2/FiO_2 was 2% [-12% to 5%] and 33% [4-65] in patients with high and low EVLW, respectively (p=0.034).

Conclusion(s): Increased EVLW reduces the efficacy of alveolar RM. Therefore, taking into account the potential adverse effects of recruitment, EVLW ³ 10 mL/kg may be looked upon as a relative contraindication for RM.

5AP2-4

Does small dose adrenaline administration benefit of oxygenation during one-lung ventilation?

Wei W., Wang M.
West China Hospital, Sichuan University, Department of Anaesthesiology and Intensive Care, Chengdu, China

Background and Goal of Study: Beta2-agonist has been used to treat hypoxia in patients with COPD or asthma. And appropriate cardiac output (CO) increasing can benefit of arterial oxygenation during one-lung ventilation (OLV).
The aim of this study is to investigate the effect of small dose adrenaline infusion on oxygenation and shunt fraction in thoracic surgical patients during OLV.
Materials and Methods: Thirty patients undergoing thoracic surgery were randomized into NS or NE group. The patients of NE group were given adrenaline 0.01$\mu g \cdot kg^{-1} \cdot min^{-1}$ (1ml/h) during OLV, while the patients in NS group were given 0.9% saline 1ml/h. The both Doppler blood flow of right and left upper pulmonary vein was detected by TEE and saved for velocity time integral(VTI) measurement in following time points: before OLV (T_0), 20min after OLV(T_1), 60min after OLV(T_2), and 10min after turning to TLV(T_3). Simultaneously the arterial blood was sample for gas analysis, and the CO was measured also. The percent decrease of blood flow (BFP) in non-dependent lung and the shunt fraction were calculated with VTI of both upper pulmonary vein flow, HR, and CO.
Results and Discussion: There were no significant difference in demographic data between two groups. HR, CO and the values of PaO_2 decrease after turning to OLV were significantly higher in NE group than NS group. At T_1 and T_2, the BFP of non-dependent lung in NE group were significantly lower than NS group. There were significant correlations between the calculated shunt fraction and PaO_2 in both groups during OLV (r=0.717 in NS group, r=0.625 in NE group.).
Conclusion(s): Oxygenation during OLV can not be improved by administration of small dose adrenaline. The calculated fraction shunt according to the velocity time integral from both upper pulmonary vein has significant relations to PaO_2. The increasing of CO after turning to OLV may be a compensatory way to reduce the drop of PaO_2.

5AP2-5

Sevoflurane and isoflurane abolished the phrenic long term facilitation in rats

Marinov V., Karanovic N., Pavlinac I., Valic M., Pecotic R., Dogas Z.
University Hospital Split, Department of Neuroscience, University of Split School of Medicine, Department of Anaesthesiology and Intensive Care, Split, Croatia

Background and Goal of Study: Phrenic long-term facilitation (pLTF) is manifested by prolonged increase in phrenic nerve activity after episodes of acute intermittent hypoxia (AIH). The goal was to explore the effects of sevoflurane and isoflurane monoanaesthesia at equal MAC values on induction of pLTF in rats, compared to urethane anaesthesia.
Materials and Methods: After Biomedical Ethics Committee approval, Sprague-Dawley adult, male rats, BM of 300-350 g were used. Two experimental groups of nine animals each (sevoflurane and isoflurane) and one control group of seven animals (urethane) were formed.
After achieving adequate depth of anaesthesia animals were tracheotomysed, mechanically ventilated and bilaterally vagotomised. Femoral veins and arteries were cannulated for saline infusion, blood pressure monitoring and arterial blood sampling. Phrenic nerve was dissected and recorded.
After obtaining the planned level of anaesthesia (1.4 MAC for sevoflurane and isoflurane and 1.2 mg/kg for urethane intraperitoneally), animals were exposed to AIH protocol (5x3 min hypoxic episodes with FiO_2=0.09, separated by 3 min pause with FiO_2=0.5).
The same level of anaesthesia was maintained to the end of the experiment. Peak phrenic nerve amplitude (PNA), respiratory frequency (f) and breathing rhythm parameters were analyzed during hypoxic episodes and at 15, 30, and 60 min after the last hypoxic episode and compared to baseline values (immediately before the first hypoxic episode). Data are presented as mean±SEM. Repeated measures ANOVA was used. Statistical significance was set at P< 0.05.
Results and Discussion: In both experimental groups average PNA decreased at 60 min after the last hypoxic episode compared to baseline values, i.e. pLTF was abolished. In sevoflurane group PNA decreased by 31.0±11.0% (P< 0.01). In isoflurane group PNA decreased by 44.6±12.7% (P< 0.01). In control (urethane) group average PNA increased by 108.7±25.3% (P< 0.01) at 60 min after the last hypoxic episode compared to baseline values, i.e. pLTF was induced. During all hypoxic episodes average PNA increased in both experimental groups and in control group compared to baseline values, i.e. hypoxic ventilatory response (HVR) was preserved.
Conclusion: Sevoflurane and isoflurane monoanaesthesia at 1.4 MAC abolished the pLTF compared to urethane anaesthesia.
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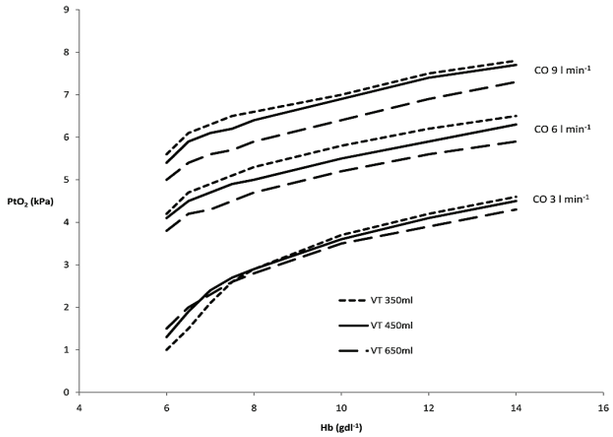
5AP2-6

The effect of haemoglobin on tissue oxygenation in critical illness

Chillistone S., Corrie K.R., Hardman J.G.
University of Nottingham, Department of Anaesthesiology and Intensive Care, Nottingham, United Kingdom

Background: Liberal transfusion policies to keep haemoglobin (Hb) above 10gdl^{-1} are not thought to be beneficial in critical illness when compared with restrictive policies (keeping Hb above 7gdl^{-1}). Furthermore, critically ill patients are often ventilated with low tidal volumes to reduce ventilator-associated lung injury.
The resulting hypercapnia may have independent, beneficial effects through an improvement in tissue oxygenation. The study aim was to investigate the effect on tissue oxygenation (PtO_2) of varying Hb in critical illness across a range of arterial carbon dioxide tensions ($PaCO_2$) and a range of cardiac outputs (CO).
Materials and Methods: We configured 72 virtual patients using the Nottingham Physiology Simulator, a validated computational model of integrated cardiovascular and respiratory systems which has been described previously.[1] The lungs were configured to create a moderate ventilation / perfusion mismatch, simulating acute lung injury. Hb was varied between 6 and 14gdl^{-1} and CO which was varied between 3 and 9$lmin^{-1}$. All subjects were ventilated with volume-controlled ventilation at FIO_2 0.5. Tidal volumes were 350, 450 or 650 ml. Tissue oxygen tension (PtO_2) was recorded.
Results: Reducing oxygen delivery reduces PtO_2. When cardiac output is normal or high, this reduction is more marked when Hb is less than 6.5 g dl^{-1}. However, in the low cardiac output state the reduction in PtO_2 becomes more marked when Hb is less than 8 g dl^{-1}. Permissive hypercapnia improves PtO_2, except during low oxygen delivery, where hypercapnia appears to worsen PtO_2.



[Figure 1]

Conclusion: Organ oxygenation may become critical when Hb is less than 8gdl^{-1} and CO is less than 3$lmin^{-1}$. When oxygenation is critical, permissive hypercapnia may worsen tissue hypoxia. A different transfusion trigger from the current convention may be required for critically ill patients with low cardiac output.
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5AP2-7

Respiratory complications after laparoscopic bariatric surgery: Comparison of sugammadex managed group with neostigmine matched group

Llauradó S., Sabaté A., Camprubí I., Fustran N., Redondo S., Sanzol R.
Hospital Universitari de Bellvitge, Department of Anaesthesiology, L'Hospitalet de Llobregat, Spain

Background and Goal of Study: Neuromuscular residual paralysis (NRP) might play a role in appearance of respiratory disfunctions after surgery. Morbid obese patients are at higher risk to suffer these events than general population. Sugammadex has been able to avoid NRP, indepently of the level of blockade. A profound level of neuromuscular relaxation is essential in laparoscopic bariatric surgery (LBS). Therefore, since introduction of sugammadex, a new protocol of neuromuscular blockade reversal in laparoscopic bariatric surgery has been applied in our hospital. In summary, rocuronium was the drug selected for neuromuscular blockade, monitoring using TOF-Watch was implemented, and once surgery ended, sugammadex administration was guided by Train-of-four ratio. Our intention was to compare appearance of respiratory complications after surgery in sugammadex managed patients with neostigmine historical matched group.
Materials and Methods: We defined two groups:
1) Sugammadex Group (SG): all patients scheduled for bariatric surgery in 2010 were included. Rocuronium was used as muscular manteinnance relaxant. We monitorized systematically Train of Four (TOF) with TOF-Watch and used sugammadex to reverse rocuronium's effects at time of extubation.
2) Matched Group (MG): patients submitted to bariatric surgery during 2008-2009. TOF monitoring had not been systematically implemented, nor use of sugammadex. Demographic, anesthetic, surgical and post-surgical data were compared. T-Student and Chi-Square test were used.
Results and Discussion: 79 patients were followed in SG, 90 in MG.

	MG (n=90)	SG (n=79)	P-value
Age(years)	45.09±12.12	46.07±10.01	0.566*
BMI (kg/m$^{2)}$	45.11±14.26	42.27±5.34	0.089*
Male/Female (%)	27.95/72.04	37.34/62.66	0.184**

[Demographic data]

	MG (n=90)	SG (n=79)	P-value
Non tracheal extubation or reintubated in operating room	4(4.44)	1(1.26)	0.222**
Readmitted in critical unit	5(5.55)	2(2.63)	0.367**
Postoperative Torax X-Ray changes	9(10)	4(5.06)	0.146**
Arterial pH 24h after surgery (mmHg)	7.35±0.047	7.37±0.035	0.014*
Arterial O2 pressure 24h after surgery (mmHg)	115.06±32.44	110.59±29.53	0.610*
Arterial CO2 pressure 24h after surgery (mmHg)	44.13±4.92	43.40±4.63	0.419*
Lenght of staying (days)	4.03±1.91	4.28±4.03	0.610*

[Outcome data]

Data in number of patients(%) and mean±standard deviation
**Chi-Square test; * t-test

Conclusion(s): Sugammadex might make tracheal extubation in operating room easier. However, respiratory complications after LBS are very low. Therefore, a large sample size study is required to show any differences.

5AP2-8

Perioperative tobacco: A simple blind study of the anaesthesiologists' practice

Membrillo M.J., Martínez R., González F.J., Orozco H.D., Sanz J., Zaballos M.
Hospital Universitario Gregorio Marañon, Department of Anaesthesiology, Madrid, Spain

Background and Goal of Study: Abstinence from smoking can improve postoperative outcomes, and surgery represents an opportunity for smokers to quit. Previous surveys had evaluated by questionnaires the anaesthesiologists' attitudes regarding perioperative smoking, but the real practice in the preoperative setting in our knowledge has not been evaluated.
Materials and Methods: After IRB approval and patient and anaesthesiologist consent, 241 preoperative evaluations were performed. An external observer (a resident) performed the survey and the anaesthesiologist and the patient were unaware of the topic of the study. The variables studied were: demographic characteristics of the patient and the anaesthesiologist who performed the preoperative evaluation; if they asked if the patient smoked; if they warned current smokers about perioperative risks of tobacco use; if they counselled the patient to quit, and how to quit; and if they prescribed β_2-aerosols and corticosteroids previous to anaesthesia induction (usual practice in our hospital).
Results and Discussion: Twelve anaesthesiologists were evaluated, and none of them were actual smokers. The mean age of patients was 59 ±16 years, and 21% of them were current smokers. In 85% of the evaluations, the anaesthesiologist asked the patients if they smoked. Only 10% of the patients were warned about perioperative tobacco risks and counselled to quit before surgery. However, in 30% of smokers, the anaesthesiologist prescribed medications to prevent bronchospasm prior to surgery (steroids and β_2-aerosol treatment). There were no differences in the anaesthesiologist attitude between smokers scheduled for major or for minor surgery.
Conclusion(s): Anaesthesiologists have an important role in helping their patients quit smoking before surgery. Our result showed a lack of routine practice in helping the patient to do so. An educational program to implement a strategy in anaesthesiologist practice is necessary to improve measures to decrease smoking in surgical patients.

5AP2-9

PH measurement in exhaled breath water condensate in patients during lung lobectomy: Effects of remote ischemic preconditioning

García-de-la-Asunción J., Perez-Griera J., García-Raimundo M., Bruno L., Martí F, Belda FJ.
Hospital Clínico de Valencia, Department of Anaesthesiology and Intensive Care, Valencia, Spain

Background and Goal of Study: Patients undergoing thoracic surgery like lung lobectomy for cancer rarely develop acute respiratory distress syndrome (ARDS), but this complication is associated with a high mortality. Oxygen deprivation from ischemia or non ventilation causes hypoxic lung injury. Paradoxically the reperfusion of hypoxic lung may result in further injury (1). The aim of the present study is to evaluate whether the remote ischemic preconditioning might be protective in lungs of patients undergoing lung lobectomy.
Materials and Methods: Prospective, aleatory and double blind study. Forty patients undergoing lung diagnosis of pulmonary carcinoma were programmed for lung lobectomy (20 controls, and 20 with remote ischemic preconditioning). 20 patients were randomized before surgery to three 5 minutes ischemia cycles separated by 5 minutes of reperfusion by a tourniquet in a upper arm. The collection of exhaled water in patients mechanically ventilated was through an endotracheal tube post-reexpansion of operated lung. The aim of this study was to test the pH in the condensate of exhaled water (2) obtained 5 minutes after lung expansion, and oxygenation in arterial blood (PaO_2/FiO_2) in spontaneous breath 18 h post surgery. During surgery the lungs were ventilated with a volume-controlled mode (7 ml/Kg) and FiO_2 0.4.
Results and Discussion: All groups were similar on sex, age, weight and ASA. Data are mean ± S.D. Mann-Whithney's U-test was used P< 0. 0.05).
Control vs. remote preconditioning
pH 6.28 ± 0.34 ; 6.52 ± 0.45 P= 0.05
PaO_2/FiO_2 251 ± 107 ; 327 ± 92 P= 0.03
These results shown an decrease of pH and arterial oxygenation levels in control group (within preconditioning) than in preconditioning group.
Conclusion(s): Collapsed lung during the surgery and the next reexpansion of operated lung after lobectomy causes lung damage. Remote preconditioning by ischemia-reperfusion protects against lung damage during lung lobectomy.
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Acknowledgements: Ayuda de investigación del Instituto Carlos III (PI070836)

5AP2-10

Effects of Ketamine/Xylazine, Propofol and Sevoflurane in mechanically ventilated healthy rats

Spieth P.M., Parotto M., Gama de Abreu M., Mazer D.C., Slutsky A.S., Zhang H.
University Hospital Dresden, Department of Anaesthesiology and Intensive Care, Dresden, Germany

Background and Goal of Study: Ketamine and propofol are commonly used for intravenous sedation in critical ill patients. Volatile anesthetics such as

sevoflurane are widely used in anesthesia and due to their anti-inflammatory properties maybe also an option for sedation in intensive care.
This study was performed to compare the effects of ketamine, propofol and sevoflurane on pulmonary function and inflammatory response in mechanically ventilated healthy rats.
Materials and Methods: 21 Sprague-Dawley rats (250-350g) were randomized to receive 4h of mechanical ventilation (F_IO_2 0.35, V_T 6 mL/kg, PEEP 3 cmH_2O, respiratory rate 80/min) with ketamine+xylazine (KX, induction: 100 mg/kg + 10 mg/kg i.p.; maintenance: 30 mg/kg/h + 3 mg/kg/h i.v.), propofol (PROP, induction: 100 mg/kg i.p.; maintenance: 30 mg/kg/h i.v.) or sevoflurane (SEVO, induction and maintenance 2.0 Vol.%).
Muscle paralysis was achieved by administration of pancuronium (0.5 mg/kg/h i.v.). Gas exchange, hemodynamics, lung mechanics, spatial distribution of pulmonary blood flow (PBF) and inflammatory response were measured.
Results and Discussion: Arterial blood pressure did not differ significantly among groups. Arterial oxygenation was significantly improved with SEVO and PROP compared to KX. Peak and mean airway pressures as well as the elastance of the respiratory system were significantly increased with KX as compared to PROP and SEVO.
Only SEVO led to a redistribution of PBF towards ventral lung regions. SEVO was associated with significantly reduced histological lung damage compared to KX. Protein content in the bronchoalveolar lavage fluid was significantly increased with KX as compared to PROP and SEVO. Neither lung wet to dry ratio nor concentrations of inflammatory cytokines in lung tissue differed significantly among groups.
Conclusion(s): In mechanically ventilated healthy rats, sedation with SEVO and PROP were associated with improved gas exchange, respiratory mechanics and lung protection compared to KX. The reduced histological lung damage and the redistribution of PBF favor SEVO as an alternative sedation strategy for mechanical ventilation.

5AP3-2

Effect of nebulized iloprost, inhaled nitric oxide and oral sildenafil on pulmonary pressure during lung transplantation

Rabanal Llevot J.M., Williams Camus M.M., Cimadevilla Calvo B., Pardo Gonzalez S., Bartolome Pacheco M.J., Placer Martinez J.R.
Hospital Universitario Marques de Valdecilla, Department of Anaesthesiology, Santander, Spain

Background and Goal of Study: Iloprost, a stable prostacyclin analogue, has proved effective in the treatment of pulmonary hypertension (PHT). During lung transplantation (LTx) pronounced increases in pulmonary pressure may lead to right ventricle failure requiring cardiopulmonary bypass, which is associated with important perioperative complications. Our study assessed the effect of nebulized iloprost on pulmonary pressure during LTx in patients presenting severe PHT.
Materials and Methods: This prospective observational study included all patients undergoing single- or double-lung transplantation between January 1st 2006 and July 1st 2008. Patients were evaluated according to the standard protocol before transplantation and received 50 mg of oral sildenafil 30 minutes before surgery and 20 ppm inhaled nitric oxide (NO) after anesthesia induction. Patients with a monitored mean pulmonary artery pressure (mPAP) above 50 mmHg received 10 μg of iloprost nebulized with an ultrasonic nebulizer for 15 minutes. Pulmonary and hemodynamic parameters were monitored at baseline (after induction), immediately before, and 5 and 30 minutes after iloprost administration. Statistical analysis was performed with a paired Student's t test, with $p \leq 0.05$ considered statistically significant.
Results and Discussion: Of the 28 patients studied 17 presented mPAP > 50 mmHg during surgery, thus requiring nebulized iloprost. The pulmonary vascular resistance index decreased from 1866±691 to 1039±298 dynes·sec/cm^5/m^2 and mPAP from 58.4±6.5 to 42.2±5.9 mmHg, levels comparable to baseline.
Mean arterial pressure, heart rate and central venous pressure were unaffected, indicating the pulmonary selectivity of iloprost. Cardiac index, right ventricle ejection fraction and mixed venous oxygen saturation improved significantly from 2.1±0.5 to 2.6±0.5 l/min/m^2, 29.4±4.7% to 33.4±3.7%, and 69.1±7.3% to 73.4±6.3%, respectively.
Conclusion(s): Nebulized iloprost in association with inhaled NO and oral sildenafil significantly reduces pulmonary vascular resistance during LTx. Improved hemodynamic parameters may obviate the need for cardiopulmonary bypass. This combination of therapeutic agents represents a useful approach in cases of severe PHT in the context of LTx surgery.
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5AP3-4

Investigations on the effect of sevoflurane on fluid absorption across respiratory epithelial cells

Schläpfer M., Leutert A.C., Voigtsberger S., Lachmann R., Roth Z'graggen B., Beck-Schimmer B.
University Hospital Zurich, Department of Anaesthesiology, Zurich, Switzerland

Background and Goal of Study: Pulmonary oedema is the hallmark of the acute respiratory distress syndrome (ARDS). Physiologically, epithelial sodium enters through apical sodium channels (ENaC) and is extruded basolaterally by a sodium-potassium-adenosine-triphosphatase pump (Na^+/K^+-ATPase). Water follows to maintain isoosmolar conditions and to keep alveoli dry. The influence of sevoflurane on oedema formation and resolution in an in vitro and in vivo ARDS model was evaluated
Materials and Methods: In vitro active sodium transport via ENaC and Na^+/K^+-ATPase in lipopolysaccharide (LPS)/phosphate-buffered saline (PBS)-exposed alveolar epithelial type II cells (AECII) was determined. ENaC and ATPase activity were assessed measuring 22sodium and Na^+/K^+- by 86rubidium influx, respectively. In vivo blood oxygenation and the severity of lung oedema were measured in rats with sevoflurane or propofol sedation, exposed to LPS with or without amiloride, an ENaC blocker, or PBS.
Results and Discussion: In AECII LPS decreased activity of the Na^+/K^+-ATPase. This effect was reversible in the presence of sevoflurane ($p < 0.05$). Sodium transport through ENaC was downregulated in injured AECII cells as well and was normalized under the effect of sevoflurane ($p < 0.05$). In vivo a considerably better oxygenation ($p < 0.05$) and a significantly lower wet/dry-ratio in sevoflurane/LPS compared to propofol/LPS treated animals could be shown ($p < 0.05$). Amiloride did not have an influence on wet/dry-ratio.
Conclusion(s): Our study shows that sevoflurane has a stimulating effect on ENaC and Na^+/K^+-ATPase in vitro in LPS-injured AECII. Our in vivo experiments, however, give strong evidence that oxygenation is positively influenced manily due to less severe oedema formation, while better sevoflurane-induced water reabsorption could no be shown. This could be due to the small number of AECII in alveoli.
Acknowledgements: This work was supported by a grant of the ESA.

5AP3-5

Targeting of an antioxidative conjugate - effects on hydrogen peroxide-induced toxicity in human pulmonary microvascular endothelial cells

Sebastiani A.S., Hermanns M.I., Muzykantov V.R., Shuvaev V.V., Wiewrodt R., Kirkpatrick C.J.
Medical Center of the Johannes-Gutenberg-University Mainz, Institute of Pathology, Mainz, Germany

Background and Goal of Study: Reactive oxygen species (ROS) such as hydrogen peroxide (H_2O_2) are associated with the pathogenesis of several inflammatory lung diseases. ROS play an important role in modulating cell activation and cellular function in hypoxia-reoxygenation injury.
Catalase conjugated with antibodies of Platelet-Endothelial Cell Adhesion Molecule-1 (anti-PECAM/catalase) was shown to bind to the endothelium and to detoxify ROS[1]. The aim of this study was to investigate the antioxidative effects of catalase conjugated to Platelet-Endothelial Cell Adhesion Molecule-1 (anti-PECAM/catalase) on human lung cells *in vitro*.

Materials and Methods: Isolated human bronchial epithelial cells (NHBE), human pulmonary microvascular endothelial cells (HPMEC) and two human bronchial epithelial cell lines (A549; Calu-3 cells) were investigated. First, the effect of ROS was identified by H_2O_2 dose response. After one hour of preconditioning with anti-PECAM/catalase conjugates, effective H_2O_2 concentrations were exposed. Cell viability (MTS-Test), cell proliferation (Ki-67-Test) and proinflammatory cytokine release (IL-6; IL-8; soluble ICAM (sICAM) were detected after 24 hours. ANOVA was used for statistical analysis ($p \leq 0.05$).
Results and Discussion: Decreased cell viability and proliferation was found by administration of 0.25-0.5 mM H_2O_2 for HPMEC, 0.03-0.3 mM H_2O_2 for NHBEs and for human bronchial epithelial cell lines ($p < 0.0001$). Preconditioning with anti-PECAM/catalase conjugates before H_2O_2 exposure showed protective effects on cell viability ($p=0.003$) by normal cell proliferation ($p=0.128$) for endothelial cells, whereas no protective effects were found for epithelial cells. In contrast to the protective antioxidative effects against H_2O_2 the release of IL-6 ($p < 0.0001$), IL-8 ($p < 0.0001$) and sICAM ($p < 0.0001$) was significantly higher in endothelial cells treated with conjugates compared to non-treated cells.
Conclusion: Targeting of anti-PECAM/catalase conjugates to HPMEC protects endothelial cells against H_2O_2 toxicity. Anti-PECAM/catalase conjugates

bind specifically to endothelial cells and show no unspecific binding effects on lung epithelial cells. However, treatment with anti-PECAM/catalase conjugates causes an increased release of several proinflammatory markers (IL-6, IL-8. sICAM) on the microvascular endothelium, as a side-effect.

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5AP3-6

Alteration of protein expression in rat lung tissue after short term normobaric hyperoxia

Spelten O., Wrettos G., Hinkelbein J.
University of Cologne, Department of Anaesthesiology and Intensive Care, Cologne, Germany

Background and Goal of Study: Hyperoxia after resuscitation results in a poor neurological outcome. It leads to deleterious consequences for the brain in animal studies and for the lungs in critical ill patients. Nevertheless sufficient oxygenation is vitally important to avoid hypoxia in emergency medicine. Hyperoxia induced free radicals lead to inflammation and apoptosis. However, the impact of hyperoxia on the expression of lung proteins has not yet been evaluated in detail. The aim of this study was to analyze time-dependent alterations of protein expression in rat lung tissue after short term normobaric hyperoxia.

Materials and Methods: After approval from the local ethics committee for animal studies, n=36 wistar rats were randomized into six different groups: three groups with normobaric hyperoxia (NH) and three groups with normobaric normoxia (NN). Normobaric hyperoxia was obtained by exposure to 100 % oxygen for three hours in contrast to normobaric normoxia which was obtained by exposure to room air. Lungs were removed immediately after the end of the experiments (NH0 and NN0 groups), after three days (NH3 and NN3) or after seven days (NH7 and NN7). Lung lysates were analyzed by two-dimensional gel electrophoresis (2D-GE) followed by subsequent identification of protein expression by mass spectroscopy. Statistical analysis was performed with Delta 2D (DECODON GmbH, Greifswald). Biological functions of differential regulated proteins (ANOVA, Bonferroni correction, $p < 0.01$) were studied using functional network analysis (Ingenuity Pathways Analysis, IPA).

Results and Discussion: PaO2 was significantly increased in NH-groups compared to NN-groups (581 ± 28 vs. 98 ± 12 mmHg, $P < 0.01$), all other physiological parameters did not differ. Expression of 14 proteins were significantly changed: 2 proteins were up-regulated (i.e. Interferon-induced protein) and 12 proteins were down-regulated (i.e. Thiol-specific antioxidant-like protein, Dihydropyrimidinase-related protein 2, Heat shock protein beta-1, Actin-related protein 3, Guanine deaminase und Protein disulfide-isomerase A3). A correlation between protein regulation and cellular outcome was identified by IPA.

Conclusions: Even though normobaric hyperoxia was comparatively short, significant alterations in protein expression could be detected up to seven days after hyperoxia in lung tissue. Therefore even persistent protein alterations are possible due to a pulmonary cell injury.

5AP3-7

Rapid recovery after xenon anesthesia

Garrigues B., Laforet H., Penella J.B., Garcia M.L., Ballester M.T., Belda F.J.
Hospital Clinico Universitario de Valencia, Department of Anaesthesiology and Intensive Care, Valencia, Spain

Background and Goal of Study: The blood/gas partition coefficient of xenon is 0.115, and it is the least soluble gas that may be used in anesthesia. This low solubility provides xenon fast induction and recovery characteristics. Moreover, xenon is eliminated unchanged by the lungs. As an inert gas, metabolism does not occur and it has low toxicity and no negative environmental effects[1]. The objective of this study was to describe the recovery after xenon anesthesia in patients older than 65 years old.

Materials and Methods: We designed a prospective descriptive study, approved by ethical committee, in 20 patients undergoing knee replacement surgery, ASA I-II and older than 65 years. The induction of anesthesia was done with propofol (1-2 mg/Kg), fentanil (1 -2 μg/Kg) and cisatracurium (0.15 mg/Kg). The maintenance of anesthesia was done with xenon in oxygen 65% and epidural analgesia. BIS was monitored during surgery. The following times after stopping xenon were measured: time to reach BIS 65 and 80, time to opening eyes, and time to extubation. Data are presented as mean and standard deviation (SD).

Results and Discussion: Twenty patients (fifteen women and five men) with ASA physical status I or II were studied.

	N	MINIMUM	MAXIMUM	MEAN	STD. DEVIATION
BIS>65	20	0	9	3	2,10
BIS>80	20	1	11	4,8	2,76
OPENING EYES	20	1	12	5,5	2,98
EXTUBATION	20	3	15	7,5	3,53
ORIENTED	20	3	15	8,2	3,5

[Times after stopping xenon administration]

They had a mean of age of 73 (range 65-83) years, and body mass index (BMI) of 27. 46 (3.73). Times recorded were lightly longer than observed in other studies[2] [3]. It may be due to the fact that our patients were older and they have a very high body mass index.

Conclusion(s): Xenon anesthesia provides effective anesthesia in older patients with the advantage of a fast recovery in older and obese patients. Due to its low solubility and lack of toxicity xenon could be indicated for maintaining hypnosis in this type of patients.

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5AP3-8

Does xenon anesthesia reduces oxidative stress after ischemia-reperfusion injury?

Garrigues B., Ferri S., Garzando M., Leon I., Garcia de la Asuncion J., Belda F.J.
Hospital Clinico Universitario Valencia, Department of Anaesthesiology and Intensive Care, Valencia, Spain

Background and Goal of Study: Xenon is a noble gas with anesthetic properties supposedly mediated by antagonism of N-methyl-D-aspartate receptors. Oxidative stress contribute to the pathophysiology of diseases such as ischemia-reperfusion injury.

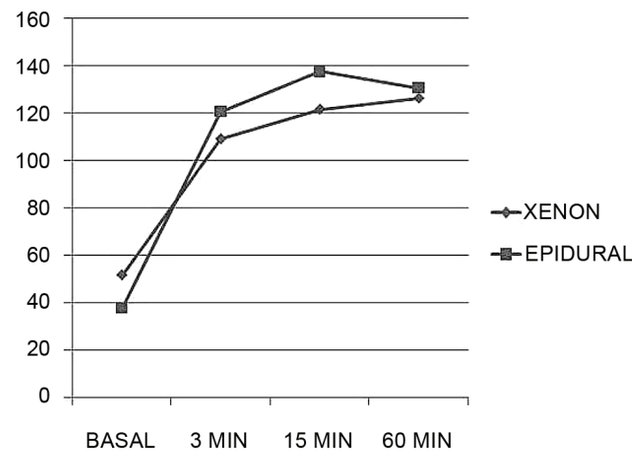
The objective of this study was to compare the impact of xenon and epidural anesthesia in oxidative stress after ischemia-reperfusion injury in patients undergoing knee replacement surgery.

Materials and Methods: We designed a prospective comparative study, approved by ethical committee in forty patients older than 65 years undergoing knee replacement surgery with ischemia.

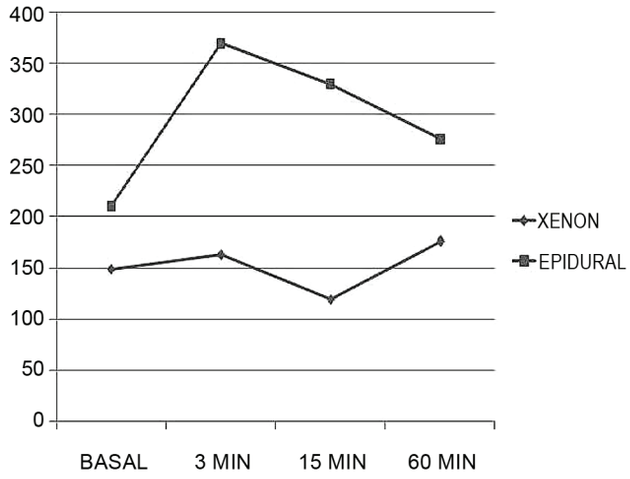
The patients were randomly assigned to receive either xenon 65% combined with epidural anesthesia (20) or single epidural anesthesia (20). Levels of 8-isoprostane, nitrites and nitrates were measured before the ischemia, and 3, 15 and 60 minutes after the end of ischemia. For Statistical comparisons we used the Mann Whitney U test.

Results and Discussion: Forty patients (20 in each group) with ASA physical status I or II, and older than 65 years were studied. Significative lower nitrite and nitrite concentrations in xenon were observed at 15 and 60 minutes after the end of ischemia. In both groups stress oxidative markers increased 3 minute after the end of ischemia and decreased after.

Conclusion(s): Xenon anesthesia reduce the concentration of stress oxidative markers after ischemia-reperfusion injury in knee replacement surgery.



[8-Isoprostane concentrations mcmol/l]



[Nitrite and nitrate concentrations mcmol/l]

5AP3-9

The pressure in endotracheal tube cuffs was increased significantly with xenon anesthesia

Carbonell Lopez J.A., Garcia Perez M.L., Gutierrez Valcarcer A., Hernandez Laforet J., Lopez Forte C., Belda Nacher J.
Hospital Clinico Universitario de Valencia, Department of Anaesthesiology and Intensive Care, Valencia, Spain

Background and Goal of Study: Cuff pressure in endotracheal (ET) tubes should be in the range of 20-30 cm H20. A critical function of the endotracheal tube cuff is to seal the airway and ensure that there are no leaks past the cuff during positive pressure ventilation. Post-intubation sore throat is a common side effect of general anesthetic and may partly result from ischemia of the oropharyngeal and tracheal mucosa, and the most common etiology of non-malignant tracheoesophageal fistula remains cuff-related tracheal injury. In addition, acquired laryngeal stenosis may be caused by mechanical abrasion or pressure necrosis of the laryngeal mucosa secondary to high cuff pressure. The objective of the study was to investigate the effect of xenon on endotracheal tube cuff by measuring continuous cuff pressure.
Materials and Methods: We planned a prospective study, approved by ethical committee, in 10 patients undergoing elective surgery with general endotracheal, ASA I-II and older than 65 years. The induction of anesthesia was done with propofol (1-2 mg/Kg), fentanil (1 -2 µg/Kg) and cisatracurium (0.15 mg/Kg). Male patients were intubated with an 8 or 8.5 mm internal diameter endotracheal tube, and female patients with 7 or 7.5 mm internal diameterendotracheal tube. The maintenance of anesthesia was done with xenon 65% in oxygen and fentanil.The cuff pressure was measured continuously using a manometer that was connected to the pilot balloon of the endotracheal tube cuff via a three-way stopcock. This type of aneroid manometer is nearly as accurate as a mercury manometer. The cuffs were filled with ambient air to provide a clinically applied intracuff pressure of 20 cm H2O. Pressure was recorded at end-expiration after ensuring that the patient was paralyzed.
All data are described as means +/- SEM
Results and Discussion: Ten patients (seven men and three women) with ASA physical status I or II were studied. The presure in the endotracheal tube cuffs increased with exposure to xenon from 20 cm H2O (basal presure) to 33 +/- 2 cm H20 at 75 minutes. (Table)
The important finding from this study was that diffusibility of xenon through the polyvinil membrane of the endotracheal tube cuff is important.
Conclusion: The pressure in endotracheal tube cuffs was increased significantly with exposure to xenon-containing gas mixture.

5AP4-1

Performance of ICU ventilators to sustain patient's ventilatory demand at low and high inspiratory flow provided by an ARDS lung model

Duma A., Roehrich M., Czopak A., Gilly H., Andel H.L.
Medical University of Vienna, Department of Anaesthesiology and Intensive Care, Vienna, Austria

Background and Goal of Study: For optimal treatment of ARDS an assisting ventilatory mode should be available that minimizes patient's muscle work load thus avoiding fatigue. Specifically a ventilator should not limit the flow demanded by the patient during inspiration in which case the airway pressure would be maintained at the same level as before inspiration. We investigated the pressure drop during the inspiratory phase and whether it depends on the ventilator used.
Materials and Methods: A self-designed active lung able to reproduce real breathing patterns was used. With a standard 9.0 ID tube the active lung was connected to four critical care ventilators and identical spiral hoses (Evita XL® (Draeger), Servo-i® (Maquet), Twinstream® (Carl-Reiner), and VDR4® (Percussionaire)) employing a CPAP mode (PEEP=10 mbar). Two breathing patterns were designed according to reported data of ARDS patients[1], one with 40 l/min peak flow (t_{insp}=0.75 s, VT=320 ml) and the other with 400 l/min peak flow (t_{insp}=0.15 s, VT=420 ml), simulating highest breathing effort. The pressure drop was calculated from the difference in airway pressure before and at the end of the inspiratory phase. Each test was repeated 4 times. The means were compared using ANOVA and post-hoc correction (PASW 18®).
Results and Discussion: The resulting pressure drops and significances at high and low flow are shown in table 1.

Ventilator	Low Inspiratory Peak Flow (40 l/min)			
10 mbar CPAP mode	Pressure Drop(mbar) Mean ± SD	p-values	Pressure Drop (mbar) Mean ± SD	p-values
Evita XL	3.6 ± 0.5	Servo-i(p=1) Twinstream(p<0.001) VDR-4(p=0.03)	58.9 ± 2.2	Servo-i(p<0.001) Twinstream(p<0.001) VDR-4(p<0.001)
Servo-i	3.6 ± 0.1	Evita XL(p=1) Twinstream(p<0.001) VDR-4(p=0.03)	52.4 ± 0.2	Evita XL(p<0.001) Twinstream(p<0.001) VDR-4(p<0.001)
Twinstream	6.1 ± 0.1	Evita XL(p<0.001) Servo-i(p<0.001) VDR-4(p<0.001)	43.2 ± 0.9	Evita XL(p<0.001) Servo-i(p<0.001) VDR-4(p<0.001)
VDR-4	3.0 ± 0.1	Evita XL(p=0.03) Servo-i(p=0.03) Twinstream(p<0.001)	19.0 ± 0.5	Evita XL(p<0.001) Servo-i(p<0.001) Twinstream(p<0.001)

[Table 1. Pressure Drop]

With all ventilators markedly large pressure drops were observed with the high peak flow pattern, reaching a negative (subatmospheric) airway pressure, even though the PEEP was set to 10mbar. VDR4 showed the smallest pressure drop in both settings. Twinstream had a smaller decline than Evita XL and Servo-i at high peak flow.
Conclusion: The significant differences in the pressure drop between the four ventilators are most probably due to flow limitations. We believe that the use of a ventilator with small pressure drop at high peak flow is beneficial for ARDS patients to support spontaneous breathing.
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5AP4-2

The obstructive sleep apnea syndrome - prevalence and screening in the pre-admission clinic

Hofmann F, Birnbaum J.
Charité, Department of Anaesthesiology and Intensive Care, Berlin, Germany

Background and Goal of Study: Approximately 5% of the German population suffers from the obstructive sleep apnea syndrome (OSAS). Concerning the cardiovascular comorbidities and the higher perioperative risk, the detection and diagnosis with an easy to use screening tool like the Epworth-Sleepiness-Scale (ESS) in the Pre-Admission clinic could be helpful to optimize the perioperative management of these patients.
Materials and Methods: 4355 patients in our Pre-Admission clinic were screened for OSAS with 2 questionnaires. The first one asked for known OSAS, daytime sleepiness, snoring and BMI >28. With relevant daytime sleepiness or the combination of snoring and BMI > 28, patients were asked to fill in the ESS-Score. A score ≥ 10 was recorded as a high risk for OSAS. Additionally 29 patients with known OSAS or an ESS-Score ≥ 10 underwent a pre- and postoperative polysomnography.
Results and Discussion: From 4355 registered patients 109 had a known OSAS. 631 patients had to fill in the ESS-Score. 82 of these (13%) patients reached a Score ≥ 10.
Altogether 191 patients were declared as conspicuous (known OSAS or ESS-Score ≥ 10), 4,4% of all the screened patients.
Of the 29 patients that were examined with a pre- and postoperative polysom-

nography 22 (76%) had a relevant preoperative AHI, and 24 (82,3%) had a relevant postoperative AHI ≥ 5. If we project these measurements on the 191 patients that were conspicuous after the screening, 145 patients would suffer from OSAS, postoperatively even more.
If we convert these findings to all 4355 screened patients, 3,3% would suffer from OSAS.
Conclusion(s): In our preadmission clinic we used an easy to use screening tool like the Epworth-Sleepiness-Scale and detected about 4,4% conspicuous patients. With the sample of 29 of these patients, we measured a relevant AHI ≥ 5 in 80% of them. That means about 3-4% of our daily surgical patients have an OSAS, known or unknown.
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5AP4-4

Anesthesia technique and patient and bronchoscopist satisfaction during endobronchial ultrasound-guided transbronchial needle aspiration performed under conscious sedation

Vila E., Mases A., Fernandez J.L., Vela E., Gallart L.
Parc de Salut Mar, Department of Anaesthesiology, Barcelona, Spain

Background and Goal of Study: Remifentanil-propofol sedation with topical airway anesthesia is a combined anesthetic technique for endobronchial ultrasound-guided transbronchial needle aspiration (TBNA-EBUS) of mediastinal lymph nodes. Cough is the main discomfort symptom for both patient and endoscopist. We performed a descriptive study to evaluate the doses needed, cough's incidence during the procedure and patient and bronchoscopist satisfaction.
Materials and Methods: Sixty two consecutive patients undergoing TBNA-EBUS under conscious sedation were studied. Patient upper airway was nebulized with lidocaine and supplemental lidocaine was administered through the bronchoscope in a "spray as you go" fashion. Sedation was induced with remifentanil and propofol, the dose was adjusted as needed. The frequency of coughing episodes was encapsulated into 4 categories based on the number of events submitted: ≤5, 6-10, 11-20 and >20. Patient satisfaction was determined by patient willingness to return for the procedure in the future. Bronchoscopist satisfaction was assessed by a questionnaire with 4 categories: excellent (unsurpassable), good (accomplishment of the procedure with few incidents), fair (the procedure is accomplished but gets longer due to the incidents) and poor (interruption of the procedure due to multiple incidents). Statistical analyses were performed with t test.
Results and Discussion: The infusion rate of propofol and remifentanil was 2.1(1.5-3.5)mg.kg^{-1}.h^{-1} and 0.14(0.08-0.18)μg.kg^{-1}.min^{-1}respectively. The duration of the sedation was 63(45-71)min. Data are shown as median and quartile values. Oxygen saturation < 90% (>1min) occurred in 28 patients. The frequency of coughing was ≤5 in 33.9%, 6-10 en 21%, 11-20 en 30.6% and >20 en 14.5% of the patients. Sixty one patients (98%) reported they would return for TBNA-EBUS in the future if required. Bronchoscopist satisfaction was excellent or good in 87.1% of the cases, fair in 11.3% and only in one case sedation was considered poor.
Conclusion(s): TBNA-EBUS may safely be performed under remifentanil-propofol conscious sedation and is associated with very high patient and bronchoscopist satisfaction. Cough was the most commonly reported symptom (84.6%) nevertheless it did not interfere significantly with the completion of the procedure.

5AP4-5

Integrated pulmonary index reflects respiratory function after elective coronary artery bypass grafting

Kuzkov V.V., Gaidukov K.M., Fot E.V., Neverova M.S., Smetkin A.A., Kirov M.Y.
Northern State Medical University, Department of Anaesthesiology and Intensive Care, Arkhangelsk, Russian Federation

Background and Goal of Study: The Integrated Pulmonary Index (IPI) is based on sophisticated algorithm integrating the real time interactions of four parameters (peripheral oxygen saturation, end-tidal CO_2, respiratory rate and pulse rate) into a single index value. The aim of this study was to explore the value of IPI after coronary artery bypass grafting (CABG).
Materials and Methods: Twenty-three adult patients (62±6 yrs.) who underwent elective off-pump CABG were enrolled into a prospective study. IPI was measured and displayed by Capnostream™ monitor (Oridion, Israel). All the patients were divided into two groups according to the postoperative IPI value: optimal IPI (IPI_{OPT} > 8, n = 11) and suboptimal IPI (IPI_{SUB} ≤ 8, n = 12). Blood gases, ventilatory and hemodynamic parameters were registered after the transfer to ICU, before and after spontaneous breathing trial (SBT), at 1 hr, 6 hrs, and 12 hrs after intervention. The groups were compared using Mann-Whitney U-test; discrete data were analysed using χ^2-test. The correlations were assessed using Spearman rho. $p < 0.05$ was considered statistically significant.
Results and Discussion: The value of IPI after the transfer to ICU correlated with IPI at 12 hrs after the intervention (rho = 0.51; p = 0.02). Moreover, values of IPI after, but not before, the standard 30-min SBT were associated with IPI values at 1 hr after extubation (rho = 0.70; p = 0.001). We found that patients of the IPI_{SUB} group were smokers more frequently that those of the IPI_{OPT} group (p = 0.01). The smokers also tended to have lower IPI at 12 hrs after intervention (p = 0.08); PaO_2/FiO_2 ratio did not differ between the groups.
Conclusions: During early postoperative period after CABG, IPI can predict the success of tracheal extubation and reflects the changes in respiratory function. Thus, IPI may be a valuable adjunct to the routine perioperative monitoring, facilitating early detection of respiratory problems.

5AP4-6

Recruitment, overdistension and barotrauma pressures in healthy rabbit lungs

García-Fernández J., Canfrán S., Álvarez-Gómez de Segura I., Suárez-Sipmann F., Aguado D., Hedenstierna G.
La Paz University Hospital, Department of Anaesthesiology, Madrid, Spain

Background and Goal of Study: One of the main concerns of recruitment maneuvers (RM) in pediatric patients is the risk of barotrauma, especially in neonates and small children. The safe range of recruitment pressures needed to fully recruit the lung especially not resulting in barotrauma has not been explored yet in healthy small lungs.
Materials and Methods: Fourteen female New Zealand rabbits (weight 2.8 ± 0.1 kg) were studied. Rabbits were euthanized, a median sternotomy was preformed and both pleural spaces were exposed. Animals were randomly allocated in two groups and submitted to two experimental phases: Phase 1: PEEP incremental steps of 5 cmH_2O from ZEEP to a PEEP of 20 cmH_2O (group PEEP-20) or a PEEP of 50 cmH_2O (group PEEP-50) maintaining a fixed driving pressure of 15 cmH_2O. Phase 2: once maximal PEEPs were reached, driving pressure was further increased in steps of 5 cmH_2O until gross macroscopic barotrauma occurred. During pressure increments three distinctive macroscopic visual conditions were defined: anatomic open lung, overdistension and barotrauma. PEEP, MIP, mean airway pressure (Paw) and driving pressure at which these conditions occurred were recorded and compared between the two groups. Safety range of pressures, defined as the difference between barotrauma MIP and overdistended MIP, was also determined.
Results and Discussion: Both groups showed similar anatomic open lung MIP (PEEP-20: 21.7 ± 2.6 cmH_2O; PEEP-50: 21.4 ± 2.4 cmH_2O, p>0.05) and overdistended MIP (PEEP-20: 33.3±2.6 cmH_2O; PEEP-50: 33.6 ± 2.4 cmH_2O, p> 0.05). However, barotrauma MIP in PEEP-50 was higher (65.7 ± 3.4 cmH_2O) than in PEEP-20 group (56.7 ± 5.2 cmH_2O) (p=0.003) and driving pressure when barotrauma occurred was also different between the two groups (PEEP-20: 37.5 ± 6.1 cmH_2O; PEEP-50: 16.4 ± 2.4 cmH_2O; p=0.000). Safety range of pressure was 23.3 ± 6.1 cmH_2O and 32.1 ± 3.9 cmH_2O in PEEP-20 and PEEP-50 groups, respectively (p=0.009). In this study, barotrauma seems to be non-related to PEEP or Paw, since lungs at higher PEEP and Paw had higher barotrauma MIP (group PEEP-50). The relevant factors that determine direct barotrauma were MIP and driving pressure.
Conclusion(s): There is a wide safety range of pressures with both pressure controlled RMs in healthy small lungs. However, an increased safety margin may be obtained when a higher PEEP is employed during RM, by maintaining a low and constant driving pressure during the all RM.

5AP4-7

Effects of alveolar recruitment strategy on lung and chest wall mechanics during laparoscopic surgery

Cinnella G., Spadaro S., Mirabella L., Salatto P., Nappi L., Dambrosio M.
University of Foggia, Department of Anaesthesiology and Intensive Care, Foggia, Italy

Background and Goal of Study: To our knowledge few data are available on the effects of an alveolar recruitment manoeuvre (ARM) on lung and chest wall

mechanics and gas exchange during laparoscopic surgery in Trendelenburg position. Aim of the study was to evaluate the effects of ARM under such conditions.
Materials and Methods: Twelve consecutive women undergoing laparoscopic hysterectomy were studied. After induction of anaesthesia patients were ventilated in volume-controlled mode, tidal volume (Vt) 8 ml/kg, respiratory rate 10-14 breaths/min, I:E 1:2 and FiO2 0.4 in air. In all patients a radial artery was cannulated to monitor the invasive blood pressure (BP) and a dedicated transducer (FloTrac™) was connected to the Vigileo™ System (Edwards Lifesciences, Irvine, CA, USA) to obtain cardiac output (CO), and an oesophageal thin latex balloon-tipped catheter was inserted to measure oesophageal pressure (Pes). During laparoscopic surgery an ARM manoeuvre was performed as described by Tusman. After ARM, ventilatory setting was unchanged and Peep 5 cmH2O was superimposed to preserve effects of ARM. Respiratory mechanics, haemodynamics and blood gases were recorded at four times: pre-pneumoperitoneum (T0), post pneumoperitoneum and pre ARM (T1), post ARM (T2), and end of surgery (T3). ANOVA one-way was performed. Data are presented as mean+standard devation
Results: Haemodynamic parameters remained unmodified throughout the study.
An improvement of PaO2/FiO2 after ARM was observed persisting until the end of surgery (T1 348±109.0 vs T2 361±116.8 ($p < .05$), T3 391±111.4 ($p < .05$ vs T2).
Respiratory system elastance showed a similar trend: E,rs increased from 31.4+6.1ml/cmH20 on T0 to 43.3 ± 8.1ml/cmH20 on T1 ($p < .007$), decreased after ARM (34.3+12.2 ml/cmH20 on T2, $p < .03$) and remained stable until the end of surgery.
The partitioning between lung at chest wall showed that this increase was due to the lung component: E,l 29,27±7.1 ml/cmH20 on T0 vs 39.7±9.1 ml/cmH20 on T1 ($p < .008$) and 29.9±9.9 ml/cmH20 on T2 ($p < .01$) and remained stable until the end of surgery. E,cw was 2.1±2.1 ml/cmH20 on T0 remained stable throughout the study
Conclusion(s): Our preliminary data suggest that E,rs variations during laparoscopic surgery in Trendelemburg position are due to the lung component; the ARM is effective in increasing arterial oxygenation and decreasing E,rs. These effects are maintained until the end of surgery without significant haemodynamic changes.

5AP4-9

Effects of different levels of spontaneous breathing activity during biphasic positive airway pressure ventilation on lung function and pro-inflammatory response in an experimental model of acute lung injury

Carvalho N.C., Güldner A., Beda A., Spieth P., Rentzsch I., Gama de Abreu M.
Technical University Dresden, Department of Anaesthesiology and Intensive Care, Dresden, Germany

Rationale: It has been shown that spontaneous breathing (SB) superimposed to pressure controlled ventilation (like biphasic positive airway pressure ventilation (BIPAP)) may have impact on lung function and inflammation during acute lung injury (ALI). However, the impact of different levels of inspiratory effort on lungs function and inflammation are not well defined. We investigated the effects of different degrees of SB during BIPAP on pulmonary function and inflammation in an experimental model of ALI.
Methods: 48 juvenile pigs (28-40 kg) were anesthetized, intubated and mechanically ventilated in supine position. ALI was induced by saline lung lavage and animals randomly assigned to 6 h of mechanical ventilation with BIPAP combined with SB able to generate either 0% ($BIPAP_0$, n=11), >0 - 30% ($BIPAP_{>0-30}$, n=12), 30 - 60% ($BIPAP_{30-60}$, n=12) or > 60% ($BIPAP_{>60}$, n=13) of the total minute ventilation. In all groups, the PEEP was 10 cmH_2O, FIO_2 was 0.5 and the driving pressure was titrated to V_T » 6 mL/kg. In the $BIPAP_0$ group, the mandatory respiratory rate (RR) was adjusted to maintain pH > 7.30, while in other groups mandatory RR was adjusted to maintain the target spontaneous-to-mandatory ventilation ratio. Lung functional parameters were measured and regional distribution of ventilation was assessed by electrical impedance tomography. After killing animals, lungs were extracted for analysis of the pro-inflammatory response. Statistical analysis was performed using parametric and non-parametric tests. Significance was accepted at $p < 0.05$.
Results: Compared to $BIPAP_0$, $BIPAP_{30-60}$ and $BIPAP_{>60}$ improved the PaO_2 ($p < 0.05$), but only $BIPAP_{>60}$ led to lower gene expression of interleukine-(IL)-6 ($p < 0.01$). Also, $BIPAP_{>60}$ led to higher ventilation of dorsal zones than $BIPAP_0$.
Conclusions: In this model of ALI, higher levels of spontaneous breathing activity redistributed ventilation towards dependent zones, improving oxygenation and decreasing the pro-inflammatory response compared to protective controlled ventilation.

Transfusion and Haemostasis

6AP1-1

Cell salvage in thoraco-abdominal aortic aneurysm repair: Donor blood and financial savings

Royds M.T., Thomson A.J., Moores C., Mcgee D., Chalmers R.T., Nimmo A.F.
Royal Infirmary of Edinburgh, Department of Anaesthesiology, Edinburgh, United Kingdom

Background and Goal of Study: Open repair of thoraco-abdominal aortic aneurysm (TAAA) is a major surgical procedure which can involve blood loss amounting to several circulating volumes. Autologous blood transfusion using cell salvage forms an important component of intraoperative circulatory management. We report on our experience using cell salvage in a cohort of patients undergoing TAAA repair in a single centre.
Materials and Methods: Data were prospectively collected for all patients undergoing open repair of TAAA from January 2006 to July 2010. Two cell salvage machines were used simultaneously for each case. Data collection included: total volume of blood loss, volume of salvaged red cells reinfused, number of units of allogeneic red cell concentrate transfused and preoperative and postoperative haemoglobin concentration.
Results and Discussion: Sixty-three patients underwent TAAA repair. 37% were female. The type of repair was Crawford extent 1 (3%), extent 2 (21%), extent 3 (11%), extent 4 (60%) and hybrid procedure (5%). Results are shown in Table 1.

Measured variable	Median [IQR(range)]
Blood loss (litres)	9.6 [5.1, 21.0(1.8, 53.5)]
Cell salvaged red cells reinfused (litres)	3.5 [2.0, 8.5(0.3, 23.4)]
Units packed red cells, intraop	6.5 [4, 12(0, 19)]
Units packed red cells, to postop day 5	9 [5, 13(1, 29)]
Haemoglobin concentration preop (g/l)	131 [120, 140(83, 170)]
Haemoglobin concentration postop day 1 (g/l)	92 [86, 100(74, 110)]

[Table 1]

A median of 3507 ml of salvaged red cells were reinfused, equivalent to 13 donor red cell units per case. This represents a financial saving of £1456 based on current NHS blood transfusion costs. This figure is partially offset by the cost of cell salvage disposables which averaged £225 per case.
Conclusion(s): Cell salvage allowed massive operative blood loss (range 1.8-53.5 litres) to be managed with only moderate use of allogeneic red cell transfusion, and without significant postoperative anaemia. Systematic review[1] has shown the efficacy of intraoperative cell salvage in reducing allogeneic transfusion in cardiac and orthopaedic surgery. This series demonstrates the value of cell salvage in major vascular surgery, both in reducing exposure to donor blood and in financial saving.
References:
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6AP1-2

Evaluation of the new Cell Saver® Elite™ System in orthopedic surgery in the RKU hospital, Ulm, Germany

Schubert M., Junker K., Geiger P.
RKU Hospital, Department of Anaesthesiology and Intensive Care, Ulm, Germany

Background and Goal of Study: The endpoints of this clinical study were to verify the new Cell Saver® Elite™ provides a washed red blood cell (RBC) product that meets the acceptance criteria for product hematocrit, and to determine the processing efficiency.
Materials and Methods: For this study an ethics approval and written consent of each patient were obtained.
23 procedures with 34 washing cycles were performed, thereof 26 complete

cycles, three concentration cycles and five incomplete cycles. Always a 125ml bowl was used. Laboratory analysis of reservoir content before wash and blood product after wash were executed, including full blood count, albumin, heparin and free hemoglobin.
Results and Discussion: The **product hematocrits** for complete and concentration cycles were 54.8±4.4% (mean ± standard deviation) (n=26) and 56.7±2.3% (n=3). No formal regulatory requirement exists for autologous washed red blood cell product hematocrit but these hematocrit values go head to head with other cell savers.
The product hemolysis for complete and concentration cycles were 1.19±0.4% (n=26) and 1.41±0.21% (n=3). Hemolysis was as expected for surgical washed RBC products, and it is close to the requirements for allogenic bagged RBC (1% in the US). The slightly higher hemolysis ratio could be explained with more damaged red blood cells (more tissue contact until collecting than as for instance in cardic surgery).
Averages of observed recovery rates of RBC ranged from 75 to 77%.
The supernatant washout was calculated using albumin (as a marker of prewash blood supernatant): 96.3±3.3% for orthopedic procedures. This is in line with bagged blood testing of this device as well as numerous studies from the cell salvage literature on bowl based technology.
The problem of a heparin marker was, that the post-wash heparin values were below the detection limit of 0.01 IU/ml for nearly all products.
Using a hemoglobin marker values were calculated to be on average 85%. In compare to studies based on bagged blood the values are too low. Weakened cells by reason of surgical procedure and centrifugation of high hematocrit samples lead to an increased hemolysis in the red blood cell product, higher free hemoglobin values and an underestimation of the supernatant washout.
Conclusions: The evaluated parameters meet all requirements and are in line with other cell saver devices. Albumin is the most qualified marker for the supernatant washout ratio.

6AP1-3

Intra-operative cell salvage during retropubic prostatectomy: A retrospective analysis of use at a single centre

Vijayakumar M., Thomas D.
ABM University LHB, Department of Anaesthesiology and Intensive Care, Swansea, United Kingdom

Background and Goal of Study: Intraoperative cell salvage (ICS) is a simple, safe and cost-effective method of reducing allogenic blood transfusion.[1]
However, there remains a considerable debate about its use in cancer surgery, for fear of reinfusion of malignant cells leading to increased recurrence & metastasis. The use of ICS for prostatectomies has been shown not to increase the risk of biochemical recurrence.[2]
Our aim was to evaluate the risk of long-term metastatic recurrence following ICS
Materials and Methods: We analysed our ICS audit data from 1992-2007 and a list of all patients who underwent radical prostatectomy where ICS was used as the sole blood management technique was created. Salvaged blood was passed through a leukocyte reduction filter before transfusion in all patients. The patient outcome was searched for on the hospital ‚patient administration system' by recording whether patients were deceased or still alive. Of the patients that had died we obtained, where available the latest chest X ray, CT scan, MRI or USG to try and confirm if they had any metastasis prior to their death.
We attempted to identify the cause of death by retrieving paper notes where possible
Results and Discussion: A total of 347 patients had retropubic prostatectomies and had received cell saved blood(Table 1). Of the 30 patients who had evidence of metastasis,only 5 had lung metastasis. 2 of these patients died within 12 months & one patient died within 15 months. These 3 (0.86%) patients may have suffered from adverse outcome of ICS. The other two patients both lived for 10 years after surgery. The metastatic spread found in 8.6% of our patients compares well with Neider et al[2] who reported a 5 year biochemical recurrence of 15% for ICS

Total number of patients receiving ICS	347
Average age at operation	66.5 years
Total number of patients still alive	309/347 (89%)
Total number of deceased patients	38/347 (11%)
Average duration of post operative survival irrespective of cause of death mean(SD)	1157 (1276) days
Evidence of metastatic spread	30/347(8.6 %)
Lung metastasis	5/347(1.4 %)

[Table 1]

Conclusions: Our results suggest that the use of ICS for radical prostatectomies may not be a clinical problem. RCTs are needed to further establish the safety of ICS.
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Acknowledgements: Dept of Urology Morriston Hospital & Mr Malcolm Rees-Cell Salvage co-ordinator

6AP1-4

Efficacy and safety of intraoperative cell saver use in cardiac surgery with cardiopulmonary bypass: A propensity score analysis

Candela-Toha A.M., Elias-Martin E., Martinez-Perez A., Prada P., Parise-Roux D.
Hospital Universitario Ramon y Cajal, Department of Anaesthesiology, Madrid, Spain

Background and Goal of Study: Controversy exists about the effect of intraoperative cell saver (ICS) use during cardiac surgery. While earlier trials showed a reduction in blood components utilization, recent studies show no effect or an increase in fresh frozen plasma use. A recent meta-analysis of 31 randomized clinical trials (RCT) found a decrease in exposure to allogenic blood products (OR 0.63) without increase in morbidity or mortality (1). Because RCTs rarely reflect clinical practice, the aim of our study was to determine the efficacy and safety of ICS in routine clinical practice.
Materials and Methods: Retrospective analysis of prospectively collected data recorded in our Cardiac Anaesthesia database. For the purpose of the present study patients operated of mayor cardiac surgery with cardiopulmonary bypass (CPB) between September 1st 2004 and December 31st 2007 were included. We excluded patients with ICS contraindication (i.e. endocarditis) and early (< 24 h) deaths. We first developed a propensity score (PS) model with ICS use as the dependent variable. Baseline variables included were demographic: age, sex, weight, height, body surface; analytical: preoperative hemoglobin, hematocrit, platelet count, INR, aPTT, serum creatinine, preoperative antiplatelet medication, and surgical variables: type, priority, complexity, previous cardiac surgery and intraoperative use of antifibrinolytics. We then performed matching without replacement based on the PS model. Efficacy variables considered were: intraoperative transfusion (IT), postoperative ICU transfusion (PT) and transfusion during the first 48h (T48). Safety evaluation was assessed wtih postoperative bleeding (PB) at 6h, 12h and 24h and bleeding needing reintervention (BNR).
Results and Discussion: During this period 986 surgeries were performed. ICS was used in 270 cases (27.4%) and 238 of them could be matched by PS. ICS use decreased IT (OR, 95% confidence interval [CI]) (0.57 [0.40-0.81]), PT 0.52 [0.35-0.77) and T48 0.38 [0.25-0.56]. PB at 6 and 12h, but not at 24h, was significantly higher in patients with ICS use (mean difference in mL [CI]) at 6h: 76 [3-149], at 12h: 105 [10 - 200] and at 24h 101 [-14 - 215]. BNR was nonsignificantly more frequent in the ICS group (OR [CI]) 1.9 [0.9 - 4.1].
Conclusion(s): ICS use in cardiac surgery with CPB decreases intraoperative and postoperative transfusion despite small non relevant increases in PB
References:
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6AP1-5

Structural cell saver use during cardiac surgery reduces 24-hour blood loss and red blood cell transfusion

Garnier R.P., Meesters M.I., Vonk A.B.A., Romijn J.W.A., Boer C.
VU University Medical Center, Department of Anaesthesiology, Amsterdam, Netherlands

Background and Goal of Study: Cell salvage in cardiac surgery is frequently limited to procedures where a high volume of blood loss is expected. Here we evaluated the impact of structural implementation of cell salvage in cardiosurgical patients on perioperative blood loss and need for packed red blood cell (RBC) transfusion.
Materials and Methods: This prospective clinical study was performed in patients undergoing cardiosurgical procedures with cardiopulmonary bypass (CPB) in a control patient cohort without cell salvage (n=536) and a patient cohort with structural use of the cell saver (n=453; Autolog, Medtronic).
Study endpoints included 24-hour blood loss and transfusion requirements, reoperations, perioperative infarction and mortality.
Results: There were no differences in patient and surgical characteristics between groups. Preoperative haemoglobin was slightly higher in the cell

saver group (8.5 ± 0.9 mmol/l) when compared to control patients (8.3 ± 0.9 mmol/l; P< 0.05). The cell saver group received on average 570 ± 265 ml of autologous blood. 24-hour blood loss was higher in control patients (754 ± 577 ml) than in the cell saver group (559 ± 405 ml; P< 0.001). The administered number of RBC units in the control group was 2 (1-5) versus 1 (0-3) in the cell saver group (P< 0.01).
The use of the cell saver was further associated with fewer reoperations for bleeding (5.3% vs. 8.6%; P=0.05) and less perioperative myocardial infarctions (0.9% vs. 2.7%; P=0.03) when compared to controls. There were more patients with a postoperative ICU stay of more than 24 hours in the control group (21.1%) than in patients subjected to cell salvage (13.5%; P< 0.01). There were no differences in cerebrovascular incidents between groups.
Conclusion(s): Structural use of cell salvage during cardiac surgery reduced perioperative blood loss and the need for RBC transfusion when compared to controls. Our data further suggest that cell salvage may be associated with improved postoperative outcome. These findings support the structural implementation of cell salvage in the cardiosurgical setting.

6AP1-6

Impact of intraoperative fluid management on outcome in patients undergoing robotic-assisted laparoscopic prostatectomy - a retrospective analysis

Piegeler T., Dreessen P, Schläpfer M., Schmid D.M., Beck-Schimmer B.
University Hospital Zurich, Institute of Anesthesiology, Zurich, Switzerland

Background and Goal of Study: Intraoperative application of fluids has been discussed largely[1]. Its influence on outcome after robotic-assisted laparoscopic prostatectomy (RALP) has not been examined. We hypothesised, that a more restrictive fluid regimen leads to a decrease in complication rate and reduces length of hospitalisation[2].
Materials and Methods: Retrospective analysis of 194 patients (ASA classification I-III) undergoing RALP at the University Hospital Zurich between 2005 and 2008. The effect of crystalloids, colloids, and erythrocyte concentrates (EC) on the rate of complications was evaluated performing Kruskal-Wallis or Fisher's exact test. A univariate linear regression model was used to examine the impact of fluids on the length of hospitalisation. The smallest unit of interest was 500ml (crystalloids and colloids) or 300ml (EC).
Results and Discussion: Perioperative data of 194 male patients with prostate cancer who underwent RALP were reviewed. Patients were 64 (median, range 44-78) years old. Every patient was given a total median amount of 3700ml (1200-10500) fluids, with a median of 3100ml (1000-8000) crystalloids. 154 patients received beside crystalloids also colloids. Applied to the whole patient group (n=194) a median of 500ml (0-3500) colloids were infused to a patient. 12 patients needed one or several EC.
Crystalloids had a significant effect on the incidence of an anastomotic leak between bladder and urethra (p=0.026), while colloids increased not only the incidence of a leaking anastomosis (p=0.01), but also vascular complications, e.g. a surgical vessel injury (p=0.024) and intraoperative bleeding (p=0.012). Anastomosis leakage was favoured by transfusion of EC (p=0.001) as well as revision after primary surgery (p=0.015).

Crystalloids (p=0.5142) and colloids (p=0.4811) had no influence on the length of hospitalisation, while EC transfusion significantly increased it (p=0.0029).

Conclusion: These results underline the importance of a well-balanced fluid treatment in patients with RALP, which co-determines complication rate as well as length of hospitalisation. A more restrictive fluid management with less complications and a faster hospitalisation are not only advantageous for the patient, but lead to decreased hospital costs.
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2. Nisanevich V, Felsenstein I, Almogy G, et al. *Anesthesiology* 2005,103(1):25-32

6AP1-7

Autotransfusion minimize allogenic blood requirements and reduces transfusion related cardiac adverse events

Lazarevic M., Jankovic R., Petrovic A., Bogicevic A., Golubovic M., Pavlovic A.
Clinical Centre Nis, Clinic for Vascular Surgery, Department of Anaesthesiology and Intensive Care, Nis, Serbia

Background and Goal of Study: Cell salvage is one technique designed to reduce the use of donor blood transfusions. Complications associated with receiving donated blood are very serious, including electrolyte abnormalities which are frequently followed by cardiac disorders.The aim of this retrospective study was to examine the efficacy of cell salvage in reducing the requirements for allogenic transfusion (red blood cells - RBC and fresh frozen plasma - FFP) and thus in minimizing transfusion related electrolyte disbalance and cardiac adverse events
Materials and Methods: Fifty-one patients were operated both on elective and emergency major vascular interventions in the period from February to November 2010. Perioperative blood salvage was used in 24/51(47.05%) patients (CS group), while on the other hand 27/51 (52.95%) patients didn't receive autotransfusion (C group). Allogenic transfusions, hemoglobin (Hb), calcium (Ca^{2+}) and potassium (K^{+}) levels were analyzed in first 24 hours postoperatively.
Results and Discussion: Patients aged between 50 and 70 years were operated. The results showed that need for intra and postoperative allogenic RBC transfusions was significantly higher in patients from C group compared to patients in CS group (3.63±1.07 vs. 0.58±0.83 units per patient; p< 0.001).
Furthermore, the need for allogenic FFP transfusion was also significantly higher in C group (3.26±1.56 units per patient) compared to CS group (0.5±0.08 units per patient; p< 0.001).
On the other hand, the levels of postoperative Hb in first 24 hours after the surgery were significantly higher in CS than in the C group (113.83±14.99 $g{\cdot}L^{-1}$ vs. 88.22±19.7 $g{\cdot}L^{-1}$; p< 0.001). In addition, K^{+} values in first 24 hours postoperatively were higher in patients from C group (4.32±0.85 $mmol{\cdot}L^{-1}$ vs. 3.89±0.46 $mmol{\cdot}L^{-1}$; p=0.026). In the C group 6/27 patients (22.22%) had adverse cardiac events postoperatively, while there were no such records in CS group (p=0.016). Autotransfusion did not appear to impact on calcium postoperative levels (p=0.08).
Conclusion(s): Cell salvage is efficient in reducing the allogenic RBC and FFP transfusions requirements, resulting in superior postoperative Hb levels and in avoiding electrolyte disbalance and related adverse cardiac events.

6AP1-8

The effects of preoperative fluid therapy on coagulation system during urological surgery under spinal anesthesia

Inan N., Tezer E., Alioglu B., Eruyar S., Dikmen B.
Ministry of Health Ankara Research and Training Hospital, Department of Anaesthesiology and Pain Medicine, Ankara, Turkey

Background and Goal of Study: The purpose of this study is to search how preoperative hydration therapy effects the coagulation system postoperatively of the patients that undergo transurethral prostatectomy (TURP) with spinal anesthesia
Materials and Methods: After the ethic committee approval and patient written informed consent obtained; ASA I-II, 51 patients randomized into 3 groups. Group H received 500 ml 6% hydroxyethyl starch (HES) 130/0,4 (n=17), Group G received 500 ml gelofusine (n=17), and Group C received 500 ml 0.9% NaCl (n=17) before spinal anesthesia applied. During operation in all groups, fluid replacement maintained with 0,9% NaCl.
Blood samples were taken preoperatively (T1), and at postoperative 1th (T2) and 24th (T3) hours and PT, INR, aPTT, thrombine time (TT), Fibrinogen (Fib), anticoagulan proteins; antithrombine (AT), protein C (PC), free protein S (FPS), plasminogen (PLG), procoagulan proteins; F2, F5, F7, F8, F9, F10, F11, F12, α2 antiplasmine (α2-AP), vonwillebrand factor (vWF) were studied. The results were statistically compaired.
Results and Discussion: There is no statistically significant difference in terms of demographic data and intraoperative hemodynamic changes between groups (p>0,05)Basal coagulation tests:
According to the results of our study, there are statistically significant difference between groups H and G, in PT (p=0,004, p=0,002), INR (p=0,004, p=0,002), Fib (p=0,005, p< 0,001), TT (p=0,002, p=0,006) and D-dimer (p< 0,001, p< 0,001) tests. In group G, the increase in PT and INR continued for 24 hours.
There were no significant difference in Group C in terms of basal coagulation tests.Anticoagulan proteins: Between Groups H and G; in AT (p< 0,001, p< 0,001) , PC (p< 0,001, p< 0,001) , FPS (p< 0,001, p=0,012) and PLG (p< 0,001, p< 0,001) results significant statistical differences were identified and these effects lasts for 24 hours. There were no significant difference in group C for these tests.Procoagulan proteins: In F2, F5, F7, F10 ,α2-AP and vWF values compared to preoperative period, there were statistically significant difference between Group H and G, and these effects on F2, F7, F10 and vWF, continued for 24 hours.
Conclusions: The results of present study showed that 6% HES130/0.4 or gelofusine make some differences in coagulation parameters, even in low doses, which is not seen in isotonic used group.

6AP2-1

Predicting blood transfusion needs in off-pump coronary cardiac surgery: Development, validation and comparison of a prognostic index

Martinez A., Fernández de Gamarra A., Font A., Belaouchi M., Gómez A.M., Moral V.
Hospital de la Santa Creu i Sant Pau, Department of Anaesthesiology, Barcelona, Spain

Background: Accurate assessment of blood requirements should be the first step in a transfusional saving protocol. Diverse independent predictive variables have been described to achieve this in cardiac surgery, but there is as yet no universally accepted model due to differences in hospital facilities, lack of agreement in transfusional thresholds and heterogenicity of studied variables, among other factors. After reviewing recent studies it seems an individualized predictive model for each center is advisable.
Goals of study:
(1) to describe the blood transfusional incidence in 'off-pump' cardiac surgery patients;
(2) to develop and validate a predictive index to quantify the risk of transfusion needs in this setting;
(3) to transform this index into an easily applicable pre-operative computer tool, and
(4) to compare the predictive index with previously published indexes such as Karkouti et al, TRUST and TRACK.
Materials and Methods: Logistic regression methodology was applied to a retrospective cohort (n=310) of off-pump cardiac patients. Intraclass coefficient of correlation (ICC) was used for external validation on a prospective and posteriorly collected cohort of patients (n=80). C-index was used for comparison.
Results and Discussion: Incidence of transfusion was 46.6% (CI 95%: 41.7-52.6). Seven variables formed *SP_offpump* predictive model*: age, sex, weight, haemoglobin, creatinine, unstable angina and number of predicted bypasses.* ICC was 0.94 and C-index was 0.89. C-index was 0.85 for Karkouti et al's model, 0.84 for TRACK and 0.79 for TRUST.
Conclusion(s): This prognostic index:
(1) provides objective information about patients' likelihood to need a blood transfusion;
(2) could improve assignment of blood-saving resources, and
(3) could be a useful classifying tool for patients in experimental clinical trials.

6AP2-2

Indication for transfusion is an independent risk factor for postoperative morbi-mortality in children undergoing cardiac surgery for congenital heart disease

Willems A., Van Lerberghe C., De Villé A., Melot C., Van der Linden P.
HUDERF, Department of Anaesthesiology and Intensive Care, Brussels, Belgium

Background and Goal of Study: Allogeneic blood transfusion is associated with increased morbidity in paediatric cardiac surgery patients (1). The present sutdy tested the hypothesis that indication for transfusion is an independent risk factor for postoperative morbi-mortality in these high risk surgical children.
Materials and Methods: All consecutive children undergoing cardiac surgery on cardiopulmonary bypass (CPB) from January 2006 until December 2009 were included in this retrospective medical chart analysis. Exclusion criteria were Jehovah's witness patients or those undergoing emergent surgery. For each transfused child, indication was carefully recorded. Indications for transfusion were categorized as the following: a "prophylactic" indication related to the necessity to maintain the haematocrit above 20% on CPB and a "therapeutic" indication related to the management of post-CPB haemorrhage or low O2 transport. The primary outcome was severe postoperative morbi-mortality which included at least two of the following criteria: postoperative pulmonary, cardiac or renal failure, and/or in-hospital death. Univariate analysis was performed to define factors associated with the primary outcome, followed by a step down multivariate logistic analysis.
Results and Discussion: A total of 855 charts were reviewed. Eleven patients had exclusion criteria and 276 were not transfused, leaving 568 patients for analysis. Fifty-five % were male. Median age was 8 [2-18] months; median weight was 6 [4-8] kg. Among the studied patients, 358(63%) received a "prophylactic" blood transfusion and 210 (37%) a "therapeutic" transfusion.

Variables	OR [95% CI]	p value
Preop weight (kg)	0.88 [0.81-0.95]	0.001
ASA score	3.19 [1.68-6.04]	<0.001
CPB time (min)	1.01 [1.00-1.01]	0.001
Perop fluid balance (ml/kg)	1.01 [1.00-1.01]	0.004
Postop day 3 fluid balance (ml/kg)	1.03 [1.01-1.04]	0.002
Indication for transfusion	1.64 [1.03-2.62]	0.039

[Risk factors of postoperative morbi-mortality]

Severe postoperative morbi-mortality was 24% in the "prophylactic" group and 48% in the "therapeutic" group (p< 0.001).
Conclusion(s): Indication for transfusion in pediatric cardiac surgery patients is an independent risk factor for severe postoperative morbi-mortality. Therefore, this parameter has to be taken into account in studies evaluating the effects of blood transfusion on patients' outcome.
References:
(1) Szekeli A et al. Ann Thorac Surg 2009;87:187-97.

6AP2-3

Predictive factors of intraoperative allogeneic blood transfusion in paediatric cardiac patients

Sanchez Torres C., Willems A., Van Lerberghe C., De Villé A., Melot C., Van der Linden P.
CHU Brugmann-HUDERF, Department of Anaesthesiology, Brussels, Belgium

Background and Goal of Study: Transfusion of allogeneic blood products remains very frequent in paediatric cardiac surgery and is associated with altered outcome (1). This study aimed at identifying factors associated with intraoperative blood transfusion in children undergoing cardiac surgery under cardiopulmonary bypass (CPB).
Materials and Methods: This retrospective study reviewed medical records of all consecutive children undergoing cardiac surgery on CPB from January 2006 to December 2009. Jehovah's witness patients and those undergoing emergent surgery were excluded.
Anaesthetic, CPB and surgical techniques were standardized. Children were transfused to maintain a haematocrit above 20% on CPB and above 24% after CPB. Transfused patients were compared to non-transfused patients using Mann-Whitney U test or chi-square. A step down multivariate logistic analysis was performed to identify predictive factors of intraoperative allogeneic blood transfusion.
Results and Discussion: Among the 855 charts reviewed, eleven presented exclusion criteria, leaving 844 children for analysis. Fifty-seven % were male. Median age was 14 [5-44] months. Median weight was 7.3 [5.0-14.0] kg. Five hundred sixty-eight (67%) children were transfused in the perioperative period of whom 518 received blood intraoperatively. Transfused patients were younger, had a lower body weight and a lower preoperative red blood cell mass. They were sicker (higher ASA scores) and underwent more complex operations (higher RACHS scores). They had also a higher rate of postoperative complications. In-hospital mortality rate was 0.4% in non-transfused and 3.7% in transfused patients (p< 0.001).

Variables	OR [95% CI]	p value
Male sex (%)	0.51 [0.31-0.83]	0.007
Weight (kg)	0.66 [0.57-0.77]	<0.001
Preoperative haematocrit (%)	0.82 [0.76-0.89]	<0.001
CPB time (min)	1.01 [1.00-1.02]	0.002
Priming volume (ml)	0.99 [0.99-1.00]	<0.001
Degree of haemodilution (%)	1.04 [1.02-1.07]	<0.001
Intraoperative blood loss (ml/kg)	1.07 [1.05-1.09]	<0.001

[Predictive factors of intraoperative transfusion]

Conclusion(s): Independent predictors of intraoperative blood transfusion are a low pre-operative red blood cell mass, a higher operative blood loss and a high degree of haemodilution achieved during CPB. Identification of these factors will help to develop strategies aiming at reducing allogeneic blood exposure and possibly improving patient's outcome.
References:
(1) Szekely A et al. Ann Thorac Surg 2009;87:187-97.

6AP2-4

Obstetrical hemorrhage and blood transfusion during caesarean section: Which risk factors?

Guasch E., Ochoa C., Montenegro P., Schiraldi R., Brogly N., Gilsanz F.
Hospital Universitario La Paz, Department of Anaesthesiology and Intensive Care, Madrid, Spain

Background and Goal of Study: The aim of the present retrospective longitudinal study was to investigate the main risk factors for OH and to set requirements of blood transfusion, among patients undergoing caesarean section (CS) in a tertiary hospital.
Materials and Methods: After revising the discharge reports from the post-anesthesia care unit (PACU) of all patients submitted to CS during 2008, age, medical and obstetric history, indication for CS and employed anesthesia, intra-operative blood loss (BL), blood count at discharge and blood transfusion needs were recorded. Parametric tests were used for quantitative variables and Chi-2 test was used for qualitative variables. A multivariate analysis was realized with a stepwise logistic regression to identify independent risk factors. A p value < 0.05 was considered significant.
Results and Discussion: 2590 patients were included. The mean age was 32 ± 5.5 years. Mean BL was 544 ± 289 ml. Hemoglobin count and Hematocrit at discharge were respectively 11.2 ± 1.3 g/dl and $33.8\pm3.8\%$. Patients with a BL>1000 ml were older than those with a BL≤1000mL ($p=0.004$). Prevalence of hypertensive disease and gestational diabetes was 6.8% (n=175) and 6.4% (n=166), respectively. BL was abundant (1000-2000 ml) in 117 patients (4.5%) and massive (> 2000mL) in 33 patients (1.2%). Hypertension ($p=0.049$), gestational diabetes ($p=0.001$), previous CS ($p=0.002$) and placental alterations (placental abruption, placenta accreta or previa) were associated with a higher BL in univariate analysis ($p< 0.001$).
Results of multivariate analysis were similar, representing placenta's alterations (OR=10) and multiple pregnancies (OR=4) the main risk factors. Anemia, defined as hemoglobin values less than 8 g/dl, was predominant after general anesthesia when compared to regional anesthesia (3.1% vs. 1.2%, $p=0.01$, OR=2.8). Similarly, higher rates of blood transfusion were observed when general anesthesia was employed (4.4% vs. 0.8%, $p< 0.001$, OR=6). Considering the whole population, 338 patients (13.1%) received intravenous iron infusion; red packed cells were transfused to 32 patients (1.2%) and other blood products were transfused to 42 patients (1.6%).
Conclusion(s): Main risk factors for obstetric hemorrhage appeared to be placental alterations, multiple gestations, previous CS and gestational diabetes. General anesthesia was associated to an increased risk of anemia and blood transfusion.
References:
A.J. Butwick et al. IJOA 2009;18:302-8.

6AP2-5

Thromboelastogprahy cannot predict serious bleeding after cardiopulmonary bypass

Hájek R., Růžičková J., Zuščich O., Fluger I., Zapletalová J.
University Hospital Olomouc, Department of Cardiac Surgery, Olomouc, Czech Republic

Background and Goal of Study: Thromboelastography (TEG) is extensively used method of hemostasis monitoring in cardiac surgery today. TEG monitoring is better predictor of hemostatic abnormalities during cardiopulmonary bypass (CPB) than laboratory tests and reduces using of blood products administration during cardiac surgery (1). The goal of study was to indentify independent predictors of serious bleeding with using hemostasis tests.
Materials and Methods: In prospective observational study group of adult patients (n=499) scheduled for cardiac surgery provided with mild hypothermic CPB was monitored both conventional laboratory hemocoagulation tests and simultaneously with TEG. The following TEG measurements were performed: 1st - after induction (native), 2nd after aortic X-clamp release (heparinase), 3rd an 4th at the end of surgery (native and heparinase).
The blood was sampled from central venous catether without heparine flushing and analysed with the TEG 5000®. Perioperative (cut-off value 500ml) and 24 h postoperative (1000ml) blood loss were recorded. SPSS software vers.15, Kolomogorov-Smirnov test for normality, Mann -Whitney U -test for comparison of groups with adequate and serious bleeding, logistic regression analysis and ROC analysis for predictor identification were used, $p=0,05$.
Results and Discussion: Mean age $66,6\pm9,7$, male gender 67,5%. Average peroperative blood loss 373 ± 351ml, postoperative 819 ±519ml, reexploration because of bleeding 1,6%, mean transfusion rate 0,63 TU RBC, 0,34 TU FFP, 0,01 TU platelets for patient. 96 (19%) patients with serious bleednig were recorded. Following parameters were indentified as significant predictor of serious peroperative bleeding: low MA1 - maximum amplitude on TEG trace in 1st sample (OR 1,046, $p=0,04$) and long prothrombin time before surgery (OR 0,98, $p=0,035$); for serious postoperative bleeding TEG parameters: low K3 (OR 1,254,$p=0,043$), low MA3 (OR 0,963,$p=0,003$) and low platelets before surgery (OR 0,992, $p=0,0001$).
The power of all this predictors is low according the ROC analysis. The only significant predictors of serious bleeding were recorded: age (RR 1,056x/per year) and male gender (RR 3,549x)
Conclusion(s): Neither thromboelastography or conventional laboratory tests of hemostasis cannot predict reliably risk of serious bleeding during surgery with cardiopulmonary bypass.
References:
(1) Ronald A, Dunning J:Interact Cardiovasc Thorac Surg. 2005 Oct;4(5):456-63

6AP2-6

Predictive factors of blood product requirements in liver transplantation

Costa M., Sabate A., Dalmau A., Contreras L., Aparicio I.
Hospital Universitari de Bellvitge, Department of Anaesthesiology, L'Hospitalet de Llobregat, Spain

Goal of Study: Bleeding during liver transplantation (LT) is due to injury produced by surgery, hemodilution of coagulation factors, acidosis, hypothermia and fibrinolysis. Bleeding risk in LT is related to severity of liver disease; however there is lack between preoperative coagulation test and blood products requirements during LT. The purpose is to determine which correctable preoperative and intraoperative factors will influence blood product requirement in LT
Materials and Methods: From our data base of LT in a 7 year period, preoperative and intraoperative data have been reviewed and related to outcome data.Both group of patients: transfused and non transfused has been compared.Using a statistical pack SPSS 15, a bivariated analysis has made followed by a lineal regression analysis.For these significant variables a received operating curve (ROC) has been made.
Results: 421 LT patients were analyzed, 193 (45%) did not required red blood cell transfusion,while 228 required a median of 3 RBC's.Child score,preoperative analysis of coagulation test,fibrinogen,platelets,haemoglobin,sodium and creatinine values were significantly different between transfused and non transfused groups.Also,we found differences related to duration of hepatectomy,median blood pressure at reperfusion and total liver transplantation length.In a multivariate analysis preoperative haemoglobin,preoperative plasmatic sodium and fibrinogen values were significant related to risk of reed blood cells transfusion,R value= 0.69,R square of 0.486. Fibrinogen had influence haemoglobin prediction only when the plasmatic value of fibrinogen was lower than 2 g/L. ROC value of haemoglobin varies from 0.853 to 0.922. ROC value for fibrinogen was 0.679 and for preoperative plasmatic sodium was 0. 67.
Conclusion: A value of Hb lower than 9.5 g/l prior to the procedure is highly sensitive for RBC's transfusion, while a value of preoperative plasmatic Hb > 12.5 g/L indicates accidental risk of RBC's transfusion.
Low values of preoperative fibrinogen influences the prediction value of Hb; therefore, to confirm this the lowest critical plasmatic value of fibrinogen that will be related to blood product requirement during LT should be calculated in a prospective study.
References:
1. Ramos E, Dalmau A, Sabate A, et al. Intraoperative red blood cell transfusion in liver transplantation: influence on patient outcome, prediction of requirements, and measures to reduce them Liver Transpl 2003; 9, 1320-1327

6AP2-7

A high ratio of transfused fresh frozen plasma to packed red blood cells during intraoperative massive transfusion is associated with improved long-term outcomes

Miltsios K.G., Krzanicki D.A., Lucci F., Thompson K.M., James K.M., Mallett S.V.
Royal Free Hospital, Department of Anaesthesiology, London, United Kingdom

Background and Goal of Study: Recent work has highlighted the importance of aggressive treatment of coagulopathy in massive transfusion. In combat-related trauma, Bogman et al have shown an association between a high ratio of transfused fresh frozen plasma (FFP) to packed red blood cells (PRBC) during massive transfusion and improved survival to discharge. We wanted to investigate if a similar association exists in the setting of intraoperative massive transfusion.

Materials and Methods: A retrospective analysis of case notes was undertaken. Between January 2006 and November2009, a total of 107 patients receiving at least 6 units of packed red blood cells (PRBC) during surgery were identified.
With the exception of cardiac surgery and orthotopic liver transplantation, all other surgical specialties were included. Based on the intraoperative FFP:PRBC ratio, patients were divided into a low ratio group (0< FFP:PRBC< 0.5) and a high ratio group (FFP:PRBC≥0.5). Data regarding age, gender, type of surgery, intra-operative transfusion, postoperative transfusion during the first 24 hours, and patient outcomes were collected and compared between the two groups.
Results and Discussion: A small group of patients (n=9) received no intraoperative FFP and were not included in either low or high ratio group. These patients had median intraoperative PRBC of 6 [range 6-10], did not usually require postoperative intensive care (78%) and demonstrated 100% one-year survival. Low (n=28, FFP:PRBC median ratio 0.33) and high (n=70, median ratio 0.95) ratio groups had significantly different intraoperative transfusion of PRBC (12.5[6-40] *vs* 7[6-29]; p< 0.01) and FFP (3.5[1-17] *vs* 7[3-19]; p< 0.05).
The first postoperative INR measurement was higher for the low ratio group (mean 2.04 *vs* 1.58; p< 0.05). Survival to discharge (40.7% *vs* 65.2%; p< 0.05) and one-year survival (26.1% *vs* 51.7%; p< 0.05) were both decreased in the low ratio group.
Conclusion: In patients receiving intra-operative massive transfusion, a higher FFP to PRBC ratio is associated with reduced intraoperative transfusion requirements and improved long-term outcomes. Further research, including prospective studies, is needed to establish a causal relationship between blood product transfusion ratios and outcomes.
References:
1. Borgman et al, *J Trauma*. 2007;63:805-813.

6AP2-8

Blood transfusion in total knee replacement: Finding mean determinants

Schiraldi R., Valbuena I., Guasch E., Diez J., Gilsanz F.
Hospital Universitario La Paz, Department of Anaesthesiology, Madrid, Spain

Background and Goal of Study: Bleeding and Blood Transfusion (BT) during Total Knee Replacement (TKR) are common and threatening events. In the present study different variables were analyzed searching which of those appeared to be related to bleeding magnitude and BT need.
Materials and Methods: Patients scheduled for TKR were sequentially studied. Demographic, surgical and anesthetic data and comorbidities were recorded. Hemoglobin values (Hb) were recorded preoperatively, at Post Anesthesia Care Unit (PACU) arrival and then 24 and 48 hours after surgery and finally at hospital discharge. Use of Blood Salvage (BS) was also recorded. Need of BT and number of infused bags were recorded. One-Way or Two-Way Anova was used for parametric data and Fisher's Exact Test or Chi-Square test was used for non-parametric data. A p value < 0,05 was considered significant.
Results and Discussion: 103 patients were included in the study. Age was 71,4±8,5 years. Weight was 79,1±11,9 kg. Height was 159,6±11,3 cm. Women were more numerous than men (81 vs. 28). Loco-regional anesthesia was predominant (used in 98% of cases). Hypertension was the most common comorbidity (52,4%). Time of surgery was 104±26,5 min. Mean bleeding volume was 808,28±473,98. 33 patients (32,1%) received BT and mean transfused volume was 439,4±108,8. BS was used in 43 cases (41,7%) and re-infused volume was 752,7±369,2 ml. Use of BS reduced need of BT (required in 9 patients, 8,7% of the whole group, vs. 24, 23,3%) even though the difference was not significant (p=0,054 using a bilateral Fisher's Exact Test). Patients who received BT had a lower preoperative Hb (12,5 vs. 13,9 g/dl; p< 0,001) and a longer time of surgery (112,1 vs. 99,8 min; p=0,029). Anesthetic technique and postoperative type of analgesia did not affect the magnitude of bleeding nor BT requirement. Patients who did not receive BT left the hospital with higher level of Hb (10,8 vs. 9,7 g/dl; p< 0,001).
Conclusion(s): According to these preliminary data, Blood Transfusion is still common during perioperative period in patients submitted to TKR. Main determinants of BT were length of surgery and preoperative Hb. Preoperative Hb optimization seems to be a rational strategy in order to avoid BT. Role of BS in avoiding BT remained unclear. BS could be scheduled in cases at high risk for BT.
References:
Donat R. Spahn, M.D., F.R.C.A. Anemia and Patient Blood Management in Hip and Knee Surgery. Anesthesiology 2010; 113:482-95

6AP2-9

Thromboelastography in prediction of blood loss after cardiac surgery

Chooi J.L., Vesamia S.A., Gama C.A., Szecowka-Harte S.R., Brown V.
Bart's and the London NHS Trust, Department of Anaesthesiology, London, United Kingdom

Background and Goal of Study: There is no consensus about the predictive value of thrombelastography (TEG) for post-operative bleeding in cardiac surgical patients. Previous work reveals TEG to be specific but not sensitive and has identified weak relationships for TEG values between bleeding and non-bleeding patients. We aimed to assess if TEG differentiates between patients who would bleed in the early postoperative period and those who would not.
Materials and Methods: We reviewed retrospectively data collected as part of continuous ongoing audit from 436 patients who had undergone cardiac bypass surgery between 21/10/08 to 22/6/10. Exclusion criteria was pre-operative Hb < 10, INR> 1.2 or resternotomy for surgical bleeding. Based on previous reports we accepted 750 ml mediastinal tube dranage as a cut off point for bleeding in the first 12 hours. We examined plain TEG samples taken 15 minutes after protamine administration. Chi-squared test was used to evaluate TEG variables between the 2 groups. The predictive values, sensitivity and specificity of TEG were assessed.
Results and Discussion: The two groups did not differ in demographic data and anti-platelet usage (aspirin p= 0.65, clopidogrel p= 0.42). There were 250 coronary artery bypass grafts(CABG) and 29 single valve operations and 96 patients had mixed (more than 1 valve or CABG with valve repair).

	Bleeding (>750 ml) N= 26	Non- bleeding (<750ml) N=410	p-value
Age	68.2+/- 12.06	67.6 +/- 11.2	0.78
Weight	81.88 +/- 15.7	80.9 +/- 18.3	0.79
Platelets	216 +/- 69	216 +/- 69	0.14
Bypass time (mins)	106.36 +/- 41.6	102.24 +/- 36.1	0.58
Cross clamp time (mins)	79.3 +/- 31.2	72.4 +/- 31.2	0.29

[Table 1: Group demographics (means +/- SD)]

There was no significant difference between the two groups in R, MA, or R+MA values (p=0.977) .TEG showed high specificity and negative predictive value but not sensitivity or positive predictive value.

	R (cutoff point <14 mins)	MA cutoff point > 48 mm
Sensitivity	7.6 %	7.6%
Specificity	95.3%	97.4%
Positive predictive value	8.7%	15.4%
Negative predictive value	94.5%	94.5%

[Table 2: Sensitivity, specificity, PPV and NPV]

Conclusion(s): Post protamine TEG alone is unable to discriminate between patients who will bleed and those who will not after cardiac surgical procedures. However, TEG has been shown to be specific with a high NPV in accordance with previous work.

6AP2-10

Application of the McCluskey Index to predict a massive blood transfusion in brain-death donor liver graft recipients

Del Hierro Pedrero E., Garcia Gutierrez A., Gutierrez García I., Gutierrez J.M., Valencia O., Pérez Cerdá F.
Hospital 12 Octubre, Department of Anaesthesiology, Madrid, Spain

Background and Goal of Study: McCluskey proposed a risk index based on 7 parameters to identify the transfusion needs of patients during liver transplantation surgery and in the first 24 hours post-operative [1].The main objective of our study was to validate McCluskey Index to predict a massive blood transfusion (MBT) in brain-death donor (BDD) liver graft recipients in our population.
Materials and Methods: We undertook a retrospective descriptive study of BDD liver graft recipients from January 2008 through September 2010.The following variables were recorded:age,hemoglobin,international normalized rati o,platelet,bilirubin,creatinine and Model for End-Stage Liver Disease (MELD).

Each patient was assigned a preoperative score between 0 and 7.Statistical analyses were performed using SPSS15.0.

Discussion and Results: 161 patients that received a orthotopic liver transplant from BDD were performed.By using readily available preoperative clinical variables McCluskey study developed and internally validated a clinical prediction risk index that can be used to accurately identify liver transplants recipients at risk of MBT [2].We had compared our population with McCluskey population to look for stadistical differences.McCluskey described that the prevalence of MBT was higher at low (25%) and intermediate risk score group (30%) than a high risk score (12%). When we compared the prevalence of both groups we found that in our group the prevalence of MBT was higher than McCluskey group at risk score 0-3 (33%) but was lower at risk score 4-5 (5%).We found a higher porcentage of MBT at all risk score than McCluskey (50%-61%-88%). It would to be explained by our MELD.

Conclusions: We had externally applicated the McCluskey Score to check the external validity in our population.We appreciated the diferencies and this may be caused by the medical team.[3-4]

References:

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6AP3-1

Determination of the coeficient of variation of continuous non-invasive hemoglobin measurement

Soliveres J., Balaguer J., Sánchez A., Estruch M., Hernández M.J., Solaz C.
University Hospital Dr Peset, Department of Anaesthesiology and Intensive Care, Valencia, Spain

Background and Goal of Study: Non invasive continuous determination of haemoglobin may be very important. Variation of measurement can be due to device variability, including self calibration (coefficient of variation -CV-) or real patient changes. Our aim is to determine the CV since it has not been reported yet for this device.

Materials and Methods: After local ethics committee approval, written informed consent was obtained from patients scheduled to any kind of surgery. After standard monitoring, a Rainbow R2-25™ (Masimo, US) probe was placed in the middle finger of the contralateral iv line hand according to the manufacturer's recommendations. After a standard anaesthesia induction, the probe was connected to a monitor (Masimo Radical 7™, USA), and non invasive haemoglobin determination (SpHb) started. No iv liquids (except to maintain blood pressure, if necessary) were administered. Anaesthesia was maintained with 1-2% sevoflurane in oxygen. No surgical procedure was performed during 40 minutes. If perfusion index was lower than 1, data were rejected. Doing this way, SpHb variations are likely to be due to monitor variability rather than patient changes. After surgery, data were downloaded to a computer (Masimo TendCom™, Masimo, US), obtaining one recording every 2 seconds. CV was analyzed offline for 8 periods of five minutes, then in periods of ten minutes (4 periods) and finally in two periods of 20 minutes. CV from each patient and each period of time was compared with the others, in order to find out the maximum period of variability and the actual CV, which is the lowest one of all the measurements. A CV below 2,8% (within-subject biologic variation) would be desirable. Comparison was performed with Student's t test or ANOVA with Bonferroni correction as appropriate. P< 0,05 was considered significant.

Results and Discussion: 35 patients were enrolled. One of them was withdrawn due to haemodynamic problems and one due to low perfusion index. 1200 determinations were obtained for each patient. Table shows CV at each moment.

Minutes	0-5	5-10	10-15	15-20	20-25	25-30	30-35	35-40
CV (%)	1,4 (1,4)	0,7 (0,6)	1,5 (0,5)	1,7 (0,6)	0,8 (1,0)	0,9 (1,0)	0,7 (0,6)	1,1 (2,9)
Minutes	**0-10**	**10-20**	**20-30**	**30-40**				
CV (%)	2 (5,3)	1,8 (1,3)	1,2 (1,2)	1,2 (1,3)				
Minutes	**0-20**	**20-40**						
CV (%)	2,8 (3,7)	1,6 (1,4)						

[Time interval CV. Data show mean (SD) (*)p<0,05]

Conclusion(s): In our study, CV has been established in 1,6% (DE=1,4%). When using SpHb, first 20 minutes should be discarded.

6AP3-2

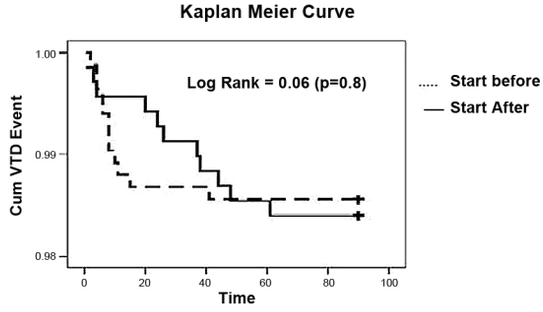
Clinical use of enoxaparin as thromboprophylaxis after total knee arthroplasty (TKA) in daily practice: An observational multicentre study

Llau J.V., and the ENOXACOR Study Group
Hospital Clinic de Valencia, Department of Anaesthesiology and Intensive Care, Valencia, Spain

Background and Goal of Study: Venous thromboembolism (VT) is a major risk after TKA. With the routine use of thromboprophylaxis, VT continues to be reported in 1.5 to 5% of patients within 3 months after surgery. Low-molecular-weight heparins represent the main prophylactic option against VT, with little information on daily clinical practice.

Materials and Methods: A multicenter retrospective study was designed to determine, as primary efficacy outcome, the incidence of symptomatic deep vein thrombosis (DVT) and/or pulmonary embolism (PE) in patients undergoing elective TKA. The patients received enoxaparin as thromboprophylaxis starting 12 h preoperatively or 6-12 h postoperatively (follow up 90 days). Statistics: VT events were estimated by using the cumulative failure rate from the Kaplan-Meier method analysis; the log rank test was used for univariate comparison of events rate.

Results and Discussion: Full data of 1522 patients were included (834, 55% received enoxaparin before surgery and 688, 45% postoperatively). The overall incidence of clinical VT was 1.5%. DVT was documented in 16 (1.1%) patients with no differences between both groups (8/822, 0.98%, and 8/677, 1,19% respectively). PE was documented in 9 (0.6%) patients, with no differences between both groups (4/822, 0.49%, and 5/677, 0,74% respectively). Two patients in the postoperative group and no patient in the preoperative one had DVT and PE. No differences were found in the incidence of thrombotic events (figure 1).



[Figure 1]

Conclusion(s): These results suggest that enoxaparin could be administered for thromboprophylaxis in patients scheduled for TKA surgery starting preoperatively 12 h before surgery or postoperatively 6-12 h after surgery with similar results of efficacy. The presentation of the thrombotic event is earlier if the enoxaparin is administrated before surgery and a little later if the first dose is administered after surgery.

Acknowledgements: All the ENOXACOR investigators.

6AP3-3

Hemoviskoelastography - a new method of monitoring hemostasis

Tarabrin O., Tyutrin I., Kalinchuk S., Turenko A., Shcherbakov S., Gavrychenko D.
Odessa National Medical University, Department of Anaesthesiology and Intensive Care, Odessa, Ukraine

Background and Goal of Study: It's known that deep vein thrombosis of lower extremities and pulmonary embolism occupies an important place in the structure of postoperative morbidity and mortality.

Materials and Methods: After Ethics approval and informed consent, was studied the functional state of hemostasis in a group of 40 healthy volunteers, who were not receiving drugs affecting coagulation and 37 patients with postphlebothrombotic syndrome (PPTS). In patients PPTS conducted baseline studies coagulation state and daily monitoring of dynamic changes in the functional state of hemostasis, a comparative evaluation of performance low-

frequency piezoelectric vibration hemoviskoelastography (LPVH) and platelet aggregation test (PAT), standard coagulation tests (SCT), thromboelastogram (TEG).
Results and Discussion: It was found that the LPVH correlated with SCT, PAT and TEG. However, our proposed method is more voluminous: indexes ICC (the intensity of the contact phase of coagulation), t1 (the time the contact phase of coagulation), and A0 (initial rate of aggregation of blood) consistent PAT indexes, indexes ICD (the intensity of coagulation drive), CTA (a constant thrombin activity) and CIP (the clot intensity of the polymerization) - SCT and TEG. In addition, the advantage of this method is to determine the intensity of fibrinolysis - with indicator IRLS (the intensity of the retraction and clot lysis).
Conclusion(s): LPVH allows make the total assessment of all parts hemostasis: from initial viscosity and platelet aggregation to coagulation and lysis of clot, as well as their interaction. His figures are objective and informative, as evidenced by close correlation with the performance of traditional coagulation methods.

6AP3-4

Benefits hemoviskoelastography over traditional diagnostic methods of hemostasis

Tarabrin O., Suslov V., Kalinchuk S., Shcherbakov S., Gavrychenko D.
Odessa National Medical University, Department of Anaesthesiology and Intensive Care, Odessa, Ukraine

Background and Goal of Study: According to the literature, postoperative deep vein thrombosis of lower extremities, which are the main sources of pulmonary embolism, occur in 50-70% of cancer patients, about half of them formed during the operation and most of them are asymptomatic.
Materials and Methods: 536 Patients undergoing open surgery for abdominal cancer received haemoviscoelastography (HVG), a viscoelastic test, measures clot formation and includes information on the cellular, as well as the plasmatic coagulation system. We examined the efficacy of a variety of coagulation tests. A complete coagulation screen activated clotting time (ACT), thromboelastography (TEG) and HVG were performed before surgery, at the end of surgery, and bemiparin anticoagulation monitoring on postoperative days 1, 2. 3. and 7. There were analyzed for the reaction time and the maximal amplitude (MA).
Results and Discussion: We calculated the elastic shear modulus of standard MA and HVG MA which reflect total clot strength and procoagulatory protein component, respectively. The difference was an estimate of the platelet component. There was a l6% perioperative increase of standard MA, corresponding to a 49% increase of HVG MA ($P < 0.05$) and an 79-85% contribution of the calculated platelet component to HVG MA. We conclude that serial standard thromboelastography and HVG may reveal the independent contribution of platelets and procoagulatory proteins to clot strength. Using multiple linear regressions, all coagulation, TEG and HVG variabilities were used to model postoperative hypercoagulation. Results showed that some components of the TEG failed to identify hypercoagulation ($r < 0.2$, $P > 0.75$). However, three components of the routine coagulation assay, including bleeding time, prothrombin time, and platelet count could be modeled to show prolonged postoperative hypercoagulability ($P < 0.01$). We conclude that all components of the HVG reflect postoperative coagulopathies, these results suggests that it may be useful in determining the coagulation status of cancer patients perioperative.
Conclusion(s): Postoperative hypercoagulability, occurring for at least 1 week after major cancer abdominal surgery, may be demonstrated HVG. Hypercoagulability is not reflected completely by standard coagulation monitoring and TEG and seems to be predominantly caused by increased platelet reactivity.

6AP3-5

Platelet function analysis by impedance aggregometry (Multiplate®): Influence of routinely used drugs in cardiac anaesthesia and critical care

Perret Morisoli A., Gronchi F., Ferrari E., Frascarolo P., Sulzer C., Marcucci C.
CHUV, Department of Anaesthesiology, Lausanne, Switzerland

Background and Goal of Study: Impedance aggregometry (IA) is a new point of care test evaluating global platelet function and the efficacy of platelet inhibitors. In IA, increase in electrical impedance of whole blood is measured after addition of a platelet activator. The increase in impedance is expressed in arbitrary units (U). Reduced impedance implies platelet dysfunction or the presence of platelet inhibitors. IA may play an important role in the early diagnosis and management of perioperative platelets dysfunction. Many drugs, routinely used in cardiac anaesthesia, like midazolam, propofol, lidocaine and magnesium, have known in vitro antiplatelet effects and may interfere with IA interpretation. Their influence on platelet function assessment by IA is unknown. The goal of the study is to evaluate to which extent IA is modified in the presence of these drugs.
Materials and Methods: We performed an experimental, in vitro study, using blood from 20 healthy volunteers between 18 and 65 years old. We excluded volunteers with known coagulopathies or having used drugs with antiplatelet effects within 14 days.
Baseline IA (Multiplate®) was measured using 4 activators: arachidonic acid (AA), ADP, TRAP-6 and collagen. We then added the study drugs in 3 increasing, clinically relevant concentrations (table 1). IA was compared to baseline using paired student t-test (JMP 7.0 software). Data are presented as mean ± SD.

	High (Toxic concentration)	Intermediate (Therapeutic concentration)	Low (Sub therapeutic concentration)
Midazolam	500 ng/ml	250 ng/ml	150 ng/ml
Propofol	8 mcg/ml	5 mcg/ml	2 mcg/ml
Lidocaine	6 mcg/ml	3 mcg/ml	1 mcg/ml
Magnesium	2,5 mmol/L	1 mmol/L	0,4 mmol/L

[Plasma concentrations of studied drugs]

Results and Discussion:

	AA (U)	ADP (U)	TRAP-6 (U)	COLL (U)
Baseline	92 ± 27.2	71.8 ± 16.9	141.1 ± 34.4	91.7 ± 22.8
Mg 2,5 mmol/L	83.8 ± 39.8	29.8 ± 14.2 a	100.9 ± 39.8 b	77.6 ± 37.8
Mg 1 mmol/L	95.1 ± 24.0	41.9 ± 21.1 c	130.1 ± 39.3	97.34 ± 16.2

[AI at baseline and with Mg 2.5 mmol/L and 1 mmol/L]

[a]$p < 0.0001$, [b]$p = 0.0002$, [c]$p = 0.02$

Midazolam, propofol and lidocaine showed no effect on IA at any of the concentrations. Magnesium had a highly significant effect on the ADP and TRAP-6 tests at 2.5 mmol/L, and a less pronounced effect at 1 mmol/L on the ADP test.
Conclusion(s): Midazolam, propofol and lidocaine do not interfere with IA measurement, even at near toxic plasma concentrations. In patients treated with high to normal doses of magnesium, IA results should be interpreted with caution.

6AP3-6

Coagulation changes following hepatic resection - PT-INR may only yield part of the picture

Krzanicki D.A., Miltsios K.G., Broomhead R., Patel S., Riddell A., Mallett S.V.
Royal Free Hospital, Department of Anaesthesiology, London, United Kingdom

Background and Goal of Study: Prothrombin time (PT) and international normalised ratio (INR) typically become transiently elevated following major hepatic resection and may guide treatment decisions. PT-INR is known to be a poor predictor of bleeding risk in cirrhotic patients[1]. We postulated that PT-INR may similarly not represent haemostasis following hepatic resection.
Materials and Methods: We prospectively identified 24 patients undergoing hepatic resection for metastases. Blood was analysed at 5 timepoints for each patient (baseline, post-resection, post-operative days (POD) 1, 2 and 5). Full blood count, conventional clotting screen, rotational thromboelastometry (ROTEM), thrombin generation and laboratory assays of anti and procoagulants were performed at each timepoint.
Results and Discussion: Mean INR rose from 1.09 (Baseline) to 2.05 (POD 1); $p < 0.01$, returning to 1.22 by POD 5. Mean ROTEM extrinsic pathway (EXTEM) measurements remained within normal limits suggesting preserved coagulation. At POD 1 Protein C levels fell by 69.3% ($P < 0.01$) and protein S by 38% ($p < 0.01$), both below the lower reference range. Indeed protein C levels remained low at POD 5 (59% of normal). Factor VIII levels rose to 246% of baseline at POD 5 ($p < 0.01$). Mean endogenous thrombin potential remained within normal limits throughout the 5 post-operative days.
Conclusion(s): PT-INR changes significantly following hepatic resection to beyond the normal range, peaking at 24 hours. Protein C and S levels fall significantly whilst Factor VIII levels rise, suggesting a ‚balanced' change in the haemostatic system. Endogenous thrombin potential remains within normal limits further supporting the theory of intact clotting. ROTEM EXTEM values

remains within the normal range mirroring our other findings of overall normal haemostasis. The ROTEM may provide a more useful clinical role in post-operative management.

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6AP3-7

How recombinant factor VII activated is affected by body temperature

Ontañón Ledesma M., Romera Rabasa A., Barrio Saiz E.,
Iglesias de la Vega M., Quintana Villamandos B., López Gil M.T.
Hospital Universitario Gregorio Marañón, Department of Anaesthesiology, Madrid, Spain

Background and Goal of Study: Efficiency of recombinant factor VII activated (rFVIIa) has been demonstrated in cardiac surgery massive and uncontrolled bleeding refractory to conventional treatment. However, effect of body temperature has not been established in rFVIIa activity yet.

Materials and Methods: Retrospective, observational study. Data of fifty seven patients of cardiac surgery with postoterative and massive bleeding uncontrolled with conventional treatment were studied if rFVIIa was administered (dose of 90 mcg/kg). Three groups were established depending on the body temperature at the momento of rFVIIa administration: group A (n=10): patients with 30-33 ºC body temperature, group B (n=24): body temperature between 33-36ºC and group C (n=23): body temperature higher than 36ºC. Study variables: laboratory measurements at the rFVIIa administration, as well as 24 and 48 hours after administration; postoperative bleeding, transfusional needings. Data are presented as medians with interquartile ranges

Results and Discussion: We found mayor differences between groups A and C in units of packed red cells transfusion after rFVIIa (A (median:7 interquartile range [2-10]), C (2 [0-3]), p=0,002,) pla telet concentrate administration (A:1 [3,75-10], C: 0[0-5] p=0,02) and postoperative bleeding during the first 24 hours (A: 60 ml [15-95], C: 15ml [10-25], p=0,01). There were also differences in the number of units of packed red cells transfused between group A (7 units [2-10]) and B (2 units [0,25-6,25]), p=0,03 as well as fresh-frozen plasma administration among groups B (2 units [0-3,75]) and C (0 units [0-1]), p=0,01) during the first 24 hours after surgery.

Conclusion(s): Body temperature is an important factor in coagulation efficiency even if rFVIIa is administrated. Further studies are needed to confirm these results.

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6AP3-8

Evaluation of prothrombin complex concentrate, recombinant activated factor VII and fibrinogen concentrate to reverse rivaroxaban in a rabbit model of bleeding and thrombosis

Godier A., Miclot A., Le Bonniec B., Durand M., Lecompte T., Samama C.M.
Hôtel-Dieu Hospital, Department of Anaesthesiology and Intensive Care, Paris, France

Background and Goal of Study: As a potent anticoagulant agent, rivaroxaban exposes to a risk of bleeding. An effective way to reverse its effects is needed. Recombinant activated factor VII (rFVIIa), prothrombin complex concentrate (PCC) and fibrinogen concentrate (FibC) could be evocated as potential antidotes. Our aim was to study their efficacy and safety to reverse the anticoagulant effect of an overdosage of rivaroxaban in a rabbit model of bleeding and thrombosis.

Materials and Methods: In 59 anaesthetized and ventilated rabbits, the Folts model was applied to assess safety: a stenosis and an injury were carried out on the carotid artery, inducing thrombosis, known as a cyclic flow reduction (CFR). After the first CFR, rabbits were randomized into 5 groups: control (saline), rivaroxaban (rivaroxaban, 5 $mg.kg^{-1}$, and saline), rFVIIa (rivaroxaban and rFVIIa, 150 $\mu g.kg^{-1}$), PCC (rivaroxaban and PCC, 40 $UI.kg^{-1}$) and fibrinogen (rivaroxaban and fibrinogen, 200 $mg.kg^{-1}$). Then CFRs were recorded over 20 minutes. The following were measured: ear immersion bleeding time (BT), clotting time (PT, aPTT, anti-Xa activity), thrombelastometric parameters (ROTEM®) and thrombin generation test (Endogenous Thrombin Potential (ETP), Peak). At last, an hepatosplenic section was performed; 15 min later, the amount of blood loss was recorded as primary end point as well as hematocrit.

Results and Discussion: Rivaroxaban increased blood loss (17[8-32] vs 7[5-18] p< 0.05), BT (140[75-190]s vs 77[41-101] p< 0.02),, clotting time, thromboelastographic clotting time and decreased ETP and peak, compared to control. rFVIIa was the only one to decrease BT (92[65-115]s vs 140[75-190]s p< 0.02), without efficacy on blood loss. PCC and rFVIIa decreased aPTT and ROTEM clotting time. Fibrinogen increased FIBTEM clot firmness and corrected ETP (689±296 vs 50±63 nM.min, p< 0.05) and peak (44±24 vs 6±10 nM, p< 0.05). CFRs were unchanged.

Conclusion(s): rFVIIa reduced BT after an overdosage of rivaroxaban but this reversal was only partial. PCC and fibrinogen concentrate only improved some of the biological parameters.

6AP3-9

Dabigatran etexilate Is effective and safe in patients undergoing total hip arthoplasty

Moise A.I., Dragulin E., Casabalian D., Guran C., Mincu N., Stelea G.
Prof. Gerota Hospital, Department of Anaesthesiology and Intensive Care, Bucharest, Romania

Background and Goal of Study: Dabigatran etexilate is an oral direct thrombin inhibitors (new anticoagulant).

This study evaluates and compares the total blood loss and allogenic transfusion requirement in the patients undergoing total hip arthoplasty with the administration of dabigatran etexilate as prophylaxis for venous thromboembolism

Materials and Methods: A prospective randomized clinical trial. After acceptation from the Ethics Committee and informed consent of the patient, 30 patients, ASA I-III our Orthopedic Department between January 2008- December 2010 for cementless and uncementless total hip arthoplasty were divided into two groups, age and sex matched: group A received Dabigatran etexilate (Pradaxa, Boehringer Ingelheim) postoperative +/- preoperative (to the patient requiring secondary prophylaxis after stroke or sever cardiac diseases) , group B received enoxaparinum (+/- aspirin as protocols). All patients received one dose-10mg/kgc tranexamic acidum before incision, loco-regional anesthesia, standard intra and postoperative monitoring.

We measured individual data concerning: the intra-operative bleeding, the total postoperative bleeding, preoperative and postoperative haemoglobin, the total allogenic transfusion requirement. At 7days enzymes liver and echodoppler was used.

EpiInfo software was used for statistical stratified processing. Data as mean +/- SD were compared using Student's t-test, for 95% confidence interval and level of significance established at p< 0.05.

Results and Discussion: For all variables considered as result of Dabigatran etexilate efficiency evaluation, there were no significant differences between group A and B: both blood loss intra-operative (275.00+/-63.465 vs 282.23+/-56.547) and total blood loss postsurgery (815+/-48,13 vs 830+/-51,34) are similar; but in the subgroup with required secondary prophylaxis, the total blood loss decreased with 34,33% in group A compared to group B (p< 0.05). No adverse reactions were observed, including deep venous thrombosis or growth of live enzymes.

Conclusion: The administration of Dabigatran etexilate is easy and safe for patients undergoing total hip arthoplasty and reduced with 34,33% the total blood loss to the subgroup with required secondary prophylaxis for stroke and severe cardiac diseases compared with clasic protocol.

6AP3-10

Does liver transplantation affect platelet function?

Eyraud D., Gostian O., Gossem P.
Pitié Salpêtrière Hospital, Department of Anaesthesiology and Intensive Care, Paris, France

Background and Goal of Study: It is assumed that thrombocytopenia present in patients undergoing liver transplantation contributes to the development of perioperative coagulopathy. Furthermore, patients undergoing liver transplantation show profound changes in their haemostatic system, with a platelet function susceptible to deteriorate, especially after reperfusion of the graft. We studied the effect of liver transplantation on the platelets function, as assessed by aggregometry and flow cytometric-based platelet function analysis.

Materials and Methods: After Ethical Committee approval and informed consent, 15 patients scheduled for liver transplantation were enrolled in a prospective, observational pilot study. The platelet function was assessed before the liver transplantation, 7 days after liver transplantation and then 28 days after liver transplantation. The tests used were the aggregometry in platelet rich plasma (PRP), with the addition of various concentrations of a panel

of agonists (collagen, arachidonic acid, ADP, ristocetin) and the detection of activated platelets by flow cytometry, measuring the platelet-leukocyte conjugates and the activation marker P-Selectin. Data were analyzed using ANOVA multivariate analysis. $P < 0.02$ was considered statistically significant.
Results and Discussion: The number of platelets in PRP rises significantly after liver transplantation, with a non-statistical impact on aggregometry. The activated platelets detected through flow cytometry are decreasing over time, even though these results are not statistically significant, due to the small number of patients.
Conclusion(s): These findings suggest that platelet function does not decrease during liver transplantation, with a normalization in number but a "deactivation" of available platelets.
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6AP4-1

Tranexamic acid in hip arthroplasty: A dose-response study

Borisov D., Yudin S., Krylov O., Markov B., Istomina N.
Northern Medical Clinical Center, Department of Anaesthesiology and Intensive Care, Arkhangelsk, Russian Federation

Background and Goal of Study: Tranexamic acid (TA) reduces blood loss and blood transfusions in hip arthroplasty. However an optimal dose of tranexamic acid has not been determined yet. The goal of our study was to compare effects of repeated i.v. bolus of TA vs single bolus of TA on postoperative blood loss in hip arthroplasty.
Materials and Methods: In a randomized controlled study, 90 patients underwent primary cementless total hip arthroplasty. Preoperatively, all patients received TA bolus (1 gm i.v.). All patients had drains and received transfusion of unwashed filtered shed blood (UFSB) if drain blood loss was >200 ml within the first 6 hrs postoperatively. All patients were randomized to three groups: single preoperative TA bolus (PREOP, n=30), repeated bolus of TA (1 gm) 3 hrs later (group POST3, n=30) and repeated bolus of TA 6 hrs postoperatively in case drain blood loss >200 ml (group POST6, n=30). The primary endpoints were postoperative drain blood loss within first 18 hrs and perioperative blood loss within first 48 hrs (calculated from the change of level Hb). Data were analyzed by one-way ANOVA followed by Tukey's *post hoc* test and χ^2-test accordingly.
Results and Discussion: All groups were similar with regard to demographic variables. Data are shown as mean±SD. The main results are summarized in the table.

Parameter	PREOP	POST3	POST6	p
Postoperative blood loss, 18 hrs (ml)	427±227	353±105	456±210	0.09
UFSB (n)	9	6	8	0.88
UFSB (ml)	289±117	250±63	363±130	0.15
Preoperative Hb (g/l)	135±16	136±18	137±13	0.94
Postoperative Hb, 48 hrs (g/l)	111±16	105±16	107±18	0.50
Perioperative blood loss, 48 hrs (ml)	994±318	1235±605	1151±368	0.19

[Parameters evaluated in the three groups]

Allogeneic blood transfusion was given to one patient of the POST3 group at postoperative day 7. No patient in any group had manifesting deep venous thrombosis or pulmonary embolism during hospitalization.
Conclusion(s): In primary cementless total hip arthroplasty, repeated i.v. bolus of TA does not result in further reduce in the postoperative blood loss compared with single preoperative bolus.

6AP4-2

Intraoperative tranexamic acid reduces blood transfusion in children undergoing craniosynostosis surgery: A randomized double-blind study

Sauter M., Sola C., Raux O., Canaud N., Capdevila X., Dadure C.
Lapeyronie University Hospital, Department of Anaesthesiology and Intensive Care, Montpellier, France

Background and Goal of Study: Surgical correction of craniosynostosis in children is associated with substantial intraoperative bleeding. We hypothesized that intraoperative tranexamic acid (TXA) would reduce blood loss and transfusion relative to placebo in patient pre-treated with erythropoietin.
Materials and Methods: Forty consecutive children, American Society of Anesthesiologists status I or II, scheduled to undergo surgical correction of craniosynostosis were randomly assigned to receive either intravenous TXA or 0.9% saline intraoperatively.
All children received preoperative erythropoietin administration (600 mg/kg once a week for 3 weeks before surgery). The intra- and postoperative transfusion threshold for packed red blood cell was set to hemoglobin of 7.0 g/dL. Perioperative blood loss, number and volume of transfusions, percentage of children transfused, and side effects were noted after surgery and at the end of the study. Surgeon satisfaction and cost of treatment were also recorded.
Results and Discussion: There was no significant difference between groups in terms of demographics or surgical data.

	TXA Group n=19	Placebo Group n=20	p
Number of Intra-operative transfused patient (%)	2 (10.5)	9 (45)	0.02
Number of postoperative transfused patient (%)	5 (26.3)	8 (40)	NS
Total number of transfused patient (%)	7 (36.8)	14 (70)	0.04
Intra-operative volume of red cells transfusion (ml/kg)	1.6 ± 5.5	11.0 ± 14.2	0.01
Postoperative volume of red cells transfusion (ml/kg)	5.6 ± 10.27	5.6 ± 7.6	NS
Total volume of red cells transfusion (ml/kg)	7.2 ± 10.8	16.6 ± 13.5	0.03
Estimated intra-operative blood loss (ml/kg)	51.4 ± 28.3	61.1 ± 16.8	NS
Postoperative blood loss in drains (ml/kg)	5.6 ± 10.3	4.8 ± 7.7	NS
Total blood loss(ml/kg)	64.0 ± 32.4	76.0 ± 16.1	NS

[Red cells transfusion requirement]

In the TXA group, the volume of packed red blood cell transfused was significantly reduced by 85% intraoperatively and 57% throughout the study period ($P < 0.05$). In comparison with placebo group, the percentage of children requiring blood transfusion was lower in TXA group during surgery (respectively, 45% vs 10.5%, $p < 0.05$) and in the whole study period (respectively, 70% vs 37%, $p < 0.05$). The intra-operative PRBC exposure (0.1±0.3 vs 0.9±1.3 units/person; p=0.01) and the total PRBC exposure (0.5±0.7 vs 1.3±1.2 units/person; p=0.02) significantly decreased in TXA group. Preoperative and postoperative hematological parameters were comparable in both groups. There were no adverse events.
Conclusion(s): In children undergoing surgical correction of craniosynostosis, pre-treated with erythropoietin, intraoperative TXA reduces transfusion requirement.

6AP4-3

Methods to reduce blood loss in pediatric scoliosis surgery

Moguilevitch M., Sarwahi V.
Albert Einstein College of Medicine, Department of Anaesthesiology, Bronx, United States

Background and Goal of Study: Pedicle screws use in idiopathic scoliosis surgery has been shown to improve the curve correction and allow a surgeon to fuse less motion segments compared to the hook fixation. The down side of the technique is significant increase in blood loss which makes this cases more difficult to manage.
The goal of the study is to show that use of antifibrinolytics, optimization of fluid management and blood transfusion strategies together with other blood conservation techniques can decrease intra-operative blood loss and eliminate the need for homologous blood transfusion.
Materials and Methods: 72 patients undergoing posterior spinal fusion with instrumentation for idiopathic scoliosis were enrolled in prospective randomized study. All patients were 14-16 years old, wt. 50-60 kg, with preoperative hematocrit 35-38%, who underwent 12-14 segments correction. The same anesthetic and surgical techniques were used and standardized indications for the blood transfusion applied to all patients. First group of 40 patients received Aminocapronic acid during the procedure, second group of 32 patients did not. Restrictive fluids management technique was applied to both groups.

Results and Discussion: Patients in both groups got cell saver blood first, than autologous blood, if it was available, and only after homologous blood transfusion was initiated if hematocrit was 20% or below.
No patients in the first group received blood, in contrast to 11 patients in the second group who were transfused with autologous, homologous blood or both. The need for the blood transfusion in the second group was statistically significant: more than 1/3 of the patients required blood transfusion. All 40 patients in the first group were extubated at the end of the procedure, compared with only 29 in the second group (100% vs. 90.6%; p=0.02).
The data obtained in this study showed definite advantage of the antifibrinolytics use in scoliosis surgery.
Conclusion(s): The use of antifibrinolytics together with other blood conservation techniques during the correction of idiopathic scoliosis allows for the elimination of homologous blood transfusion. Also it permits early extubation.
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6AP4-4

Patient blood management (PBM) in patients undergoing orthopedic surgery

Heschl M., Rehak P., Hofer A., Gombotz H.
General Hospital Linz, Department of Anaesthesiology and Intensive Care, Linz, Austria

Background: Optimizing red cell mass by treatment of preop. anemia is an essential part of the new PBM concept. The prevalence of preop. anemia in orthopedic surgery ranges between 15-20% (1) and is associated with a 3-4fold transfusion rate and adverse outcome (2, 3). In more than 90% of pts. preop. anemia is not treated. The aim of our study was to investigate the effect of anemia correction on transfusion requirements.
Patients and Methods: After ethical approval 100 anemic pts. of both genders scheduled for elective unilateral primary total hip or knee replacement were included in a retrospective observational study.
The type of anemia was determined by using following parameters: hemoglobin (hb), C-reactive protein, serum iron and ferritin as well as transferrin saturation (tfs). 50 patients participated in the PBM program (group I), while the other 50 patients (group II) did not for organisational reasons.The initial treatment of iron deficit was started by administering i.v. iron according to the Ganzoni formula and was supplemented by ESA in case of insufficient hb increase. Mann-Whitney U test was used for statistics, p< 0.05 was accepted as significant.
Results: There was no difference in demographic data and co-morbidities between the groups. In group I iron deficit was detected in 68% (n=34) (tfs < 20%). In group I there was a significant preop. hb increase (p< 0.01). As a consequence, the RBC volume and the number of RBC units transfused were significantly higher in group II. In addition, discharge hb was significantly higher in group I (table 1). No adverse side effects were detected.

	group I	group II	p value
Inital Hb (g/dl)	11.4±1	--	--
Preop Hb (g/dl)	12.8±1	11.2±1	>0.001
Discharge Hb (g/dl)	10.4±1	9.8±0.9	0.002
Volume transf.(ml RBC)	47±151	490±235	>0.001
N.Pts.transf.(%)	5(10)	50(100)	>0.001

[Table 1]

Conclusions:
· There is a high prevalence of preop. anemia in patients undergoing orthopedic surgery.
· Timely preop. treatment of anemia results in a dramatic reduction of transfusion requirements and is associated with higher hb levels even after discharge.
· The low incidence of periop. adverse events in both groups may be due to the small number of patients and their low risk profile.
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6AP4-5

Effect of tranexamic acid in decreasing need to transfusion in hip fracture surgery

Moghaddam M.J., Darabi E., Sheikholeslamy F.
Shaheed Beheshti Medical University, Department of Anaesthesiology, Tehran, Iran, Islamic Republic of

Background and Goal of Study: Blood and blood products impose many risks & costs on patient and health organizations. Several technics, different drugs and modalities used by anesthesiologist to reduce need to transfusion. In this study we evaluate tranexamic acid effects on reducing hemorrhage and allogeneic blood transfusion in femoral fracture repair.
Materials and Methods: In a double blind clinical trial 60 patients in ASA class I/II in age limit of 20 - 50 and femoral bone fracture divided in two study groups. After induction of anesthesia, Group I received 10 mg/kg bolus dose of tranexamic acid and 1mg/kg infusion during entire operation and anesthesia. Study group II receive the same amount of normal saline as a placebo. Both patient groups considered for amount of blood loss, hgb changes and amount of transfused bloods.
Results and Discussion: Demographic finding between two groups was similar. Blood loss in group I was (670±208/7cc) and in group II was (998/4±230/9)(p=0.01). Patient population that needs blood transfusion was 5 in tranexamic acid group and 14 in control group. (p≥0.01)
Conclusion(s): Considering significant reduction in blood loss and needs to transfuse allogeneic blood produ
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6AP4-6

Continuous vs. repeated bolus of tranexamic acid for total knee arthroplasty

Bouali Y., Rais K., Belhaj H., Jabri H., Kaabachi O.
Kassab Orthopedic Institute, Department of Anaesthesiology and Intensive Care, Tunis, Tunisia

Background and Goal of Study: Multiple studies suggest tranexamic acid (TXA) reduces blood loss and red cell transfusions in patients undergoing total knee arthroplasty (TKA). Several protocols with different dose of TXA were used. Repeated doses for longer period were more effective (1). However, many of the dosing schedules in these studies are not ideally suited for routine application. We suggested that continuous infusion of TXA could be superior to repeated bolus regarding total postoperative blood loss and secondarily the need of red cell transfusion.
Materials and Methods: After ethical committee approval and oral consent of patients, forty patients scheduled for primary unilateral TKA under spinal anaesthesia were randomised in two groups after a loading dose of 1g TXA 30 min before tourniquet release: group C had continuous infusion de 4 g TXA starting 3 hours until 12 H postoperatively ; and group D, received repeated bolus of 1g TXA at 3, 6, 9 and 12 h postoperatively. Data collected included : postoperative bleeding at 1, 3, 6, 9, 12 hours and on day 1, 2 and total bleeding ; preoperative and postoperative hemoglobin and hematocrit levels (12 h, Day 1, 2, 3 and 5) hemoglobin at day 5 (discharge), change in hemoglobin (reduction in haemoglobin be was calculated by subtracting the lowest postoperative hemoglobin level from the preoperative hemoglobin level), allogeneic blood transfusions, and complications (thromboembolic event, nausea and vomiting).
Continuous data were compared using Mann Whitney test and parametric data were analysed using Fisher exact test.
Results and Discussion: Demographic data were similar in both groups. There was a reduction in external bleeding during the first 12 hours in group D compared to group C but the difference was not significant and total bleeding was similar in both groups. The reduction in haemoglobin level was lower in group D but not significantly. Red cell transfusion need was similar in both groups. We did not report any complication.

Conclusion(s): The primary results of a study comparing two protocols of TXA in patient undergoing TKA suggest that repeated bolus seems to be superior to continuous infusion regarding postoperative blood loss and reduction of haemoglobin level.
The study is going one to confirm these results.
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6AP4-7

The efficacy of antifibrinolytics at reducing blood loss in major spine surgery: A prospective randomized comparison of tranexamic acid, aminocaproic acid, and placebo

Boenigk K., Verma K., Hoelscher C., Huncke K.T., Lonner B., Errico T.
NYU-HJD, New York University, Departments of Orthopaedic Surgery and Anesthesiology, New York, United States

Background and Goal of Study: Antifibrinolytics have long been used to minimize blood loss during surgery. However, the relative benefit of using these drugs for patients undergoing major spine surgery is unclear. No study has compared tranexamic acid (TXA), epsilon aminocaproic acid (EACA), and placebo to directly assess blood loss, drain output, and transfusion rate in a prospective randomized study.
Our study provided level-one data comparing TXA, EACA, and placebo in Adolescent Idiopathic Scoliosis (AIS).
Materials and Methods: This is a prospective, randomized, double blinded comparison of TXA, EACA and placebo used intra-operatively in patients with AIS. 74 patients with AIS were randomly assigned to one of the treatment arms or the placebo group. TXA was administered at 10mg/ kg for a loading dose followed by 1mg/kg-hr, while EACA was given at a 10 fold higher dose. Estimated blood loss (EBL), pre, intra and post-operative hematocrit, blood product usage, and post-operative drain output were recorded. An ANOVA with Tukey's post hoc analysis was used to compare groups.
Results and Discussion: AIS patients received TXA (n=18), EACA (n=21), or saline (n=35) in the operating room (57F, 17M, mean age 15, range 11-21). Average blood loss with TXA (607 ± 545ml) or EACA (671± 517ml) was less than placebo (1038 ± 880ml) ($p< 0.05$). Total drain output was decreased with TXA (684 ± 355ml), but not EACA (1,161 ± 549ml), compared to Saline (1,125 ± 479ml) ($p< 0.05$). Similarly, total blood loss was reduced with TXA (1329 ± 567ml), but not EACA (1863 ± 857ml), compared to Saline (2,126 ± 1,187ml) ($p < 0.05$).
There was no difference in the number of units transfused, duration of surgery, and hematocrit during surgery when comparing the three treatment arms. EACA may prevent a post-operative decrease in hematocrit compared to Saline ($p = 0.06$). There were no thromboembolic, renal, or major wound complications. We found a significant reduction in blood loss but not transfusion rate with antifibrinolytics compared with placebo. TXA, but not EACA, is effective in reducing post-operative drain output as well.
Conclusion(s): We report that antifibrinolytic treatment reduces blood loss but not transfusion rate in AIS. Total drain output and total blood loss were reduced with TXA, but not EACA, compared to Saline. Both treatment options were equivalent in terms of intra-operative blood loss.
Acknowledgements: No pharmaceutical funding was received for this study.

6AP4-9

Postoperative intravenous iron after lower limb arthroplasty: A comparative study of different doses on transfusion requirements

Muñoz M., Naveira E., Seara J., Cordero J., Marcos F, Bisbe E.
Medicine University of Malaga, Biochemistry, Malaga, Spain

Background: An important percentage of patients undergoing total hip (THA) or knee (TKA) arthroplasty receive a transfusion of allogeneic blood (ABT) to avoid the risks of perioperative acute anemia.
However, concerns about the risks of ABT in its turn have led to the search for alternatives, such as stimulation of erythropoiesis. In this regard, a previous pilot study showed that postoperative IV iron sucrose (300 mg) reduced transfusion requirements after THA (Muñoz et al. Transfus Med 2006; 16: 137-42), and a NATA consensus statement suggested the administration of IV in patients undergoing orthopedic surgery with high risk for developing severe postoperative anemia (Beris et al. BJA 2008; 100:599-604).
Patients and Methods: We prospectively investigated the effect of postoperative administration of 100 mg/day IV sucrose (Venofer) during three consecutive days (300 mg) vs. 200 mg/day IV sucrose during three consecutive days (600 mg), or 600 mg IV ferric carboxymaltose (Ferinject) on postoperative day (POD) 1, on ABT requirements in 123 THA and 99 TKA consecutive patients. All patients were operated on by the same surgeon, using the same implants, and a set of perioperative clinical data was gathered.
Results: No adverse reactions to iron administration were observed. There were no differences between groups regarding age, gender distribution or co-morbidity, but there were a higher proportion of hip procedures and slightly lower preoperative hemoglobin in the 300 mg IV iron group .
Compared to patients receiving 300 mg IV iron, those receiving 600 mg showed lower ABT rate (12.4 vs 26.4%) (without differences in pre-ABT Hb levels), shorter length of hospital stay (8 vs 8.9 days), and a trend to lower postoperative infection rate (1.6 vs 7.5%).
In addition, during the study period, no differences in peri-operative data were observed between patients receiving 600 mg Venofer or 600 mg Ferinject .
Conclusion: Postoperative administration of 600 mg of either Venofer or Ferinject seems to be safe, and more effective than that of 300 mg Venofer to reduce ABT requirements in THA and TKA patients. Ferinject has the additional advantage of being given in a rapid single infusion.
A large, randomized controlled trial to confirm these results is warranted.

6AP4-10

Tranexamic acid in liver transplantation: Is it comparable to aprotinin?

García J., Gajate L., Cavero V., Alonso B., Moreno R., Alonso S.
Hospital Universitario Puerta de Hierro Majadahonda, Department of Anaesthesiology and Intensive Care, Majadahonda, Spain

Background and Goal of Study: Intraoperative and postoperative bleeding remains a complication that increases transfusion requirements, morbidity and mortality in liver transplant surgery.
Several studies have demonstrated increased fibrinolytic activity during liver transplantation and the significant decrease in blood loss with the use of antifibrinolytic drugs. Since the withdrawal of aprotinin, tranexamic acid has been considered the antifibrinolytic drug of choice for liver transplant surgery. In our study we wanted to determine if tranexamic acid at doses currently used, is as effective as aprotinin in reducing transfusion requirements and increased survival without increasing postoperative complications in patients undergoing liver transplantation.
Materials and Methods: We conducted a cohort study, retrospective, observational database of 219 patients in the Anesthesiology Service between January 2002 and December 2009. We classify our sample into two groups. Group A received tranexamic acid at doses of 10 mg / kg loading + 1mg/ kg/h, and group B received Aprotinin at a dose of 2 million load + 500000 U/h.
Results and Discussion: The samples were homogeneous in both groups except in the history of previous abdominal surgery, pretransplant status, donor age, time of surgery, duration of anhepatic phase and Piggy-Back technique. We found significant differences in total blood transfusion of packed red blood cells, fresh frozen plasma and platelets. The proportion of packed red blood cell transfusion was doubled in the group receiving tranexamic acid compared with the group that received aprotinin. The same happened with platelet transfusion. The proportion has tripled in the group receiving tranexamic acid when it comes to transfusions of packed red cells over 20 management units and fresh frozen plasma. The short-term survival was similar. There was no difference in the increase of postoperative complications. Multivariate analysis would be needed to find out which were the independent risk factors for blood transfusion in our population.
Conclusion(s): Tranexamic acid appears to be less effective than aprotinin in reducing transfusion requirements at the doses used in our study. Short-term survival and postoperative complications were similar in both groups.
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6AP5-1

Rapid blood transfusion during liver transplantation induces a more severe decline in the ionised serum calcium concentration

Park C.S., Jung H.S., Lee S.R., Ghil B.G.
College of Medicine, The Catholic University of Korea, Department of Anaesthesiology and Pain Medicine, Seoul, Korea, Republic of

Background and Goal of Study: A rapid blood transfusion during liver transplantation (LT) frequently induces a severe, prolonged decline in the ionized serum calcium concentration (I-CA). We compared the decline in I-CA after rapid blood transfusion during LT with that in other surgery.
Materials and Methods: We compared the changes in the I-CA after trans-

fusing 500 mL of packed red blood cells in 22 LT patients with liver cirrhosis (Group L) and 30 patients undergoing spinal surgery with normal hepatic function preoperatively (Group S). The transfusions were completed in 10 min just after the induction of anesthesia, and the I-CA was measured before (T0), just after (T1), and 20 (T2) and 60 (T3) min after the transfusion. Repeated-measures analysis of variance (ANOVA) and Student's t-test were used for the statistical analyses.

Results and Discussion: The mean age of the LT patients was younger (48.6 vs. 55.6 years) and the most common indication of LT was liver cirrhosis by hepatitis B virus (54.5%). Group L had a higher international normalised ratio (INR) and activated partial thromboplastin time, and a lower serum albumin level than Group S (all $P < 0.05$). The I-CA at T1 decreased markedly in both groups from the baseline values at T0, although the I-CA of Group L was lower than that of Group S (4.05±0.28 vs. 4.18±0.19 mg/dL; $P = 0.049$). In Group S, the I-CA at T2 was restored to nearly the level at T1 ($P < 0.05$), while the low I-CA in Group L had not improved ($P < 0.05$). The gap in the I-CA between the two groups was wider at T2 (3.99±0.33 vs. 4.25±0.19 mg/dL; $P = 0.001$). At T3, the I-CA in both groups did not differ from the baseline values at T0 or between the groups.

In the correlation analysis, the low I-CA at T1 in Group L was negatively related to the serum lactate level ($\gamma = -0.44$) and the volume of blood loss ($\gamma = -0.44$) at T1. The decline in I-CA after rapid transfusion was more marked and its recovery was delayed in LT patients. The decreased hepatic metabolism of citrate-bound calcium and a poor circulatory state seem to contribute to this decline in I-CA.

Conclusion(s): Patients with damaged hepatic function have a more severe, prolonged decline in I-CA from rapid blood transfusion than those with normal hepatic function. Exogenous calcium needs to be supplemented to prevent dangerous cardiovascular complications due to hypocalcaemia.

6AP5-2

Clinical use of freeze dried plasma (FDP) in deployed operations: Analysis of 72 episodes of transfusion (ET)

Patrick J., Cauet A., Deshayes A.-V., Demazeau N., Sailliol A., Ausset S.
Percy Military Hospital, Department of Anaesthesiology and Intensive Care, Clamart, France

Background and Goal of Study: Several studies on massive transfusions in combat casualties have shown that a large and an early use of plasma in this setting is associated with improved survival. To achieve this goal, the French Military Health Service issues since 1994 a Freeze-Dried Plasma (FDP) available in less than 3 minutes without thawing.Its many useful attributes include a 2-year shelf life at room temperature storage, universal blood group compatibility, and reduced risk of transfusion-transmitted disease (secured either by quarantine or pathogen inactivation).

Since 2000, clinical outcomes and adverse events have been monitored through a formal reporting system. Since 2010, biological monitoring parameters (test of hemostasis (TH) values before and after use) have been added to this reporting system.

The aim of our study is to report our experience at the Military Medical Treatment Facility of KAIA (Kabul, Afghanistan).

Materials and Methods: Between February and August 2010, 63 combat casualties received FDP at the ISAF Role3 of KAIA, during 72 episodes of transfusion (ET). On average, 3.3 FDP units were transfused per ET. Whenever possible, TH and blood counts (BC) were performed before and after transfusion of FDP.

Results and Discussion: Of the 63 patients studied, 5 died from non-survivable injuries and outcomes were unavailable for 16. The other 42 patients survived. During 44/72 ETs, 1 to 9 FDP units were transfused and TH and BC were performed. Before and after biological data were available for 24 ETs. Prothrombin time (PT) before FDP was 17 sec vs 15.6 after FDP ($p=0.0143$ - paired t-test). This moderate decrease in PT reflects continued bleeding and resuscitation as featured by an only 2 g/dl increase of hemoglobin level despite a transfusion of 5.9 blood cells unit on average (max-min=30-0). It nevertheless suggests improvement in hemostasis prior to surgical control of bleeding.

All FDP users reported ease of use, clinically observed efficacy equivalent to Fresh Frozen Plasma (FFP) and the absence of adverse effects associated with FDP.

Conclusion: These results taken together with pre-clinical laboratory analyses showing characteristics close to FFP, provide evidence of the effectiveness of FDP for damage control resuscitation in combat casualties.

The study of the efficacy and safety of FDP must be pursued in controlled settings, on a larger number of patients and using standardizing data collection.

6AP5-3

Peri-operative transfusion in non-traumatic, non-cardiac nonagenarians undergoing emergency surgery

Pelavski A.D., De Miguel M., Lacasta A., Rochera M.I., Roige J.
Vall d'Hebron University Hospital, Department of Anaesthesiology, Barcelona, Spain

Background and Goal of Study: Perioperative anemia and transfuson have been extensively studied in the extreme elderly undergoing hip surgery. However, little is known about these topics in other emergency procedures. As a result, we performed a prospective observational study, to elucidate the main determinants of transfusion in this population; and the outcomes in terms of 30-day postoperative mortality and hospital length of stay.

Materials and Methods: All non-traumatic nonagenarians who underwent surgery between July 2006 and September 2010 in our University Hospital were recruited and followed up over a month after discharge. A descriptive statistical analysis and a logistic regression to determine risk factors associated with transfusion were performed. Anemia was defined as a pre-surgical hemoglobin lower than 12 mg/dl.

Results and Discussion: 119 patients were recruited. 67% females, 64% ASA 3, median age 92 (range 90-100). The most frequent causes of surgery were acute limb arterial thrombosis, incarcerated hernia, and bowel occlusion. 50.4% of all cases were anemic at admission, 35.3% were transfused (mean trigger heamoglobin 8.1 mg/dl, SD 0.8), and the overall 30-day mortality rate was 33.6%.

The mean hospital length of stay was 10.1, SD 7.1 days. Risk factors associated with transfusion are shown in table 1.

	Regression Coeficient	Odds Ration	95% CI	P
Neoplasm	1.91	6.77	2.51-18.2	<0.0001
Exploratory laparotomy	2.39	10.99	8.86-34.82	0.008
Anemia	1.11	3.05	1.26-7-28	0.013

[Transfusion predictive factors]

In the bivariate analysis, an increased mortality was found in transfused patients ($p=0.017$), as well as an increased length of hospital stay ($p< 0.0001$). Furthermore, the number of red blood units was linearly correlated with the days of hospital stay (Pearson coef 0.48 $p< 0.001$). Finally, the complications associated with transfusion were: heart failure ($p=0.039$), stoke ($p=0.033$), urinary tract infection (0.039), wound infection ($p=0.06$), and sepsis ($p=0.41$).

Conclusion(s): The main risk factors for transfusion in this population were anemia, the presence of a neoplasm, and the need for a laparotomy. The important association between transfusion and negative outcomes, highlights the difficulty of the decision as to when to transfuse these patients. Furthermore, this results confirm that also within the nonagenarians, the risks of anemia should be balanced very carefully against the risks of transfusion.

6AP5-4

Delayed transfusion after orthopaedic surgery

Dubost C., Vincent C., Gozlan C., Ausset S., Lienhart A., Benhamou D.
Hôpital Bicêtre, Department of Anaesthesiology, Le Kremlin-Bicêtre, France

Background and Goal of Study: Acute anaemia is common after orthopaedic surgery and may worsen postoperative outcome, especially if severe or of long duration due to delayed transfusion[1]. To understand mechanisms of anaemia we analysed all the full blood counts (FBC) drawn from patients of one orthopaedic ward during the year 2005 in a major academic and trauma hospital.

Orthopaedic surgery was also chosen because FBC are frequently performed to monitor the risk of thrombocytopenia associated with low weight molecular heparin prophylaxis.

Materials and Methods: FBC were extracted from the Haematology Laboratory database and medical records of patients in whom postoperative haemoglobin (hb) concentration below 8 g/dl was recorded at least once were thoroughly assessed. Patients' baseline characteristics, timing of both anaemia (onset and correction) and transfusion (numbers of units) were analysed. Time intervals between transfusion threshold, the lowest hb level (nadir) and transfusion (if any) were calculated.

Results and Discussion: 15920 FBC drawn from 2389 patients were screened. The medical records of 108 patients with at least one hb value < 8 g/dl were analysed. Epidemiologic data are presented in Table 1.

Age (years)	59 (54-63)
ASA 3-4	29 (28%)
Sex ratio M/F	1.1
Emergency surgery	70 (68%)
- Hip/femur/knee surgery	35/12/12 (32/11/11%)
- spine surgery	11 (10%)
- other	38 (36%)

[Table 1]

The median of the post-operative hb nadir was 7.4 (95% confidence interval: 7.2-7.5) g/dL. The median value (95 % CI) of the calculated intervals were: surgery - nadir: 94 (72-115) hrs, nadir - transfusion: 14 (8-20) hrs and transfusion threshold - transfusion: 30 (21-39) hrs.

Conclusion: Delayed transfusion (defined as >12 hours between transfusion threshold has been reached and actual transfusion) was observed in 27% of anaemic patients after orthopaedic surgery. Identification of the moment at which transfusion threshold is attained is one critical point. In many patients from this unit, hb remains under the desirable level for a too long period of time.

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6AP5-5

Early transfusion with FFP or FFP plus fibrinogen concentrate in massive hemorrhage: A randomized intervention trial

Lancé M.D., Ninivaggi M., Hamulyak K., Pampus van E.C., Cate ten H., Heemskerk J.W.

Maastricht University Medical Centre, Department of Anaesthesiology and Pain Medicine, Maastricht, Netherlands

Background: Treatment of dilutional coagulopathy due to massive hemorrhage is a major challenge in trauma and surgery. Current therapy consists of replenishment of blood components, including fresh frozen plasma (FFP). Early replacement of FFP by fibrinogen might improve coagulant outcome, but controlled clinical trials supporting such protocols are lacking. Aim of the study was to demonstrate enhanced coagulation activities as a result of replacement of FFP by fibrinogen.

Methods: After written informed consent 43 patients undergoing major elective surgery were treated with fluids and packed red blood cells according to standard protocols. When requiring FFP, patients were randomized into two groups. Group A received 4 units (U) FFP; group B 2 U FFP plus 2 g fibrinogen concentrate. Blood samples were obtained before and after the intervention. Measurements included hematological parameters, factor levels, rotational thromboelastography and thrombin generation. Demographic data and clinical outcome were recorded. Researchers were blinded to the type of intervention.

Results: Group A (B) consisted of 21 (22) patients with mean age 65.7 (65.6); 13 (14) operations were cardiovascular, 7 (6) abdominal, and 1 (2) spinal column. Patients of group A (B) received 6.3 (6.0) U red cells, 5.5 (2.9) U FFP, 1.66 (1.5) U platelets and 2.4 (2.1) liter cell saver blood. In either group, 5 patients continued bleeding within 24 h after intervention. No therapy associated adverse events were noticed. Fibrinogen levels increased with 0.05 g/l in group A and with 0.48 g/l in group B. Levels of prothrombin and factor X raised with 14.8% (5.2%) and 14.5% (3.2%) in group A (B). Rotational thromboelastography in whole blood and plasma showed marked, significant improvement in fibrin clot formation in group B (ΔMCF 5.3-8.3), but not in group A (ΔMCF 3.3). Conversely, plasma thrombin generation significantly improved in group A (ΔETP 63.3) but not in group B (ΔETP 16.9).

Conclusions: Partial replacement of FFP by fibrinogen leads to significantly increased clot formation (thromboelastography) and fibrinogen levels, but at the expense of less improved thrombin generation and coagulation factor levels. There was no difference in clinical efficacy of the transfusion between two groups. We postulate that both fibrinogen and coagulation factors are relevant for early restoration of normal hemostasis.

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6AP5-6

Relationship between packed red blood cell storage time and arginase concentration

Sanchez Conde M.P., Palomero-Rodriguez M.A., Garcia Navas R., Mollinedo F, De Vicente J., Muriel Villoria C.

Hospital Universitario de Salamanca, Department of Anaesthesiology and Pain Medicine, Salamanca, Spain

Background and Goal of Study: Prolonged erythrocyte storage time is associated with increased rates of postoperative infection, tumor recurrence and a significantly increased risk of postoperative complications after cardiac surgery. Arginine stimulates lymphocyte function and is degraded by arginase, enzyme present in red blood cells which impairs lymphocyte function. Leakage of arginase from packed red blood cells (PRBC) may be involved in these processes.

Materials and Methods: 16 bags of PRBC stored for transfusion were sampled. Hemoglobin, ph, arginase and duration of storage were recorded. For arginase activity determination, samples were centrifugated (1200 rpm for 12 min at room temperature), and serum was collected and stored at -80ºC until its use. Arginase activity was determined as previously described by Corraliza IM et al [1] with slight modifications. One unit of enzyme activity is defined as the amount of enzyme that catalyzes the formation of 1 μmol of urea/min. Statistical analysis was performed by simple linear regression.

Results and Discussion: Mean duration of storage of PRBC was 18.5 ± 11 days. A relationship between duration of storage time and ph ($r=0.728$; $p< 0.05$) and between storage time and hemolysis ($r=0.65$; $p< 0.05$) were found, and between arginase and duration of storage ($p=0,061$).

Arginase activity was higher in PRBC with 15 or more days of storage compared with those with less than 15 days of storage ($p< 0,05$). These data indicate that arginase is active during PRBC storage and paralell increases with duration of storage.

Conclusion(s): Arginase is present in PRBC units and may cause arginine depletion.

We found a direct correlation between an increase in arginase activity and duration of storage. Depletion of arginine by PRBC arginase may be a potential mechanism for immunosuppression, being this effect more intense in PRBC with long time of storage.

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6AP5-7

Blood loss in total hip/knee replacement surgery

Menezes S., Manso T., Seifert I., Rodrigues R., Gil G.

Hospital Central do Funchal, Department of Anaesthesiology, Funchal, Portugal

Background and Goal of Study: The corrective surgery of osteoarthritis of the hip and knee increased substantially due to increased life expectancy. Total hip (THR) and knee-replacement (TKR) involves considerable blood loss, which increases the need of blood transfusion, sometimes associated with infectious risks and other complications.

This study aims to identify the factors associated with intraoperative and postoperative blood loss.

Materials and Methods: This was a retrospective study, which included all patients (n=137) submitted to THR or TKR in our hospital in 2009. Patients were divided into four groups according to surgical and anesthetic technique they have undergone: Group A:THR and general anesthesia; Group B:THR and regional anesthesia; Group C:TKR and general anesthesia; Grupo D: TKR and regional anesthesia. The postoperative levels of haemoglobin were measured on the first postoperative day and compared it with the preoperative values. Blood loss in the operating room, blood loss in the PACU during the first two hours following surgery and the need for autologous/allogeneic transfusion was also analyzed. Student's t-test and Chi Square test were used for analysis. A p value < 0.05 was considered as significant. (Mean±S.D.)

Results and Discussion: In the study period of one year underwent hip replacement 49,6% and knee replacement 50,4% of patients. The average age is 68 years with 66% of patients ≥ 65 years. The regional anesthesia was used in 81.7%, while general anesthesia was performed in 18.2%. In the analysis of individual variables (anesthetic technique and type of surgery); blood loss during surgery is about three times higher in THR (371±347ml) in relation to TKR (121±101ml). Postoperatively, blood loss in TKR (430±313ml) is about seven times higher than in THR (66±70ml). The use of general anesthesia implies a higher total blood loss (346±227ml) in relation to the use of regional anesthesia (225±54ml). The largest decrease in haemoglobin level occurred in group C. Thirty-nine patients underwent autologous transfusion and five had to perform allogeneic transfusion.

Conclusion(s): The results showed association between anesthetic technique and type of surgery and a higher blood loss in intraoperative and postoperative period. In terms of gender and age there was no statistically significant correlation with blood loss.

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6AP5-8

Fresh whole blood transfusion: The French army experience

Daban J.-L., Blot R.-M., Donat N., Clavier B., Ausset S., Sailliol A.
Percy Military Hospital, Department of Anaesthesiology and Intensive Care, Clamart, France

Background and Goal of Study: Hemorrhagic shock is the leading cause of avoidable mortality in modern conflicts [1]. Since the late 70s, the component therapy for transfusion is the gold standard. But, the specificities of military medicine have led to the maintenance of fresh whole blood (FWB) transfusion. During french military operations, FWB is the only source of platelets and the only way to restore in emergency the stocks of blood. The aim of our study was to evaluate the practice of FWB transfusion at the French military hospital in Kabul over the period 2006-2009.
Materials and Methods: During our study period, 19 FWB transfusions were performed and the data from 15 FWB transfusions could be analysed. For these transfusions, we studied the number of units by recipient, the characteristics of recipients, the results of blood tests for HIV, HBV, HCV, HTLV and malaria performed after transfusion at the French Blood Service, the incidents in donors and recipients, the period for obtaining an unit of FWB and mortality of recipients.
Results and Discussion: A total of 66 units of FWB were transfused in 15 patients. Each patient received an average of 4.4 +/-4.2 SD FWB units. Two recipients were children (13%). FWB indications were combat-related injuries for 87% (n=13) with 9 due to Improvised Explosive Device and 4 due to ballistic trauma; hemorrhagic surgery for one case and thrombocytopenia secondary to leukemia for one case.
All units were tested before transfusion for HIV with rapid diagnostic tests. Every blood samples of donors were negative for pathogens screened at the French Blood Service. No incident in donors and in recipients was reported. The average time between collection and transfusion was 140 +/-197 minutes (median 43 minutes). Mortality in recipients was 27% (n = 4).
Conclusion(s): In our study, the FWB transfusion is not associated with incidents for recipients or donors. The safety of FWB is acceptable but lower than banked blood because every tests could not be performed before transfusion. For this reason, FWB should be used only for exceptional situations like military conflicts where the potential risks are lower than the absence of transfusion.
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6AP5-9

Uncontrolled non-heart-beating donor liver graft recipients show significant higher blood product use and shorter survival

Gutiérrez García I., García Gutiérrez A., Elices R., Perez-Cerdá F.
Hospital 12 Octubre, Department of Anaesthesiology, Madrid, Spain

Background and Goal of Study: Orthotopic Liver Transplantation (OLT) remains as a high risk massive transfusion scenario. Non-heart-beating donors (NHBDs) are used in order to increase the liver pool and to decrease the waiting list mortality. RBC and plasma transfusion were associated with significant decrease in the one year survival rate and poor outcome. Differences in blood product use respect brain-death-donor (BDD) liver transplant have not been reported .
The purpose of this study was to reevaluate the blood component therapy transfusion in the NHBD.
Materials and Methods: We retrospectively reviewed the 196 patient charts for all primary OLTs for a 33 moths period from January 2008 through September 2010. Strict selection criteria were applied;biliar cirrhosis, pediatric recipients, partial liver grafts, retransplantation, fulminant liver failure and combined transplants were excluded. We compared 100 BD transplants and 34 NHB donation transplants. Intraoperative transfusion of blood products, antifibrinolitic drugs, aFVIIr requirements. Primary graft failure and survival were analyzed. Non parametric test were used with SPSS 17.0.
Results and Discussion: 134 patients undergoing a first OLT formed the basis of the current study, 34 from NHBD and 100 from BDD. No significant differences were found according to age, weight, aetiology of the end stage liver disease, MELD score, ischemia times or preoperative coagulation tests between both groups . Patients undergoing NHB donation received significantly further RBC packages, fresh frozen plasma(FFP) and platelets packages compared with the BDD transplant patients.
Conclusion(s): In the one hand, we detected that liver transplantation recipients from NHBD has been associated with a heaviest blood loss and more important transfusion demands during the surgery. Specially in the case of packed red blood cells and for FFP, platelets and also fibrinogen . This is probably caused by an enhance incidence of coagulopathy in the NHB donor group. On the other hand , the survival period after the liver transplant seems to be shorter in the patients who received grafts for OLT from the NHBD group.
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6AP5-10

Nonsteroidal antiinflamatory drugs and perioperativ blood loos in major hip surgery

Gvozdenovic L., Pajtic V., Mancic N., Ivanov D., Milic S., Gvozdenovic N.
Clinical Centre of Vojvodina, Department of Anaesthesiology and Intensive Care, Novi Sad, Serbia

Background and Goal of Study: The goal of this investigation was to determine whether prior exposure of diclofenac as non-steroidal anti-inflammatory drug increases perioperative blood loss associated with major orthopaedic surgery in general and regional anaesthesia.
Materials and Methods: Randomized controlled study was performed in Orthopaedic Clinic, Clinical Centre of Vojvodina in Novi Sad, Serbia, during 2009. Investigation included 120 patients who were to undergo elective total hip replacement for coxarthrosis during spinal and general anaesthesia.
Group 1 and 2 which were pretreated with diclofenac and operated in general and regional anaesthaesia.
Group 3 and 4 weren't pretreated with any analgesic drugs and operated in general and regional anaesthaesia. Two groups of patients (who were operated in general and regional anaesthesia) were pretreated before surgery with diclofenac intravenos injection, on a day before and on a day of surgery three times a day. We used 75 mg of diklofenak-sodium (Diklofen^R injection solution 75 mg/3ml Galenika AD, Belgrade).
Results and Discussion: The overall blood loss, i.e. the perioperative blood loss plus the blood loss in the first 24 h after surgery, showed an increase of 34,8% in the diclofenac group operated in general anaethesia and increase of 32,9% in patients operated in regional anaesthesia ($P < 0.05$). In general anaesthesia compared to regional anaesthesia, the overall blood loss in the first 24 h after surgery, showed an increase of 5,2% in the diclofenac group and increase of 3,6% placebo group. This was not statistically different.
Conclusion(s): Pretreatment with diclofenac before elective total hip surgery increases the perioperative blood loss significantly. Early discontinuation of non-selective non-steroidal anti-inflammatory drugs is advised.

6AP6-1

Thromboelastographic-based decision making in cardiac surgery

Ziser A., Leiba R., Bolotin G., Dann E.
Rambam Health Care Campus, Department of Anaesthesiology and Intensive Care, Haifa, Israel

Background and Goal of Study: Coagulopathy is thought to be common after CPB. Activated coagulation time(ACT) is commonly used to evaluate heparin reversal after protamine administration. We studied the impact of using thromelastography (TEG) on post-CPB heparin reversal and blood product administration.
Materials and Methods: We explored our prospective TEG database to evaluate the therapeutic decisions that were made in the end of CPB, based on the TEG results. After heparin reversal by a standard protamine dose, and the return of ACT to its baseline value, we performed a TEG study. A plain and a heparinase cup were used for each test.
Results and Discussion: 137 patients were studied. 61(44.5%) had combined surgery, 45(32.8) had CABG and 26(19) had valve surgery. 19(13.9) were re-do operation. The logistic Euroscore was 13.65±15.8 (Median 7.46). Mean±SD age was 64.6±10.8 years, CPB & AOXC times were 142.5±44.9 and 103.5±40.3 minutes respectively. Baseline and post-protamine ACT were 138.8± 15.8 and 125.9±16.4 seconds respectively. TEG provided additional information and affected the clinical decision in 53 (38.7%) of the patients. In 31 of 53 (58.5%) patients additional protamine was administered while the post-protamine ACT was normal. in 12 (22.6%) patients the TEG guided blood product transfusion and in 10 patients other decisions were taken.
Conclusion(s): TEG provides useful information regarding post-CPB coagulation management. By a point-of-care use of this device, heparin reversal and blood product management can be evaluated effectively and timely.
More studies should be done in order to explore the impact of TEG on post CPB blood loss and blood product use.

6AP6-2

Effects of desflurane and sevoflurane on thromboelastogram in patients undergoing laparoscopic cholecystectomy

Yuceaktas A., Topal A., Celik J.B., Erol A., Otelcioglu S.
Selcuk University, Department of Anaesthesiology and Intensive Care, Konya, Turkey

Background and Goal of Study: There is limited information on the thromboelastogram (TEG) effects of sevoflurane and desflurane (1). We aimed to compare the effects of sevoflurane and desflurane on homeostasis using TEG.
Materials and Methods: After institutional approval and informed consent, 60 adult patients undergoing laparoscopic cholecystectomy were randomized. After i.v. induction anesthesia was maintained with sevoflurane (Group S) or desflurane (Group D). Venous blood samples, obtained preoperatively, at the 30th min of induction and at the 24th hour were analyzed with TEG. Student t-test, Mann-Whitney U test, One-way ANOVA or paired t-test was used as appropriate. $p < 0.05$ was considered as significant.
Results and Discussion: Demographical properties, Hb, Hct, PT, aPTT, platelet count, arterial pressures and heart rates were similar between the two groups. Reaction time (R) was longer in group D than group S at the 30th min ($p=0.033$). Coagulation time (K) value was shorter in group S than group D at the 30th min ($p=0.021$). Alfa angle and maximum amplitude (MA) values were statically lower in group D than group S at the 30th min and 24th hour ($p < 0.001$). In group D, R value was statistically higher at the 30th min compared to preoperative values ($p=0.022$). K value was statistically lower at the 30th min compared to preoperative values, in group S ($p < 0.001$). α-angle and MA were statistically lower at the 30th min and 24th hour compared to preoperative values in group D ($p < 0.001$).
Conclusions: Sevoflurane shortens coagulation time during anesthesia. Desflurane causes changes in TEG values suggesting a delay in coagulation extending to 24 hours postoperatively.
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6AP6-3

Thromboelastometry derived transfusion triggers for platelet concentrate in orthotopic liver transplantation

Minou A.F, Dzyadzko A.M.
Republican Centre of Organ and Tissue Transplantation, Department of Anaesthesiology and Intensive Care, Minsk, Belarus

Background and Goal of Study: Patients with end-stage liver disease have complex hemostatic disorders due to diminished clotting factors concentration, fibrinogen and platelet deficiency. Several algorithms based on rotational thromboelastometry (ROTEM) have been proposed to guide transfusion therapy in liver transplantation. However, hypofibrinogenemia and platelet deficiency have common patterns of changes of ROTEM parameters: clot formation time (CFT) prolongation and decreased clot firmness amplitude after 10 min (A10). The aim of the present study was to determine reliable transfusion triggers for platelet concentrate in case of concurrent fibrinogen deficiency.
Materials and Methods: 64 patients undergoing liver transplantation were enrolled in this prospective observational study. Standard coagulation tests, platelet count, thromboelastometry were performed at 5 specific time points: the beginning of the surgery, the end of the dissection phase, 15 minutes into the anhepatic phase, 15 minutes into the reperfusion phase, 1 hour after donor graft reperfusion, at the end of the surgery. ROTEM tests with signs of hyperfibrinolysis or heparin presence were excluded. Spearman Rank correlation and ROC curve were used to analyse the data.
Results and Discussion: A good agreement was found between platelet count (PLC) and ROTEM parameters - CFT in tests ExTEM and InTEM, A10 in ExTEM, whereas there was only moderate agreement between fibrinogen level and the same ROTEM parameters.

	CFT-ExTEM	CFT-InTEM	A10-ExTEM
PLC	-0,758*	-0,794*	0,750*
Fibrinogen	-0,403*	-0,382*	0.462*

*p<0.0001

[Correlation between fibrinogen, PLC and ROTEM]

In the ROC curve analysis PLC was used as variable thus the sensitivity would display the probability that PLC is less then threshold when the ROTEM-derived signs of platelet deficiency were present. PLC $50*10^3$ /μL was chosen as the threshold.

	AUC	CI	Sensitivity*, %	Specificity*, %	P
A10-ExTEM<36, A10-FibTEM>8	0,789	0,735-0,837	42,86	85,54	0,0001
CFT-InTEM>300 or CFT-ExTEM>300	0,885	0,840-0,920	60,98	88,16	0,0001
CFT-InTEM>300 and CFT-ExTEM>300 and A10-FibTEM>8	0,906	0,864-0,938	100,00	82,56	0,0001
CFT-InTEM>300 and CFT-ExTEM>300 and A10-FibTEM<9	0,914	0,874-0,945	95,24	88,31	0,0001

* Sensitivity and specificity are shown for platelet count less then 50.000 /μL

[The data of the ROC curve analysis]

Conclusion(s): Our findings suggest that simultaneous prolongation of CFT greater than 300 sec in both tests (InTEM and ExTEM) could serve as reliable transfusion trigger for platelet concentrate regardless of concurrent presence of fibrinogen deficiency.

6AP6-4

Randomized controled trial to evaluate postoperative coagulation management with bed-side trombelastometry (Rotem) compared with a transfusion protocol based on laboratory meausurments in bleeding patients after cardiac surgery: Preliminary data

Paniagua P, Koller T., Requena T., Gil J.M., Campos J.M., Galan J.
Hospital de la Sta Creu i St Pau, Department of Anaesthesiology, Barcelona, Spain

Background and Goal of Study: Rotem® has demonstrated to be effective in reduction of blood products consumption specially in studies which compare before and after implementation of this bed-side monitoring. Our objective is to demonstrate this reduction in a randomized control trial.This preliminary data shows diagnoses based on Rotem or on laboratory data and their impact on blood products consumption.
Materials and Methods: We include all patients (pts) scheduled to cardiac surgery with extracoporeal circulation who have major postoperative bleeding($\geq$ 300ml in the first postoperative hour). We randomize these pts to be diagnosed and treated based on Rotem (RG) or based on laboratoy measurements management (CG). Hypofibrinogenemia(hF) in RG was diagnosed if MCF in EXTEM< 50 and in FIBTEM< 9 and in CG if Fibrinogen (Clauss method)< 1gr/L and Trombocitopenia (TP) was diagnosed in RG if MCF in EXTEM< 50 and in FIBTEM$\geq$9 and in CG if platelet count< $80x10^9$/L .All RG pts have the same laboratory data than CG ,not to guide treatment but to be used in the analysis.All meausurements were done at the time of the inclusion and 10 min after each treatment until stop bleeding(< 150m/h).
Results and Discussion: 22 pts were analyzed. Diagnoses in RG (n=13) were: hF in 8 , Heparin rebound (HR) in 7, Clotting factor deficiency (CFD) in 3, TP in 1pts, in CG (n=9) or based on laboratory values in RG (n=13) were: TP in 12;HR in 10;CFD in 7; hF in 1 pts. 6/13 pts in RG and 5/9 in CG had more than one coagulopathy. We first apply non blood product treatment if it is indicated, by that 4/8 pts in RG with hF stopped bleeding without plasma transfusion(currently in our center we lack fibrinogen concentrate).The mean time spend to stop bleeding was 3 in RG and 7h CG ($p < 0,04$). The total amount of blood products used by each group was Packed red blood cells (RBC) 38/45(mean 3,8/6,4),Fresh frozen plasma (FFP) 31/24(3,1/3,4) and Platelet concentrate (PltC) 5/11(0,5/1,57 $p < 0,05$) in RG/CG.
Conclusion(s): Our objective is to include 100pts in order to achive statistical significance, but in this preliminary analysis we have already seen a clear tendency towards reduction in need of RBC and FFP transfusion.The reduction of platelet transfusion and total bleeding time reacheed statistical significant levels. In RG the most frequently diagnoses was hF whereas in the CG it was TP. The second most frequent diagnose was heparin rebound in both groups.

6AP6-5

Comparison of thromboelastography and thromboelastometry to coagulation factors levels and the extent of bleeding during liver surgery

Van Aelbrouck C., Lelubre C., Pradier O., Melot C., Barvais L., Ickx B.
Universite Libre Bruxelles, Department of Anaesthesiology, Bruxelles, Belgium

Background and Goal of Study: Haemorrhage may be important during liver surgery, particularly during liver transplantation. Current coagulation lab tests

do not reliably predict the risk for bleeding (1). The application of viscoelastic tests such as thromboelastography (TEG®) and rotation thromboelastometry (ROTEM®) has not yet reached standardization (2).
To clarify the usefulness of these devices, we performed a study to correlate the values observed with TEG/ROTEM and the concentration of the coagulation factors, the conventional lab tests, and blood loss during liver surgery.
Materials and Methods: In this prospective observational study, we collected 95 samples from 8 patients admitted for liver transplantation and 6 patients for hepatectomy. Conventional lab tests, TEG® (with kaolin) and ROTEM® (exTEM and inTEM) tests were performed at different times during the procedures. Blood loss was recorded.
The Shapiro-Wilk test to test normality of continuous variables and the Spearman's correlation coefficient R were used. Power (for bleeding) and linear regressions (for TEG® and ROTEM®) were calculated. ROC curve analyses were drawn to determine the discrimant values. $p < 0,05$ was considered significant.
Results and Discussion: During liver transplantation, based on 69 samples, bleeding correlated best with factors VIII ($R^2 = 0,25$) and IX ($R^2 = 0,22$) levels, and was also correlated with APTT ($R^2 = 0,36$) but less with the alpha angle of ROTEM® ($R^2_{exTEM} = 0,23$), probably because the latter was not very sensitive to factors VIII ($R^2 = 0,42$) and IX ($R^2 = 0,23$) levels. During hepatectomy, based on 26 samples, the amount of bleeding, the alpha angle and the maximal amplitude of ROTEM® were well correlated with the predictors of bleeding expected in this clinical setting: fibrinogen levels ($R^2 = 0,38$; $R^2_{exTEM} = 0,64$; 0,71), platelets count ($R^2 = 0,32$; $R^2_{exTEM} = 0,54$; 0,52) and haemoglobin level ($R^2 = 0,34$; $R^2_{exTEM} = 0,40$; 0,41).
ROC analysis showed that factor VIII and factor IX levels with a threshold of 70% and 27%, predicted bleeding with a sensitivity of 95,5% and 72,7% and a specificity of 78,6% and 78%, respectively.
Conclusion(s): Factor IX and particularly factor VIII levels predicted significantly the risk of bleeding. TEG® and ROTEM® predicted thrombocytopenia and hypofibrinogenemia, but not the deficit of coagulation factors, the best predictors of bleeding.
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6AP6-6

Recommended thresholds for fibrinogen substitution (FS) in rotational thrombelastometry (ROTEM) subtest FIBTEM and conventional Clauss method (CM) do not correspond

Requena T., Koller T., Paniagua P., Gil J.M., Fernandez J.A., Moral V.
Hospital Santa Creu i Sant Pau, Department of Anaesthesiology, Barcelona, Spain

Background and Goal of Study: In bleeding patients with hypofibrinogenemia it is crucial to correct plasma fibrinogen concentration to improve patient's coagulation. The prevailing cut off values for indicating FS recommended by many authors are ≤ 1,0 g/l (1) plasma fibrinogen concentration measured by CM or a maximum clot firmness (MCF) of ≤ 9mm (2) in the Fibtem if MCF in EXTEM is reduced. We studied the comparability of these two cut-off values for indicating FS.
Materials and Methods: Plasma samples (CM) and whole blood samples (Fibtem) were collected from adult patients undergoing cardiac surgery with extracorporeal bypass when presenting an active bleeding in the ICU (blood drainage of > 300 ml in 1. hour, > 250 ml in 2. hour, > 150ml in any consecutive hour after surgery). CM was executed by the hospital`s laboratory department, Rotem in our ICU by the anesthesiologist on duty. Statistical analysis were performed using a statistical software program (SPSS 18).
Results and Discussion: A total of 26 samples were investigated. There was fair correlation between the two compared analytic methods (correlation factor r=0,8). However the frequently recommended threshold for fibrinogen substitution of 9mm in Fibtem (at simultenously reduced MCF in Extem) does not correspond to the recommended threshold of ≤ 1,0 g/l fibrinogen plasma concentration measured by CM. Performing linear regression analysis a threshold value of 9mm in Fibtem would be equal to 2,5 g/l In the CM. Thus, in patients treated by ROTEM algorithms, FS is already initiated at the lower normal range for plasma fibrinogen concentration (2,5 g/l) instead of ≤1,0 g/l. Consense has to be found by further investigation which cut off value for fibrinogen is really predictive for postoperative bleeding complications and justifies fibrinogen substitution.
Conclusion(s): At comparing two widely used fibrinogen analyzing methods - the CM and the newer Rotem subtest Fibtem - we observe that FS criteria of Fibtem < 9mm corresponds to the inferior limit of normal fibrinogen levels measured by CM (2,5 g/l) while the normally recommended threshold for FS by CM is ≤ 1,0 g/L.

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6AP6-7

Non-heart-beating donor liver graft recipients show significant increased hyperfibrinolysis incidence after reperfusion assessed with ROTEM®

Garcia Gutierrez A., Valencia O., Jiménez R., Torcal F., Sanz R., Pérez-Cerdá F.
Hospital 12 Octubre, Department of Anaesthesiology and Intensive Care, Madrid, Spain

Background and Goal of Study: Non-heart-beating donors (NHBD) are used as source of grafts for orthotopic liver transplantation (OLT). Post-reperfusion significant hyperfibrinolysis occurs in 40 % OLTs [1]. Thromboelastometry (ROTEM®) is used to guide the transfusion therapy in liver transplantation. We undertook this study to investigate the post-reperfusion haemostatic profile of NHBD liver graft recipients.
Materials and Methods: With this prospective observational study, 51 patients undergoing liver transplantation with hepatocelular or criptogenetic cirrhosis were enlisted. Pediatric recipients, partial liver grafts, retransplantation, acute liver failure and combined transplants were excluded. Intraoperative transfusion of blood products, tranexamic acid, and fibrinogen concentrates requirements were obtained. ROTEM tests EXTEM, INTEM, and FIBTEM, were performed at dissection, an-hepatic and post-reperfusion stages. Categorical variables were compared using the Chi-square, continuous variables with the Mann-Whitney U-test.
Results and Discussion: 17 patients were discarded. 34 patients were eventually included in the analysis, 14 received a NHBD graft and 20 brain death donor (BDD) graft.
Both groups were equivalent respect to age, etiology, MELD and other preoperative variables. Patients undergoing NHBD OLT received significantly further red blood cells (RBC), fresh frozen plasma (FFP) packages , fibrinogen and tranexamic acid compared with the BDD transplant recipients; [RBC: 18.5(12.25-33.25) vs. 9(3.5-17); p=.007]; [FFP: 27.5(13-37.5) vs. 13.5(7.7-17.9); p=.004] [Fibrinogen: 6.5(2.75-10) vs. 1(0-3.75); p= .001] [Antifibrinolytics: 92,9% vs 30,0%; p=.000].
Post-reperfusion Coagulation Time (CT) in EXTEM was significantly higher [91 seconds (72.7-208) vs 67.5 (57-84.5); p=.025]. Post-reperfusion hyperfibrinolysis incidence was 42% in NHBD group vs 10% in BDD; p=0.04]. Moreover, hyperfibrinolisis was associated with a higher RBC (p=.015) and FFP (p=.007) packages requirements.
Conclusion: Hyperfibrinolisis and coagulation factors deficiency might play an important role in the oirgin of the observed differences in blood products requirements in patients undergoing NHBD transplantation.
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6AP6-8

Minimal effects of fresh frozen plasma administration on clot firmness as measured by rotation thromboelastometry

Meesters M.I., Romijn J.W.A., Vonk A.B.A., Boer C.
VU University Medical Center, Department of Anaesthesiology, Amsterdam, Netherlands

Introduction: Cardiac surgery-associated consumption of coagulation factors may lead to perioperative hemostatic disorders that require transfusion of fresh frozen plasma (FFP). It is thought that FFP decreases the clotting time (CT) and increases the firmness of the clot (MCF) by increasing the concentration of coagulation factors. Replacement of coagulation factors with FFP might however not result in improvement of hemostasis due to the dilutional effect of FFP. Here we investigated the effects of FFP on CT and MCF using rotation thromboelastometry and further evaluated whether the effects of FFP are enhanced when combined with platelet administration.
Methods: This study included 55 patients undergoing elective cardiac surgery. Patients received two units (600 ml) of FFP with (FFP+PLT) or without (FFP-) one unit of platelet concentrate. Blood samples were drawn before and after FFP+/-PLT administration. Hemostatic parameters were obtained using rotation thromboelastometry (ROTEM®) and included the CT and MCF of the INTEM (intrinsic coagulation), EXTEM (extrinsic coagulation) and FIBTEM (fibrin part of clot formation). Data are represented as mean ± SD.

Results and Conclusion: The reduction in INTEM CT (14±11 s vs. 21±18 s) and EXTEM CT (45±78 s vs. 47±89 s) was similar in FFP- and FFP+PLT groups. The EXTEM CT remained prolonged for both treatments when compared to ROTEM reference values. The increase in INTEM MCF was higher in FFP+PLT (from 49±8 to 55±6 mm) than in FFP only (from 49±6 to 52±6 mm; P< 0.05). The EXTEM MCF did not improve after FFP- administration (53±6 to 54±5 mm), while FFP combined with platelets slightly increased the MCF from 53±7 to 58±6 mm (P< 0.05 vs. baseline). There was no difference in the increase in the FIBTEM MCF by FFP- or FFP+PLT (1.0±1.8 vs. 1.9±2.7 mm).
Discussion: Solely FFP administration decreased the clotting time, whereas clot firmness only slightly improved. The improvement in MCF was more pronounced when FFP was combined with platelet concentrate. In general, the effects of FFP with or without platelet administration on ROTEM values were relatively small, which might be explained by the dilutional effect of FFP. These findings warrant further studies to optimize treatment strategies for coagulation factor deficiencies during cardiac surgery.

6AP6-9

Thromboelastography as preoperative coagulation screening tool in management of neurosurgical patients on low-dose aspirin therapy

Israelyan L., Lubnin A., Zeitlin A.
Burdenko Neurosurgery Institute, Department of Anaesthesiology, Moscow, Russian Federation

Background and Goal of Study: Aspirin therapy has been identified as an important risk factor in the development of postoperative haematoma following intracranial surgery. There is not generally adopted policy regarding management of neurosurgical patients on low- dose aspirin therapy. Preoperative diagnostic testing for the presence of aspirin-induced coagulopathy may be difficult. The goal of this study was to assess thromboelastography (TEG) as screening tool of coagulation disorders in neurosurgical patients on low- dose aspirin therapy (range: 50-130 mg/ day).
Materials and Methods: TEG (TEG®5000, Haemoscope, USA) was performed in 176 neurosurgical patients (sex: 86 m/90 f, age: 54,6±15,7 yr, weight: 83±17,9 kg) on aspirin therapy (97,9±11,5 mg/day, therapy duration > 3 month). Native whole blood samples were used. Aspirin therapy was interrupted. Main TEG parameters (r, k, α, MA, LY30, CI) and hemorrhagic complications were analyzed. Data are expressed as mean± standard deviation.
Results and Discussion: TEG parameters within normal ranges (-3 < CI< +3) were obtained in 132 of 176 patients (75%). In this group of patients operations were not delayed. TEG signs of coagulopathy (CI< -3) were observed in 39 of 176 patients (22%). In this group of patients operations were delayed until normal TEG profile was achieved. TEG hypercoagulation (CI>+3) was revealed in 5 of 176 patients (3%). Bridge-therapy with LMWH was performed in this group of patients. None of the patients in the present study had been developed hemorrhagic complications.

TEG parameters/ TEG groups	r	A	k	MA	LY30	CI
Normal	16±5	32±10	7±3	54±12	0,3±1,6	-0,6±1,5
Coagulopathy	26±5	17±5	14±5	40±12	0±0,1	-4,7±1,8
Hypercoagulation	6±3	61±11	3±1	73±6	0,1±0,4	4,2±0,8

[TEG parameters in patients]

Conclusion(s): There was revealed normal coagulation status according with TEG results in the vast majority of neurosurgical patients on low-dose aspirin therapy, and delay of surgery was not necessary in this group of patients. TEG-guided algorithm is practical tool without deterioration of outcomes in neurosurgical patients on low-dose aspirin therapy.

Neurosciences

7AP1-1

Hysteresis of EEG during propofol induced loss of consciousness

Kreuzer M., Kochs E.F., Schneider G., Jordan D.
Technische Universität München, Department of Anaesthesiology, München, Germany

Background and Goal of Study: Propofol concentrations are higher at loss of consciousness LOC than at return ROC[1]. This suggests drug hysteresis between LOC and ROC. Permutation entropy PeEn can indicate the hypnotic component of anaesthesia. Specific EEG frequencies may be used for different processing tasks, i.e β-oscillations (12-24Hz) seem to process information corticocortically while θ (4-8Hz) and α (8-12Hz) can be associated to the corticothalamocortical (CTC) loop. In order to reveal information about possible underlying mechanisms for LOC and ROC, PeEn of the frequency bands was calculated in the transition phases of LOC and ROC. Working hypothesis of this work is that there is hysteresis in propofol induced changes of cortical activity that can be detected with PeEn, i.e. PeEn values at LOC and ROC are not identical.
Materials and Methods: EEG of 38 LOC and 33 ROC transitions with propofol obtained during two studies was evaluated with PeEn (d=5) in 4s steps starting 300s before until 300s after the event. Artefacts were visually identified and removed from analysis. PeEn was calculated for the δ(0.5-4Hz), θ, α, β and γ(24-47Hz) band. Therefore EEG was filtered with 3rd order Butterworth bandpass. Effect site concentration was assessed with a Schnider model[2]. The time interval between event and the time point were PeEn after LOC was equal to PeEn after ROC, i.e. where cortical activity was in the same state, was defined as time delay.
Results and Discussion: PeEn(δ) and PeEn(θ) showed same values 96-100s after the events. PeEn(α) was identical 40-44s after LOC/ROC. PeEn(β) values were already identical 4-0s before the events took part and PeEn (γ) was even faster with 12-8s before the event. Averaged C_{eff} was higher at LOC (3.73±1.51μg/ml) than at ROC (1.25±0.44μg/ml). PeEn(β) and PeEn(γ) showed same values, i.e. represented the same activity, before the events in contrast to slower frequency bands. Observation of PeEn courses reveals an almost "switch-like" change of PeEn(γ) and PeEn(β) at the events and can be associated with a change between consciousness and unconsciousness. At slower frequencies the course is more continuous.
Conclusion: These findings lead to the conclusion that intra- and corticocortical anaesthetic effects are triggered faster and more abrupt by propofol than CTC and corticohippocampal effects that are represented by slower oscillations.
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7AP1-2

Learning and memory effects of propofol and midazolam as sedative agents on mice

Isguzar A., Kayhan Z., Araz C., Erdem R., Keskin U.
Baskent University, Faculty of Medicine, Department of Anaesthesiology, Ankara, Turkey

Effects of sedative and anesthetic agents on organs and systems are known. In this study the effects of widely used sedative agents, propofol and midazolam on learning and memory were studied in mice.
This prospective and controlled study was carried out according to the Başkent University Ethics Committee regulations. Fifteen months old, male, adult, 30 Swiss-albino mice weighing between 35.7-53.4 gr were included in this study. The objects were randomly and equally divided into three as control (n=10), midazolam (n=10) and propofol (n=10) groups. Experiments on learning and memory started 72 hours after the intraperitoneal injections. Mice were expected to find the platform hidden in Morris Water Maze during consecutive 5 days for evaluating the learning process, and on the 19th day for evaluating memory. Time to find the platform (latency), total distance covered to reach the platform, and swimming speed were recorded for each mice on each experiment day, and then evaluated statistically.
Propofol and midazolam were found to lengthen the latency on the first three days when compared to the control group. In additon, midazolam was found to impair memory, when compared to propofol and control groups (p< 0,01). Swimming speed and distance covered as indicators of the motor activity decreased gradually from the beginning, however there was no statistically significant difference between the groups with this respect (p>0,05).
In Morris Water Maze (MWM), thought to be an appropriate tool for evaluating learning and memory in mice, time to find the hidden platform, swimming

speed and total distance were evaluated. The use of midazolam and propofol prolonged the latency on first three days. Midazolam was also found to negatively affect the memory. In the light of these findings, it can be concluded that midazolam and propofol affected learning slightly while midazolam affecting memory significantly.

7AP1-3

Differentiated effects of propofol at sedative and hypnotic concentrations are detected by source localisation of middle latency auditory evoked potentials

Jordan D., Paprotny S., Ilg R., Kochs E.F., Schneider G., Research Group on Brain Mechanisms of Consciousness and Anaesthesia
Technische Universität München, Department of Anaesthesiology, Munich, Germany

Background and Goal of Study: Auditory evoked potentials (AEP) reflect the electrophysiological brain response to an auditory stimulus and can be extracted from the electroencephalogram (EEG) by trigger synchronised averaging. Middle latency AEP indicate anaesthesia-induced loss of consciousness [1], which may be related to dynamic changes in the auditory pathway. In this study Low Resolution Brain Electro-magnetic Tomography (LORETA) source localisation [2] was used to identify auditory evoked activity of particular brain areas during consciousness and propofol-induced sedation and unconsciousness.
Materials and Methods: Approved by the ethics committee, 15 volunteers were enrolled into the study. 64-channel EEG (average reference) and AEP (binaural rarefaction clicks 70dB above hearing threshold, 8.33Hz +/-10%) were recorded. After 15 minutes baseline (BL), propofol was administered with a target controlled infusion (TCI) pump, and concentration was increased until loss of consciousness (LOC) occurred. At LOC, TCI level was maintained for 15 minutes and subsequently a phase of sedation (0.5LOC) was maintained during 15 minutes at 50% of LOC concentration. At BL, LOC and 0.5LOC AEP (26-400Hz bandwidth, 40-60ms post-stimulus) were analysed using LORETA power in frontal and auditory cortices and in limbic system. LORETA is based on the potentials at scalp locations providing an optimum fit inverse problem estimate for current cortical sources at the trade-off between quality of fit and smoothness [2]. Propofol-induced changes in the analysed areas were indicated by a Wilcoxon test (*: $p < 0.05$).
Results and Discussion: LORETA power significantly decreases from BL to 0.5LOC / LOC in frontal cortex and limbic system and from BL to LOC in auditory cortex.
Conclusions: Changes in cortical and subcortical AEP power indicate that propofol affects regions within the auditory pathway at different concentration levels: During sedation activity of the auditory cortex is maintained, whereas activity of frontal and limbic response significantly declines. These regions are related to formation and distribution of short term memory. During propofol-induced unconsciousness, a breakdown of thalamo-cortical connectivity [3,4] may suppress auditory processing in cortical pathways including auditory cortex.
References:
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[3] Science 2008; 322(5903): 876-80
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7AP1-4

Symbolic transfer entropy indicates changes of cortical flow of information between consciousness and propofol-induced unconsciousness

Jordan D., Paprotny S., Kochs E.F., Schneider G., Research Group on Brain Mechanisms of Consciousness and Anaesthesia
Technische Universität München, Department of Anaesthesiology, Munich, Germany

Background and Goal of Study: Analysis of interactions from biosignals is crucial to improve understanding of dynamical interdependences which underlay various physiological conditions. Symbolic transfer entropy (STEn) was introduced as a robust ordinal measure to quantify information transfer in multidimensional dynamical systems [1]. Based on high resolution 64-channel electroencephalogram (EEG) the present investigation evaluates effects of propofol-induced unconsciousness on cortico-cortical interaction indicated by STEn.
Materials and Methods: Approved by the ethics committee, 15 volunteers were enrolled into the study. After a resting period, volunteers were instructed to relax and close eyes while 64-channel EEG (average reference) baseline (BL) recordings were performed 15 minutes. Subsequently propofol was infused until loss of consciousness (LOC) using a target controlled infusion pump. At this level, concentration was maintained 15 minutes and EEG measured. EEG was analysed using STEn which quantify the mutual information flow between two signals. Thereby information is coded by amplitude order sequences, where the degree of prediction of actual information from past signal content is reflected by a generalised Markov property. STEn was calculated at BL / LOC and over all channel pair combinations using artefact free EEG of 10s length and 0.5-30Hz bandwidth. 95% bootstrap confidence intervals of prediction probability were used to identify effects of propofol.
Results and Discussion: During BL condition, STEn indicates information transfer mainly between frontal-anterior-parietal and parietal-temporal-occipital electrode combinations which may be related to cortico-cortical network integration. LOC is associated with a significant decline of fronto-parietal transfer and transfer within occipital regions, where within frontal communication remains.
Conclusions: EEG symbolic transfer entropy indicates effects of propofol which may be related to changes in cortical dynamics. In particular, the presented concept allows analysis of short time scales and could reveal communication pathways within the cortex. Results are consistent with brain imaging studies indicating a decline of functional connectivity from consciousness to propofol-induced unconsciousness [2,3]. Mainly long-range flow of information seems to be affected by propofol.
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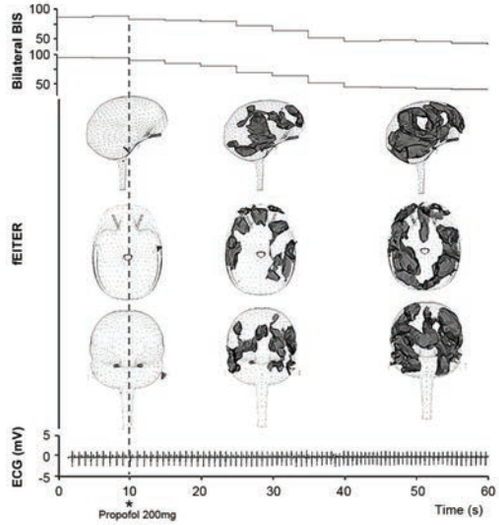
7AP1-6

Functional electrical impedance tomography by evoked response (fEITER): Sub-second changes in brain function during induction of anaesthesia with propofol

Pollard B.J., Pomfrett C.J., Bryan A., Quraishi T., Davidson J.L., McCann H.
The University of Manchester, Department of Anaesthesia - CMFT, Manchester, United Kingdom

Background and Goal of Study: Functional electrical impedance tomography by evoked response (fEITER) is a novel neuroimaging device which measures internal electrical impedance across the brain using a temporal resolution of 10ms. Sub-second activity deep within the brain has been visualised for the first time during induction of anaesthesia. We aimed to reconstruct loss of consciousness in real time as a 3D movie and calibrate fEITER for future clinical work.
Materials and Methods: fEITER injects current sequences of 1 mA peak-to-peak at 10 kHz. 32 ZipPrep™ (Covidien) electrodes were placed on the scalp. A high resolution ECG was simultaneously recorded. Continuous electrical impedance data was captured using fEITER across non-current electrode pairs for all trials lasting 1 minute. A trial comprising 20 patients scheduled for surgery is currently underway. We report the first reconstructions from EIT data during induction of anaesthesia with propofol.
Results and Discussion: Reconstructed images of sub-second impedance changes show loss of consciousness as anaesthesia is induced with propofol (figure 1)[1].



[Fig1. Trans-cerebral conductance during induction]

A concurrent decrease in BIS value was observed. The potentiating effects of propofol on inhibitory neurotransmitters in the brain have been visualised for the first time. Unconsciousness is the increase of inhibitory assemblies across the cortex. These findings support Greenfield's hypothesis of neural assemblies forming consciousness[2].

Conclusion: Anaesthetic induction has been visualised for the first time showing a real time loss of consciousness in anatomically distinct regions of the brain. fEITER has potential clinical utility in awake and anaesthetised individuals, with no safety implications.

References:

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7AP1-7

Isoflurane influenced cerebral regional and neural network function: A resting-state fMRI study of rhesus monkeys on 3T

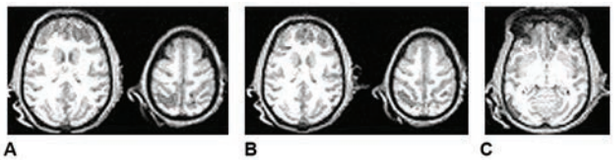
Lu P., Lui S., Wang Y., Liu B., Gong Q.
West China Hospital of Sichuan University, Department of Anaesthesiology, Chengdu, China

Background and Goal of Study: How isoflurane modulate the cerebral function? One of hypothesis is that it may influence the synchrony of neuronal networks as reflected by studies on rats. Here, we applied resting-state fMRI to probe alteration of both regional and neural network function in rhesus monkeys at different concentrations of isoflurane (1.0, 1.3, 1.6 MAC).

Materials and Methods: 5 female rhesus monkeys (Macaca mulatta) were scanned on a 3T MR system (Siemens Trio) using a single shot gradient echo EPI sequence with 12 channel phase coil. After induction and intubation, inhalation of isoflurane in oxygen was given to each monkey by anesthesia machine at three different concentrations, resulted in three levels of MAC, i.e., 1.0, 1.3 and 1.6 as reflected on the monitor placed outside scanning room. fMRI data were acquired for each of the three conditions after the stabilization of MAC for at least 20 munities. Simultaneous cardiac, blood So2 and respiratory recording were also acquired during scanning.The amplitude of low frequency fluctuations (ALFF) of BOLD signals, believed to reflect spontaneous neural activity, was used to characterize regional cerebral function. Functional connectivity across brain regions was evaluated using a seed voxel correlation approach.Changes in these measures at three levels of MAC were examined to characterize effects of isoflurane on regional function and functional integration respectively across the whole brain using repeated measure analysis.

Results and Discussion: Consistent with the previous reports that spontaneous neural activity could be affected by anesthesia, decreased ALFF were observed in bilateral dorsolateral prefrontal cortex, medial prefrontal cortex and parietal cortex in both medial concentration (1.3 MAC) and high concentration (1.6 MAC) state in relative to low concentration (1.0 MAC) (see figure 1). Furthermore, such suppressed regional intrinsic activity were accompanied with wide spread attenuation of neural network. However, the direct comparison between medial concentration (1.3 MAC) and high concentration (1.6 MAC) state revealed decreased ALFF in prefrontal cortex in medial concentration state in relative to high concentration (see figure 1).

Conclusion(s): The globally disconnecting and regionally suppressive effects of anesthesia were dose dependent and should be considered as important phenomena in comprehensive study of central anesthetic action.



[Section images of comparisons of ALFF]

7AP1-9

Preliminary data of different effects of propofol and sevoflurane anaesthesia on short term postoperative cognitive function - the role of crossword puzzles solving

Micha G.I., Arnaoutoglou E., Zalonis I., Papathanakos G., Chondreli S., Papadopoulos G.S.
University of Ioannina-Medical School, Department of Anaesthesiology, Ioannina, Greece

Background and Goal of Study: The aim of this study was to investigate the impact of propofol and sevoflurane anesthesia on postoperative cognitive function in patients undergoing non cardiac surgery.

Materials and Methods: Patients 60-74 years of age, scheduled for a non cardiac surgery, of more than two hours duration, were randomized in two groups. Patients of Group A were administered total intravenous anaesthesia with propofol (2mgkg^{-1} i.v. induction and then 6-10 mg/kg/h for maintenance) and those of Group B propofol for induction (2mgkg^{-1} i.v.) and sevoflurane for maintenance. In both groups remifentanil was administered after intubation. Cognitive function was evaluated with the Mini Mental State Examination test (MMSE) pre- and 48 postoperatively. Oxygen saturation and blood arterial pressure were measured in all patients perioperatively. Patients with episodes of hypoxaemia or hypotension were excluded.

The influence of age, gender, Charlson comorbidity score, educational status and solving crossword puzzles was analyzed. A GLM repeated measurements model was applied to detect differences pre and postoperatively for the MMSE test. P-values were obtained with the "Unequal N Tukey's HSD test" and P- values < 0.05 were considered statistically significant.

Results: 49 patients were enrolled in this study and 20 (40.8%) were randomly allocated into Group A and 29 (59.2%) into Group B. Two of the patients in Group A were excluded from the study (surgery was cancelled) so 47 patients were finally analyzed. All the results were adjusted for age, gender, Charlson comorbidity score and crossword puzzles solving. Statistically significant differences were not detected pre and postoperatively in group A for women or men neither for crossword solvers or not ($p>0.05$ in all cases), while a significant decrease was observed postoperatively for group B for women ($p< 0.001$) but also for men ($p=0.002$). This effect remained for non crossword solvers ($p< 0.001$) but turned non significant for solvers ($p=0.447$).

Conclusions: Cognitive function was not affected in the propofol group while a decline was observed in the sevoflurane group as detected by the MMSE test. The beneficial influence of crossword puzzles solving needs further studies.

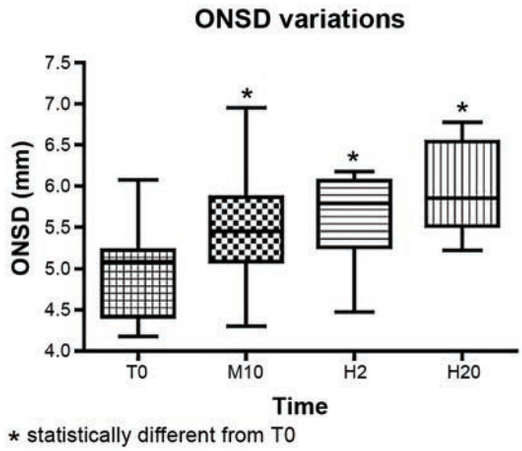
7AP2-1

Increase in optic nerve sheath diameter induced by epidural blood patch

Dubost C., Le Gouez A., Zetlaoui P.J., Benhamou D., Mercier F.J., Geeraerts T.
Hôpital Antoine Béclère, Department of Anaesthesiology and Intensive Care, Clamart, France

Background and Goal of Study: Accidental dural puncture (ADP) is rare, estimated at 0.5% in obstetric anesthesia[1]. Recently, studies in trauma patients have shown a good relationship between optic nerve sheath diameter (ONSD) measured by ocular sonography and invasive intracranial pressure (ICP)[2]. The aim of this study was to evaluate ICP changes after lumbar epidural blood patch (EBP) using ONSD measurement.

Materials and Methods: Patients receiving an EBP for post dural puncture headache (PDPH) were included. For each optic nerve two measurements were made and averaged, one in the transverse plane and the other in the sagittal plane using a 7.5 MHz ultrasound linear probe. Measurements were performed before the blood patch (T0), 10 minutes (M10), 2 hours (H2) and 20 hours (H20) after the EBP.



[Graph 1]

Results and Discussion: Nine patients were included from June 2009 to November 2010 in two teaching hospitals. The EBP was clinically successful in eight of nine patients. In the patients with successful EBP, the median ONSD

(95 % confidence interval) at T0, M10, H2 and H20 were 5.1 (4.4-5.5), 5.5 (4.9-6.2), 5.8 (5.1-6.1) and 5.9 (5.3-6.7) mm respectively. The median ONSD increased significantly between T0 and M10 (p=0.0078), T0 and H2 (p= 0.0156) and T0 and H20 (p= 0.0035) for these patients. ONSD of the patient with failed EBP first increased at M10 and H2 but decreased at H20. Graph 1 represents 10th, 25th, 75th, 90th percentiles and median values of ONSD before and after EBP.

Conclusion: In this preliminary series, we have shown that the clinical improvement of PDPH after performing EBP correlates with the increase in ONSD measured by ultrasonography. Since ONSD is a surrogate marker of intracranial pressure, this suggests that a sustained increase in intracranial pressure is associated with a successful EBP.

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7AP2-2

S100-b levels after carotid endoarterectomy - pilot study

Giuliani E., Coppi G., Genedani S., Bonvecchio C., Mosca F, Barbieri A.
University of Modena and Reggio Emilia, Department of Anaesthesiology and Intensive Care, Modena, Italy

Background and Goal of Study: Neurological damage during carotid endoarterectomy can be difficult to identify. Carotid endoarterectomy is the gold standard for carotid stenosis treatment and is often performed in elderly patients with systemic cardiovascular pathologies, that can lead to cerebral hypoperfusion during carotid surgery.

The aim of this study was to measure postoperative S100b (a glial protein whose concentration rises after neural hypoxic damage) serum concentration in patients that underwent carotid endoarterctomy.

Materials and Methods: 30 consecutive patients undergoing carotid endoarterectomy under conscious sedation with local anaesthesia were enrolled.

S100-b serum levels were measured 24 hours before and after the operation. Subjects were divided into two groups (shunt and no-shunt) according to the necessity of shunt placement to maintain adequate cerebral perfusion, their distributions were tested for normality and compared by Mann-Whitney test (p-values < 0.05 were considered significant).

A ROC curve was calculated for the post-operative S100b serum concentration and shunt placement. Youden's index was implemented to identify a marker cut-off level. Neurological defects were recorded at discharge.

Results and Discussion: Of the 30 patients enrolled 7 required a shunt to maintain cerebral perfusion. Mean age and ASA physical status for the shunt group were 72.86±6.82 years and 2.26±0.54, for the no-shunt group 70.96±9.06 and 2.29±0.49 respectively.

S100b serum levels distributions were similar in shunt and no-shunt in preoperative samples (median 0.06 and 0.05 μg/l respectively, p 0.456), while in postoperative samples their medians were 0.1 and 0.06 μg/l respectively (p 0.022). Just one neurological defect was reported in the shunt group.

The area under the ROC curve for postoperative S100b serum concentration in shunt and no-shunt group was 0.79±0.09 (95%CI from 0.61 to 0.97), the cut-off level for elevated S100b in this cohort of patients was 0.1 with a sensitivity of 57.14% and a specificity of 86.96%.

Conclusion: S100b serum levels were significantly different in shunt and no-shunt group in the postoperative samples which could indicate a mild neural damage that, even if immediately silent, may manifest at middle-long term with cognitive function deterioration.

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7AP2-3

Int6/eIF3e silencing promotes angiogenic factors of human neuroblastoma cells by upregulating hypoxia-induced factor 2α expression

Miyashita R., Chen L., Sakurai Y., Shibasaki F, Uchino H.
Tokyo Medical University, Department of Anaesthesiology, Tokyo, Japan

Background and Goal of Study: The Int6/eIF3e gene was first identified as a frequent integration site of the mouse mammary tumor virus in preneoplastic and neoplastic mammary lesions.[1]

We previously reported that the tumor suppressor Int6 binds in a subtype-specific manner to hypoxia-inducible factor 2α(HIF2α)and is involved in HIF2α regulation.[2]

When small interfering RNA(siRNA) against Int6 was used, HIF2α activity was stabilized even under normoxic conditions, and the expression of several angiogenic factors.[2] We aimed to verify the hypothesis that silencing of the Int6 by intraneural gene transfer of siRNA might promote angiogenic factors of the neuroblastoma cells by stabilization of HIF2α protein.

Materials and Methods: Human neuroblastoma cells (SH-SY5Y) were used for gene and protein expression analyses after Int6 silencing. We first examined whether Int6 silencing influences the expression of angiogenic factors;quantitative real time-PCR was used for the evaluation of mRNA expression. We second measured specific secreted protein concentrations in the culture supernatant of a 24-h culture of transfected SH-SY5Y cells with supersensitive multiplex assay (MUSTag®) kits. Immuno-PCR (MUSTag®) assays were performed according to the manufacturer's instructions (Synthera Technologies Co, Japan).

Results and Discussion: Silencing of Int6 mRNA resulted in a significant induction of platelet-derived growth factor-B (PDGF-B) mRNA and vascular endothelial growth factor A (VEGF-A) compared with the control at 24 h after transfection. In addition, the protein level of PDGF-B and VEGF-A significantly increased with MUSTag assays. In this study, we demonstrated that inhibition of Int6-dependent degradation leads to an accumulation of HIF-2α protein in neuroblastoma cells. We also confirmed increases in the expression of key angiogenic molecules, such as PDGF-B and VEGF-A. Thus, our results suggest that the pathway involving Int6/HIF2α acts as a hypoxia-independent master switch of functional angiogenesis in neuroblastoma cells.

Conclusion(s): We suggest that Int6 silencing acts as a hypoxia-independent master switch of functional angiogenesis in the neuroblastoma cells. Therefore, Int6 silencing might be of clinical value in treating ischemic diseases such as brain ischemia.

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7AP2-4

The effects of high-frequency oscillatory ventilation on intracranial pressure in patients with head injury

Sabirov D., Krasnenkova M., Rosstalnaya A., Akalaev R.
Tashkent Institute of Postgraduate Medical Education, Department of Anaesthesiology and Intensive Care, Tashkent, Uzbekistan

Background and Goal of Study: Negative effects of mode CMV are well-known. The objective of this study was to determine the intracranial, cardiovascular changes induced by conversion to high-frequency oscillator ventilation (HFOV) from conventional mechanical ventilation (CMV).

Materials and Methods: In this study, 14 patients with severe head injury had cardiovascular and invasive intracranial monitors placed. Middle age has made 36±6 years, GCS 7-9 points; level ICP exceeded 15- 31 mm hg. Cerebral haemodynamics was studied by a method of transcranial ultrasonography. We registered: cerebral blood flow velocity (Vm), resistance pial vessels (Pi) and a dilatation's reserve (Ri).

Results and Discussion: The analysis of parameters central and system haemodynamics at various respiratory support has revealed significant distinctions. At mode CMV-ICP - 23,6±0,7 mm hg; Vm - 51,1±1,4 sm/s; Pi-1,84±0,1; Ri -1,28±0,01; CPP - 67,4±1,3 mm hg and at HFOV -ICP-18,8±2,9 mm hg; Vm 57,8±7,1 sm/s; Pi-1,39±0,2; Ri - 1,36±0,01; CPP - 64,1±6,1 mm hg. Arterial PaC02 increased significantly after converting from CMV to HFOV. Although the PaC02 significantly increased during periods of HFOV, there was no difference in ICP values for both modes of ventilation. The arteriovenous lactate difference (AVDL) was not affected by mode of ventilation; however, it did increase as mean airway pressure was increased. At HFOV authentically lower level of Pi, higher parameter of Ri and lower ICP is marked. That interferes with occurrence of the expressed spasm and an ischemia of a brain. Cerebral perfusion pressure was significantly lower during CMV than during HFOV (CMV: 63,4±3,7 mmHg vs. HFOV: 75,1±5,8mmHg).

Conclusion(s): The using of HFOV as respiratory support at severe traumatic brain injury, on a background of an intracranial hypertension, has doubtless advantages before traditional methods of CMV. Its application provides preservation active autoregulation of brain blood circulation, promotes stabilization of intracranial pressure at lower level.

7AP2-5

Contribution of noradrenergic inputs to hypoglossal motoneuron (IHMN) activity in decerebrate dogs

Radocaj T., Mustapic S., Stuth E.A.E., Stucke A.G., Zuperku E.J.
Clinical Hospital Sestre Milosrdnice, Department of Anaesthesiology and Intensive Care, Zagreb, Croatia

Introduction: Inspiratory hypoglossal motoneurons(IHMNs) contribute to upper airway patency during sleep and anesthesia.Noradrenergic excitatory

input contributes to phasic and tonic genioglossus activity in wakefulness and non-REM sleep in freely behaving rats.We hypothesized that noradrenergic inputs to IHMNs also contribute to their activity in decerebrate dogs.We studied the effect of the adrenergic α-1 receptor agonist Phenylephrine (Phe),the α-2 agonist Medetomidine (Med),the α-1 antagonist Prazosin (Pra) and the α-2 antagonist Yohimbine (Yoh) on the discharge patterns of single IHMN.
Methods: Dogs were vagotomized and decerebrate under isoflurane anesthesia and studied during isohypercapnic hyperoxia in the absence of anesthesia,while being mechanically ventilated.IHMNs were located in the brainstem via stereotaxic coordinates, response to picoejection of 5HT and by discharge pattern.Multibarrel micropipettes were used to record extracellular activity and picoeject agonists (Phe:100μM, Med:10μM) or antagonists (Pra:50μM, Yoh:100μM) on single IHMNs in vivo.Drug-induced changes in discharge frequency (Fn) patterns were analyzed using cycle-triggered histograms.Statistical analysis was performed comparing control Fn to Fn during drug application.Plots of Fn patterns during drug application vs. control conditions were analyzed by linear regression.Repeated measures ANOVA and post hoc procedures were used to test for significant differences ($p < 0.05$).
Results: Four protocols were performed.In protocol 1 we picoejected α-1 and α-2 agonists.Phe increased the peak inspiratory discharge Fn to 148+-39% ($p=0.001$) of control and the average Fn to 145±36% ($p=0.003$),while Med did not have any effect:only α-1 receptors are present on IHMNs.In protocol 2 Phe increased the peak Fn to 151±31% ($p < 0.012$) and ave Fn to 148±27% ($p=0.003$).Pra did not produce any significant effect but completely reversed the Phe effects to control level.In protocol 3 both Med and Yoh did not produce significant changes.In protocol 4 Pra and Yoh also did not produce any significant changes:no endogenous activation.
Conclusion: Picoejection of α-1 agonist Phe on single IHMNs produced significant increase in Fn confirming the presence of α-1 adrenergic receptors. However, neither α-1 nor α-2 antagonists produced any significant changes. This suggests that even though α-1 receptors are present on IHMNs, there is no significant endogenous noradrenergic excitatory drive contributing to IHMN activity.

7AP2-7

Assessment of cerebral autoregulation with transfer function analysis by using blood pressure oscillations created with positive pressure ventilation

Immink R.V., Jansen G.F.A., Stok W.J., Hollmann M.W., van Lieshout J.J.
University Medical Center Utrecht, Department of Anaesthesiology and Intensive Care, Utrecht, Netherlands

Background and Goal of Study: Historically, cerebral autoregulation (CA) is defined as a constant cerebral blood flow (CBF) between a mean blood pressure (BP) of ~50 and ~150 mmHg.
Since three decades, changes in CBF can be monitored beat-to-beat and CA can be quantified by analyzing how an oscillation in BP, is transferred to the CBF signal. It was found that CA is not a perfectly functioning mechanism but behaves as a high pass filter implicating that, the slower the BP oscillation frequency, the more the CBF oscillation precedes the BP oscillation (i.e. the phase difference). In healthy subjects a 0.1 Hz oscillation in BP is preceded by the CBF oscillation with ~50° while during 0.25 Hz oscillations this difference nullifies. Propofol does not impair CA, while volatile anesthetic agents influence CA dose dependently. In the present study we quantified CA during propofol and isoflurane with transfer function analysis in anesthetized patients. We created different oscillatory frequencies in BP (and CBF) by stepwise increasing the positive pressure ventilation frequency from 5 to 15 min^{-1}.
Materials and Methods: In eight ASA 1 women, who underwent oncological gynecological surgery, transcranial Doppler derived mean middle cerebral artery blood velocity (MCA V_{mean}) and radial artery mean BP were followed during epidural analgesia with anesthesia maintained with 1.2% isoflurane and later 6 $mg \cdot kg^{-1} \cdot h^{-1}$ propofol. Different oscillatory frequencies in BP were generated with positive pressure ventilation between 5 and 15 min^{-1}. The transfer functional MCA V_{mean}-to-mean BP phase shift was determined and compared to the phase shift obtained in eight spontaneous breathing awake women.
Results and Discussion: Positive pressure ventilation generates sinusoidal oscillations in mean BP and MCA V_{mean}. Increasing the breathing frequency resulted in a decreasing MCA V_{mean}-to-mean BP phase shift under isoflurane (from 68±12° to -9±6°) and propofol (from 75±12° to -14±5°); mean±S.E.M; p=NS). During a frequency of 6 min^{-1} (= 0.1 Hz), the phase difference in patients receiving anesthesia (55±8° and 51±10° with isoflurane and propofol resp.) was comparable to that of the spontaneous 0.1 Hz mean BP oscillation seen in awake subjects (58±5°).
Conclusion: Normal dosed propofol and isoflurane do not influence CA as assessed with transfer function analysis on generated oscillations in MABP with positive pressure ventilation.

7AP2-8

Female gender promotes upregulation of nuclear factor kappa B in the hippocampus after deep hypothermic circulatory arrest independent of sex hormones

Kellermann K., Gordan M.L., Friedrich S., Blobner M., Kochs E.F., Jungwirth B.
Klinikum rechts der Isar der TU München, Department of Anaesthesiology, Munich, Germany

Background and Goal of Study: Female gender is an independent risk factor especially within the setting of cardiopulmonary bypass (CPB).[1] Sex hormone status seems to play a role[2] with sex hormones known to impact inflammatory parameters such as Nuclear Factor Kappa B (NFκB).[3]
The underlying relations however are still not clear.
The aim of the study was to investigate cerebral NFκB expression as a function of gender and hormonal status after 45min of CPB with deep hypothermic circulatory arrest (DHCA) in normal and neutered female and male rats.
Materials and Methods: With institutional review board approval 40 rats were assigned to 4 groups (n=10 each): female-normal, female-neutered, male-normal, male-neutered.
At 12 weeks age, animals were neutered or sham-operated according to group assignment. After 28 days to allow for elimination of sex hormones, rats were anesthetized, cannulated, connected to CPB, cooled down within 30 min (15-18°C) and exposed to 45 min of DHCA.
Following reinstitution of flow and rewarming (40 min), animals were weaned from CPB at 35.5°C rectal temperature. 1 hour after DHCA, rats were allowed to recover from anesthesia. 14 days after DHCA, rats were sacrificed, serum 17β-Estradiol-, Progesterone- and Testosterone-levels determined and hippocampal NFκB assessed immunohistochemically. Data were analyzed using Kruskal- Wallis ($p < 0.05$).
Results and Discussion: 17β-Estradiol, Progesterone and Testosterone differed between groups as expected. Serum levels of 17β-Estradiol- and Progesterone were highest in the female-normal group. Testosterone was present in the male-normal group only. Neuronal expression of NFκB in the hippocampus was significantly higher in females compared to both male groups (in percent of total neurons: female-neutered 11.9 ± 1, female-normal 12.7 ± 0.5, male-neutered 9.1 ± 0.7, male-normal 7.3 ± 0.5).
Conclusions: Our results indicate that female sex hormones do not attenuate hippocampal NFκB-expression after DHCA. This activation of NFκB after DHCA in female rats is not primarily linked to 17β-Estradiol or Progesterone but occurs in both female groups independent of hormonal status. Whether this phenomenon is limited to the hippocampus, or extends to other brain regions or organs such as the heart, needs to be determined by further investigations.
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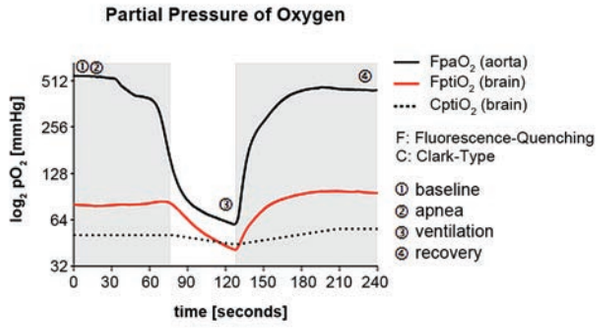
7AP2-9

Real-time measurement of brain tissue oxygen tension by fluorescence quenching

Klein K.U.
Medical Center of the Johannes-Gutenberg-University Mainz, Department of Anaesthesiology, Mainz, Germany

Background and Goal of Study: An ultrafast responding fluorescence-quenching probe (Foxy AL-300, Ocean Optics Inc., USA) allows for dynamic measurement of partial pressure of oxygen[1,2].
The present study introduces this experimental technique for measurement of brain tissue oxygen tension during episodes of apnea in pigs.
Materials and Methods: Following approval of the institutional animal care committee eight pigs were anaesthetized using fentanyl and propofol. Two novel pO_2-probes were placed in the ascending aorta ($FpaO_2$) and subcortically at 14 mm ($FptiO_2$) in brain tissue. As reference, a clark-type probe was placed next to the cerebral Foxy probe (Licox, Integra Neurosciences, USA, $CptiO_2$). Measurements were performed at FiO_2 of 1.0 at baseline, apnea, start of ventilation and recovery phase. Statistics: paired t-test: baseline vs. start of ventilation and recovery; $p < 0.05$.
Results and Discussion: In all animal experiments individual paO_2 and $ptiO_2$ courses were related to episodes of apnea (baseline: $FpaO_2$ 558±131, $FptiO_2$ 69±29, $CptiO_2$ 57±29mmHg; start of ventilation: $FpaO_2$ 64±10, $FptiO_2$ 37±13, $CptiO_2$ 32±17mmHg, $p < 0.001$; recovery phase $FpaO_2$ 458±114, $FptiO_2$ 80±24, $CptiO_2$ 62±32mmHg).
During apnea real-time $FptiO_2$ drops at $FpaO_2$ cutoff value of about 130 mmHg. Fluorescence-Quenching measurements showed a faster response

time and higher $FptiO_2$ values compared to Clark-type technology. These findings might be attributed to the uncoated ruthenium complex at the probe tip.



[Figure 1: Example showing measurements]

Conclusion: The results demonstrate the feasibility of ultrafast pO_2 measurements in brain tissue during episodes of apnea and recovery. This novel technique may allow for continuous investigation of dynamic regulation of oxygen brain tissue oxygen tension.

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7AP2-10

Cerebral hemodynamic and metabolic effects of propofol or thiopental in the treatment of refractory intracranial hypertension in patients with severe traumatic brain injury: A preliminary study

Trochut E., Cottenceau V., Masson F., Petit L., Soustiel J.-F., Sztark F.
Hôpital Pellegrin, CHU Bordeaux, Service Anesthésie Réanimation 1, Bordeaux, France

Background and Goal of Study: Barbiturates infusion is often used for the treatment of refractory intracranial hypertension (ICHT) after severe traumatic brain injury (TBI). Maximal decrease in cerebral metabolism is achieved when electroencephalogram burst-suppression is obtained. This pattern corresponds to a bispectral index (BIS) between 5 and 15 (1). Propofol can also reduce cerebral metabolism and produce the same electroencephalogram pattern as barbiturates. This study aimed to compare cerebral hemodynamic and metabolic effects of propofol or thiopental for the treatment of refractory ICHT in patients with severe TBI.

Materials and Methods: In this preliminary, observational and comparative study, patients with severe TBI and ICTH (intracranial pressure (ICP) > 20 mmHg) refractory to the first line therapy (sedation, external ventricular drainage, hyperosmolar therapy) were prospectively enrolled and received either propofol or thiopental infusion, according to clinician choice, until BIS between 5 and 15. Cerebral blood flow was determined from both internal carotid arteries by an original dual-beam doppler ultrasound device allowing the measure of the carotid diameter (2). Cerebral metabolic rate of oxygen was calculated according to the Fick equation.

Results and Discussion: 10 patients were included in the propofol group (PG) and 7 patients in the thiopental group (TG). ICP was significantly decreased in the PG (22 +/- 6 mmHg vs. 14 +/- 6 mmHg) and in the TG (26 +/- 7 mmHg vs. 11 +/- 5 mmHg) with an improvement or a preservation of cerebral perfusion pressure. Norepinephrine flow infusion was significantly increased in the PG. Propofol dose infusion was 6 +/-3 mg/kg/h and thiopental dose infusion was 3 +/-3 mg/kg/h.

Cerebral blood flow and cerebral metabolism parameters were not significantly changed before and after hypnotic infusion.

Conclusion(s): Propofol and thiopental administration until optimal electroencephalographic pattern similarly decrease ICP in patients with severe TBI and refractory ICTH. However, required dose of propofol is above recommended infusion rates and cannot be used for prolonged sedation.

Nevertheless, co-administration of both hypnotic agents, reducing the dose of each one and probably their side effects, could represent an interesting approach.

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7AP3-1

The activity of Cdh1-APC in hippocampus is down-regulated after global cerebral ischemia in rat

Yao W., Zhang Y., Qiu J., Qian W., Zhu C., Zhang C.
Tongji Hospital, Tongji Medical College, Huazhong University of Science and Technology, Department of Anaesthesiology, Wuhan, China

Background and Goal of Study: Many studies have demonstrated that cell-cycle regulating proteins are involved in neurological diseases. Cell cycle inhibition has been shown to provide neuroprotection after central nervous system injury. Anaphase-promoting complex (APC) and its coactivator Cdh1 are required for maintaining cells in G1 phase of cell cycle by ubiquitin-dependent proteolysis of cyclins and other regulatory proteins in proliferating cells. Recent studies show that Cdh1-APC is active in terminally differentiated neurons, which regulates neuronal survival, differentiation, axonal growth and synaptic development. However, the possible function of Cdh1-APC in ischemic brain injury remains unknown. This study is to investigate the activity of Cdh1-APC in hippocampus after global cerebral ischemia in rat.

Materials and Methods: Forty-two adult male Sprague-Dawley rats (weighing 280-300 g) were allocated into control (n=21) and ischemia groups (n=21). Transient global cerebral ischemia was induced by the four-vessel occlusion method of Pulsinelli. Vertebral arteries were coagulated. Both common carotid arteries were carefully isolated using nylon strings and clamped for 20 min to cause global ischemia. Control rats were subjected to an identical procedure, except bilateral carotid occlusion.

On the 1st,3rd,5th day of reperfusion following ischemia, the rat was anesthetized and the hippocampus was removed for analysis. TUNEL method was used for detecting neuronal apoptosis after ischemia. The expressions of Cdh1 and the downstream substrates of Cdh1-APC (such as SnoN and Skp2) were examined by western blot.

Results and Discussion: A large number of TUNEL-positive neurons were found in hippocampus after transient global cerebral ischemia. Compared with control group, the expression of Cdh1 in hippocampus was significantly decreased on the 1st and 5th day of reperfusion in ischemia group ($P < 0.05$), whereas SnoN and Skp2 (two downstream substrates of Cdh1-APC) was significantly increased ($P < 0.05$).

Conclusion(s): The activity of Cdh1-APC in hippocampus is down-regulated after global cerebral ischemia. It suggests that the down-regulation of Cdh1-APC may play an important role in neuronal apoptosis following ischemic brain injury. This study also brings a prospect to explore the function of Cdh1-APC in the injured nervous system.

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7AP3-2

Gene expression profiles of sevoflurane and isoflurane in a rat model of focal cerebral ischemia: Preconditioning provide neuroprotection by inhibition of apoptosis

Bedirli N., Bagrıacık E.U., Emmez H., Yılmaz G., Unal Y., Zerrin O., Bayraktar AC, Kavutci M
Gazi University School of Medicine, Department of Anaesthesiology and Intensive Care, Ankara, Turkey

Aim and the Goal of Study: Volatile anaesthetics exert protective effects against ischemia-reperfusion (IR) injury in various organs however the mechanisms of organ protection by volatile anaesthetics are unclear. IR cause organ damage and triggers activation of several transcription factors which may alter the transcription of multiple genes associated with inflammatory response. The aim of this study was to investigate the effects of isoflurane and sevoflurane on IR injury and apoptotic genes in a rat model of focal cerebral IR.

Materials and Methods: Twenty-four rats were randomly divided into three groups; control (n=8, no volatiles), sevoflurane (n=8, 2% sevoflurane), and isoflurane (n=8, 1.5% isoflurane) groups. The rats were anaesthetised by intramuscular injection of 150 mg/kg ketamine hydrochloride and 10 mg/kg xylazine and followed by endotracheal intubation. The rats in control, sevoflurane and isoflurane groups were exposed to 50 % O_2, 2% sevoflurane and 1.5% isoflurane respectively for 30 min. Focal cerebral ischemia was produced by intraluminal MCA occlusion for 1 h followed by 6 h reperfusion. Blood samples were collected for blood gas, tumour necrosis factor-α (TNF-α), interleukin-6 (IL-6), interleukin-1β (IL-1β) measurements and cerebral tissue samples were obtained for measurement of myeloperoxidase (MPO) and malondaldehyde (MDA) concentrations, histological examinations, and for isolation of total RNA.

Results and Discussion: Blood gas analysis did not show any significant difference among the groups ($p > 0.05$). Serum cytokine levels and tissue MPO

and MDA levels were significantly decreased in sevoflurane group compared to the both groups ($p < 0.05$). Trp 53 and Trp 63 are proapoptotic proteins primarily expressed in the sympathetic nervous system and capable of promoting neuronal apoptosis was significantly down regulated while neuronal apoptosis inhibitory protein, Birc1b, was significantly up regulated in sevoflurane group compared to isoflurane and control groups ($p < 0.05$). Both sevoflurane and isoflurane preconditioning up regulated the antiapoptotic gens bcl2, CD401g, prok 2 and decreased DNA fragmentation factor Dffb significantly compared to control rats ($p < 0.05$).

Conclusion(s): Treatment with sevoflurane ameliorates IR injury and down regulation of proapoptotic molecules and up regulation of antiapoptotic molecules could be responsible for this alleviation effect of the volatile anaesthetics.

7AP3-3

The occurrence of acute systemic inflammatory response syndrome (SIRS) in subarachnoid hemorrhage

Burimi J., Pushi. A, Hoxha. A
University Hospital Center 'Mother Theresa', Department of Anaesthesiology and Intensive Care, Tirana, Albania

Background and Goal of Study: Systemic inflammatory response syndrome (SIRS) without infection is a well-known phenomenon that accompanies various acute cerebral insults. The objective of this study was twofold, firstly to asses the occurrence of SIRS in SAH patients during the period of one year, and secondly to find which factors recorded on hospital admission, include proinflammatory cytokines in peripheral blood, relate to outcome in subarachnoid hemorrhage (SAH).

Materials and Methods: Our hospital is an academic tertiary care referral center. We evaluated 102 patients with SAH, admitted consecutively from September 1, 2009 to September 31, 2010. The occurrence of SIRS was assessed according to the presence of 2 or more of the following: temperature of < 36°C or >38°C, heart rate of >90 bpm, respiratory rate of >20 breaths/min, and white blood cell count of < 4000/mm3 or >12 000/mm3. After hospital admission were assessed proinflammatory cytokines in peripheral blood: TNF-a(normal value: 0-8.1), IL-6 (0-5.9),IL-8 (0-62), and CRP (0.01-1.1). SIRS criteria and other prognostic parameters were evaluated as predictors of dichotomus Glasgow Outcome Scale score.

Results and Discussion: Among our patients, the occurrence of SIRS was 56%. SIRS was highly related to poor clinical grade (Hunt and Hess clinical grading scale), a large amount of SAH on CT (Fisher CT group), and high plasma glucose concentration on admission. By univariate analysis, the occurrence
of SIRS was associated with higher mortality and morbidity rates than was the nonoccurrence ($p < 0.001$).
Among individual SIRS criteria, heart rate ($p=0.004$), respiration rate ($p=0.003$), and white blood cell count ($p=0.02$) were significant outcome predictors.
Higher levels of proinflammatory cytokines were found in 90% of patients meeting 2 or more SIRS criteria. Among proinflammatory cytokines only IL-6 ($p=0.01$) and CRP ($p=0.002$) were significant outcome predictors.
By multivariate logistic regression analysis, the presence of SIRS independently
predicted outcome. SIRS carried an increased risk of subsequent intracranial complications such as vasospasm and normal pressure hydrocephalus, as well as systemic complications

Conclusion(s): In SAH patients, SIRS on admission occures mostly, it reflected the extent of tissue damage at onset and predicted further tissue disruption, producing clinical worsening and, ultimately, a poor outcome.

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7AP3-4

Effect of blood glicose concentration fluctuation control on glucose metabolism of rat brain following transient global brain ischemia

Mi W., Chen G., Cao J.
Chinese PLA General Hospital, Department of Anaesthesiology, Beijing, China

Background and Goal of Study: It has been found that perioperative glucostasis improves neuronal damage and apoptosis in hippocampus after global brain ischemia.
We took this study to observe the effect of glucostasis on energy metablism in rat hippocampus following transient global ischemia/reperfusion, to investigate the possible mechanism of that protecting effect.

Materials and Methods: Sixty-four normal SD rats were randomly allocated into 4 groups (16 in each): pseudooperation group(CON), global brain ischemia/reperfusion group(I/P), blood glucose fluctuation group(BGF) and blood glucose stabilization group(BGS). The global cerebral ischemia rat models were made by bilateral common carotid artery occlusion combined with hemorrhagic hypotension. Perioperative blood glucose concentration fluctuation were controlled by Euglycemic hyperinsulinermic clamp technique(EICT). After 15 min ischemia, rat brain was reperfused. Eight rats in each group were sacrificed at 150 min after reperfusion and the others at 5th day, to get brain samples.
Positron emission tomography (PET) was used to assay glucose metablism in the latter eitht rats in each group at 5th day after brain ischemia and reperfusion, and immunostaining to observe the expression of glucose transporters(GLUT1) in the hippocampus.

Results and Discussion: The glucose metablism levels were reduced at 5th day after ischemia/reperfusion. Stabilizing glucose concentrations with EICT improved the glucose metablism.
Meanwhile, glucose metablism in BGF group showed similar trend with I/P group. Expressional levels of GLUT1 in I/P group and BGF group at 5th day after ischemia/reperfusion decreased. Stabilizing glucose concentrations with EICT in BGS group improved the expression of GLUT1.

Conclusion(s): Perioperative glucostasis may regulate energy metablism of rat brain following transient global brain ischemia/reperfusion by improving GLUT1 expression, which may be responsible for the protecting effect of glucostasis on neurons.

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7AP3-8

Predictors of cerebral vasospasm occurrence after aneurysmal subarachnoid haemorrhage: A role for statins?

Boudour A., Audibert G., Latarche C., Bruder N., Mertes P-M., Puybasset L.
Hopital Central, Department of Anaesthesiology and Intensive Care, Nancy, France

Background and Goal of Study: Vasospasm is a devastating complication of aneurysmal subarachnoid haemorrhage (SAH). Predictors of vasospasm include young age, smoking history, hyperglycemia and, mainly, the amount of subarachnoid blood. Statins have been proposed as a way to prevent vasospasm (Sillberg VA, Stroke 2008, 39: 2622).
The aim of this study was to asses the prognostic factors of the occurrence of vasospasm after SAH, with a special focus on preventive treatment with statins.

Materials and Methods: Prospective multicentre case-control study nested in a cohort of patients admitted in 23 universitary hospitals during one year. Patients were eligible since the SAH was related to cerebral aneurysm rupture. No change was made to the usual management in each center. Statin use was left to the choice of the attending physician. Vasospasm definition associated clinical signs, transcranial Doppler and angiography.
Data were analyzed with bivariate analysis followed by use of a multivariate logistic regression model.

Results and Discussion: The study included 736 patients, among which 171 had cerebral vasospasm (23.2%). Chronic treatment with statins was present in 8% of the patients. A prevention with statins was given to 354 patients (48.2%).
After bivariate analysis, 4 factors were associated with vasospasm occurrence: age (cases: 47.9±12.3 yr, controls: 52.2±13.3 yr, $p=0.008$), smoking history, amount of subarachnoid blood (assessed by modified Fisher score) and statin treatment (cases: 58.5%, controls 45.1%; $p=0.002$). Treatment strategy (coiling versus clipping) did not modify the risk of vasospasm. Multivariate analysis revealed that the probability of occurrence of symptomatic vasospasm decreased with age (OR=0.97; 95%CI: 0.96-0.99) and increased with statin prevention (OR=1.85; 95%CI: 1.21-2.83).

Conclusion(s): In this study, statin use did not prevent vasospasm occurrence after SAH and may even promote it. As the statin use was not randomized, no definitive conclusion can be drawn. The methodolgy did not permit to study the influence of statin use on delayed ischemic deficits, diagnosed with CT scan.
Nevertheless, these results are in agreement with a recent meta-analysis (Vergouwen MD, Stroke 2010, 41: e47) and confirmed that a beneficial effect of statins in patients with aneurysmal SAH remains to be demonstrated by adequately powered randomized studies.

7AP3-9

Perioperative management of unruptured intracranial aneurysms

Magaldi M., Carrero E.J., Valero R., Perelló L., Sanroman L., Fàbregas N.
Hospital Clinic i Provincial de Barcelona, Department of Anaesthesiology and Intensive Care, Barcelona, Spain

Background and Goal of Study: Several studies have demonstrated the safety and efficacy of coiling in unruptured intracranial aneurysms (UIA), but little has been published about perioperative anesthetic care.
The aim of our study is to review the anesthesiological approach to these patients at a University Hospital.
Materials and Methods: We retrospectively reviewed elective endovascular procedures of UIA (2009-2010).
Sex, age, anaesthesia type, monitoring, intraoperative and postoperative complications, time and location for postoperative care and length of admission were collected.
Results and Discussion: 67 patients underwent endovascular treatment of UIA, 18M/49F, age (mean±SD): 51.9±10.4 years. General anaesthesia with TCI (propofol and remifentanyl) in all patients but one (sevoflurane). Neuromuscular blockade in 52 patients (26% reverted with Sugammadex). Invasive arterial blood pressure in 52 patients and a non-invasive continuous device (ccNexfin,bmeye®) in 15. Orotracheal intubation in 32 (2 awake with fiberscope for difficult airway); laryngeal mask in 35 patients. Major intraoperative complications: 2 thromboses, 1 coil migration and 1 ruptured aneurysm (evolved to death); minor: an endovascular shear during microcatheterization, 2 hypertensive crisis. All patients awakened without new neurological deficit, except 3 who were transferred under sedation.
Postoperatively 48 patients went to a recovery room (4.3±1.4h) and to an intermediate neurological care unit afterwards; 19 patients were admitted in the ICU (16 for 24h / 3 for >24h). Postoperative complications are shown in Table 1. Mean hospital length stay: 5.4±5.6 days.

Complication	Location	Outcome
Cerebral ischemic events: 13 (19,4%)	Intermediate Neurological Care Unit	Good recovery (10) Moderate Disability (3)
Seizures: 1 (1,5%)	Intermediate Neurological Care Unit	Good recovery
Femoral bleeding: 3 (4,5%)	Post anaesthesia recovery room	Good recovery
Retroperitoneal haematoma : 1 (1,5%)	Post anaesthesia recovery room	Good recovery
Intracerebral hematoma: 1 (1,5%)	15 days after discharge	Dead
7 Others (2headache, 1respiratory failure, 1nistagmus, 1fever, 1retroorbital pain,1anemia) (10%)	Intermediate Neurological Care Unit	Good recovery

[Table 1. Postoperative complications]

Conclusion(s): Endovascular procedures in UIA are frequently uneventful and associated with good outcome. A less invasive intraoperative monitoring can be recommended, nevertheless a postoperative care management with neurological scores scheduled and frequently applied for the first 24 h seem necessary for such cases.
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7AP4-1

Role of central neuronal $\alpha_4\beta_2$ subtype nicotinic receptor in isoflurane-mediated inhibition of long-term potentiation in rat hippocampal slices

Feng C., Liu B., Piao M.
The First Hospital of Jilin University, Department of Anaesthesiology, Changchun, China

Background and Goal of Study: Volatile anesthetic isoflurane is known to impair maintenance of long-term potentiation (LTP) (1), a synaptic model of learning and memory, but its mechanisms are poorly understood. Central neuronal $\alpha_4\beta_2$ subtype nicotinic acetylcholine receptors (nAChRs) are involved in the induction of the LTP in the hippocampus (2). Isoflurane inhibits $\alpha_4\beta_2$ nAChRs at concentrations lower than those used for anesthesia (3).
Therefore, the authors hypothesized that inhibition of $\alpha_4\beta_2$ nAChRs by isoflurane caused LTP inhibition.
Materials and Methods: Transverse hippocampal slices (400 μm thick) were obtained from male rats (2 month old). Extracellular excitatory postsynaptic potentials were recorded from the CA_1 region of rat hippocampal slices. LTP was induced using a high frequency stimulation (HFS; 100 Hz/1s) of the Schaffer collateral-commissural pathway of hippocampus via two independent inputs.
Clinically relevant concentrations of isoflurane 0.125-0.5 mM, nicotine (nAChRs agonist) 1.0 μM, mecamylamine (nAChRs antagonist) 3 μM, epibatidine ($\alpha_4\beta_2$ nAChRs agonist) 0.1 μM, dihydro-β-erythroidine (DHβE) ($\alpha_4\beta_2$ nAChRs antagonist) 0.1 μM were respectively added to the perfusion solution from 20 min before HFS to test their effects on LTP by HFS. In addition, the authors examined the interactions between nicotine and isoflurane, mecamylamine and isoflurane, epibatidine and isoflurane and DhβE and isoflurane for LTP induction.
Results and Discussion: Isoflurane at 0.125-0.5 mM dose-dependently inhibited LTP induction produced by HFS. The effect of isoflurane on LTP was prevented by nicotine and epibatidine. Application of mecamylamine and DhβE both caused inhibition of LTP similar to that caused by isoflurane. Both mecamylamine and isoflurane and DhβE and isoflurane had additive effects on the inhibition of LTP.
Conclusion(s): Since inhibitive effect of isoflurane on LTP induction is prevented by nAChRs and $\alpha_4\beta_2$ nAChRs agonists, and is mimicked and potentiated by nAChRs and $\alpha_4\beta_2$ nAChRs antagonists, the authors conclude that isoflurane inhibition of $\alpha_4\beta_2$ subtype nAChRs activation is involved in its inhibition of LTP.
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7AP4-2

Xenon reduces calcium influx during high frequency stimulation and attenuates hippocampal long-term potentiation (LTP)

Mattusch C., Kratzer S., Haseneder R., Kochs E., Eder M., Rammes G.
Klinikum rechts der Isar der TU München, Department of Anaesthesiology, Muenchen, Germany

Background and Goal of Study: The neuronal mechanisms, how the gaseous anaesthetic xenon (Xe) mediates its anaesthetic, analgesic and amnestic properties are not yet fully understood. High frequency stimulation (HFS) of afferent neuronal inputs leads to activation of NMDA receptors, to a rise in intracellular Ca^{2+} and, finally results in an enhanced synaptic transmission due to protein phosphatase activation and receptor phosphorylation (1-4). In this study, we investigated the effect of Xe on hippocampal LTP and on intracellular Ca^{2+} influx during HFS.
Materials and Methods: Sagital brain slices (350μm) containing the hippocampus were obtained from male mice (Bl6, p21-30). In the CA1 region excitatory postsynaptic field potentials (fEPSP) were evoked by stimulation of the Schaffer collateral-commissural pathway. LTP was induced by HFS (100 Hz/1s). Throughout HFS, the change in intracellular Ca^{2+} was measured by fluorometric calcium imaging. Cells were loaded with Fluo-4-AM (500μM; ex 488nm; em 516nm). Changes in intracellular Ca^{2+} were measured as ΔF/F0. The time integral (area under the curve; AUC) was used to assess changes in total Ca^{2+}. For Xe application aCSF was gassed with 65% Xe resulting in a final concentration of 1.9 mM.
Results: Under control conditions, HFS led to LTP of fEPSP slopes of 127.2±5.8% (control-LTP; n=25; p< 0.05) whereas under Xe, HFS evoked a reduced potentiation of fEPSP slopes (109.8%±5.5%; n=25; p>0.05). The difference between control-LTP and Xe-LTP was statistically significant (p< 0.05). In addition, Xe decreased calcium influx during HFS (AUC 30.2±6.9% of control; n=8; p< 0.05).
Conclusion: The present study demonstrates that, in the hippocampus of mice, Xe reduces intracellular Ca^{2+} influx during HFS and attenuates LTP An increase of Ca^{2+} during HFS can be mediated by NMDA receptors and/or L-type Ca^{2+} channels. It has been shown repeatedly, that Xe is a potent antagonist of neuronal NMDA receptors. In contrast, it seems unlikely, that xenon influences neuronal L-type Ca^{2+} channels (5). Thus, we conclude, that the observed reduction of Ca^{2+} influx and consecutive attenuation of LTP might be due to Xe's antagonism against NMDA receptors.
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7AP4-3

Xenon reduces currents through synaptic and extrasynaptic NMDA receptors with the same potency

Kratzer S., Mattusch C., Haseneder R., Kochs E., Eder M., Rammes G.
Klinikum rechts der Isar der TU München, Department of Anaesthesiology, Muenchen, Germany

Background and Goal of Study: An antagonism of Xe against NMDA receptors has been described (1). NMDA receptors are located synaptically and extrasynaptically. Calcium influx through synaptic NMDA receptors is important for synaptic plasticity (2), whereas extrasynaptic NMDA receptors are involved in neurotoxic processes (3). Beside its anaesthetic action, Xe potentially exerts pronounced neuroprotective effects (4). We investigated the effect of Xe on currents through synaptic and extrasynaptic NMDA receptors in acute hippocampal brain slices of mice.
Materials and Methods: Sagital brain slices (350μM) containing the hippocampus were obtained from male mice (Bl6, d21-30). In CA1 neurons, NMDA receptor mediated excitatory postsynaptic currents (synNMDA-EPSCs) were evoked upon electrical stimulation. To activate extrasynaptic NMDA receptors by spillover of glutamate (extraNMDA-EPSCs), the glutamate reuptake inhibitor DL-TBOA (30μM) was added to the artificial cerebro-spinal fluid (aCSF). NR2B subunit containing NMDA receptors are predominantly located extrasynaptically (5). To prove an activation of extrasynaptic NMDA receptors, we coapplied the NR2B-specific antagonist Ro-25-6891 (1μM) and compared the degree of reduction in the presence and in the absence of DL-TBOA. For Xe application aCSF was gassed with 65% Xe resulting in a final concentration of 1.9 mM.
Results and Discussion: Xe reduced synNMDA-EPSCs to 65.9±9.4 % of control responses (n=7; p< 0.05). Application of Ro-25-6891 led to a decrease of synNMDA-EPSCs to 53.3±4.9% of control (n=5; p< 0.05). In the presence of DL-TBOA, extraNMDA-EPSCs were reduced to 37.4±6.4% (n=5; p< 0.05), proving an activation of extrasynaptic NMDA receptors. Xe reduced extraNMDA-EPSCs to 58.2±5.8% (n=5; p< 0.05), which was not different from the degree of reduction of synNMDA-EPSCs (p>0.05).
Conclusion: In this study, we could show that Xe reduces currents through synaptic and extrasynaptic NMDA receptors with similar potency. The antagonism against synaptic NMDA receptors might be important for the Xe induced hypnosis and analgesia, whereas the antagonism against extrasynaptic NMDA receptors might be involved in Xe's neuroprotective properties.
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7AP4-4

Xenon does not influence inhibitory synaptic transmission to thalamocortical neurons

Haseneder R., Mattusch C., Kratzer S., Kochs E., Eder M., Rammes G.
Klinikum rechts der Isar der TU München, Department of Anaesthesiology, Muenchen, Germany

Background and Goal of Study: The thalamocortical network regulates levels of consciousness and has been suggested as an important morphologic correlate that is involved in the generation of the hypnotic component of general anaesthesia (1, 2). An enhanced GABAergic inhibition of thalamocortical neurones (TC neurones) has been shown e.g. for pentobarbital (3) or isoflurane (4). In the present study, we investigated whether the gaseous anaesthetic xenon affects GABAergic inhibitory synaptic transmission to TC neurones in an acute murine brain slice preparation.
Materials and Methods: Thalamocortical brain slices were prepared from male C57BL/6J mice as described (5), and whole-cell patch-clamp recordings were performed from visually identified TC neurons. Current responses were evoked upon electrical stimulation of the internal capsule. $GABA_A$ receptor mediated inhibitory postsynaptic currents (GABA-R-IPSC) were isolated using a holding potential of -50 mV and specific receptor antagonists against the excitatory ligand-gated ion channels. For xenon application, the artificial cerebrospinal fluid was gassed with 65% xenon resulting in a final concentration of 1.9 mM.
Results: GABA-R-IPSC were recorded from TC neurons in the absence and presence of xenon. Neither amplitudes (96.9±8.8% of control, n=7) nor current decays (100.3±4.7% of control, n=7) of GABA-R-eIPSC were altered by 1.9 mM xenon. Consecutively, the area under the curve, which reflects the charge transfer and thus the strength of synaptic inhibition, was not changed by xenon (102.9±15.5% of control).
Conclusion(s): In the present study, we showed that xenon does not affect inhibitory synaptic transmission to TC neurons. This finding is in line with studies showing a negligible effect of xenon on GABAergic inhibition in other cortical or subcortical CNS areas (6, 7), and suggests that, most probably, xenon's hypnotic properties are mediated via inhibition of excitatory ion-channels.
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7AP4-6

An activated indoleamine 2,3-dioxygenase induced by inflammation promotes the development of postoperative cognitive dysfunction in elderly rats

Yang J., Gong C.Y., Zhang H.W., Chen L., Li Z., Wang H.M., Wang X.
West China Hospital, Sichuan University, Department of Anaesthesiology, Chengdu, China

Background and Goal of Study: Postoperative cognitive dysfunction (POCD) in the elderly is being increasingly reported as a complication of uncertain mechanism. Some studies implicated an important role of an activated indoleamine 2, 3-dioxygenase (IDO) induced by inflammation in the pathogenesis of neuroinflammatory diseases. IDO is a rate-limiting enzyme of kynurenine pathway, which converts tryptophan into kynurenine in extrahepatic tissues. Inflammatory cytokines can increase IDO expression with consequently raised neurotoxic metabolites (quinolinic acid, 3-hydroxykynurenine, etc). We assumed that over-expression IDO induced by inflammation would generate more neurotoxic metabolites, which could be closely related to the pathogenesis of POCD in the elderly. The current study was carried out to verify this prediction in a rat model.
Materials and Methods: 96 aged (18 weeks) male SD rats were randomly assigned to four groups: 50% oxygen inhalation (group C), 2% isoflurane anesthesia (group I), left nephrectomy under 2% isoflurane anesthesia (group S), and left nephrectomy and LPS injection (250 ug/Kg) after surgery (group L). Cognitive function were assessed daily in a Y maze. On 0.25, 1, 3, 7 days post-intervention, INF, TNF, IL-1 and IL-6 in hippocampus and plasma were quantified by using a MILLIPLEX MAP Rat Cytokine Panel, and IDO concentration in hippocampus was calculated by using a IDO ELISA kit.
Results and Discussion: Compared to group I and C, cognitive function in group L and S was severely impaired on postoperative 1 and 3 day. Hippocampal IDO concentration in group L and S increased and are obviously higher than those in group I and C ($p < 0.05$) On postoperative 0.25 day, there were increased hippocampal and plasma concentrations of four cytokines in group L compared to those in group C, especially concentration of IL-6 (89.3 ± 2.66 vs. 7457.88 ± 50.84 pg/mg in the hippocampi, 81.48 ± 10.34 vs. 4598.79 ± 1235.70 pg/ml in the plasma, $p < 0.05$), and recovered on 1, 3, 7 days following intervention. No significant difference in cytokines was found in other groups.
Conclusion(s): These results suggest that nephrectomy and LPS trigger a cognitive decline that is associated with a transient inflammation as well as up-regulated IDO in both hippocampus and plasma.
Duration of isoflurane anaesthesia is not associated with cognitive decline. IDO regulate the kynurenine pathway may be a possible mechanism of developing POCD.

7AP4-7

Large dose haloperidol decreased the extracellular concentration of nitric oxide products and propofol did not modify the change in the rat brain striatum: In vivo microdialysis experiment

Adachi Y.U., Takada K., Sato S., Matsuda N.
Nagoya University Graduate School of Medicine, Department of Emergency and Critical Care Medicine, Nagoya, Japan

Background and Goal of Study: Previously, we demonstrated that general anesthesia using propofol decreased the extracellular concentration of nitric oxide products (NOx) in the rat brain striatum using in vivo microdialysis study. Recently, the role of nitric oxide (NO) as a neurotransmitter on motor behavior is focused and it was reported that co-administration of NO donors prevents haloperidol-induced dyskinesia. However, the exact change in the concentra-

tion of NOx in the brain after administration of haloperidol is not clear.
Thus, in the current investigation, we studied the effect of haloperidol and propofol on the extracellular concentration of NOx.
Materials and Methods: Male Sprague-Dawley 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. The rats were freely moving and haloperidol and propofol were administered intraperitoneally. Haloperidol was infused 70, 200, 500 and 1500 μg kg^{-1} and propofol was given 10, 30, 100 mg kg^{-1}, and co-administered to the rats administered 1500 μg kg^{-1} of haloperidol with the dose of 30 and 100 mg kg^{-1} propofol.
Results and Discussion: Propofol reduced the extracellular concentration of NOx in a dose dependent manner. Not a small dose, but larger dose of haloperidol significantly reduced NOx. Co-administration of propofol, however, showed no additional effect of haloperidol-induced NOx reduction.

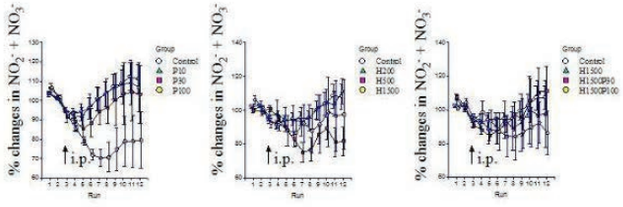

Figure. The change in nitric oxide products in the rat striatum after the administration of propofol, haloperidol and both drugs. P10: Propofol 10 mg kg^{-1}, P30: Propofol 30 mg kg^{-1}, P100: Propofol 100 mg kg^{-1}, H200: Haloperidol 200 μg kg^{-1}, H500: Haloperidol 500 μg kg^{-1}, H1500: Haloperidol 1500 μg kg^{-1} , H1500P30: Haloperidol 1500 μg kg^{-1} with Propofol 30 mg kg^{-1}, H1500P100: Haloperidol 1500 μg kg^{-1} with Propofol 100 mg kg^{-1}.

[Figure]

Conclusion: Acute administration of large dose of haloperidol decreased NO products in the rat brain. This reduction was not enhanced by additional administration of propofol. The general anesthesia using propofol for the patients who are medicated by major tranquilizer, e.g., haloperidol might be safe and acceptable.
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7AP4-8

The propofol-induced inhibition of nitric oxide release in rats brain was antagonized by perfusion of saclofen, $GABA_B$ receptor antagonist, using in vivo microdialysis experiment

Adachi Y.U., Kimura-Kuroiwa K., Kobayashi A., Sato S., Matsuda N.
Nagoya University Graduate School of Medicine, Department of Emergency and Critical Care Medicine, Nagoya, Japan

Background and Goal of Study: Previously, we found that propofol inhibited nitric oxide (NO) releases in the rat striatum using in vivo microdialysis study (1). The important role of NO on the homeostasis of neurotransmitters, including GABAergic and NMDAergic neural signaling was suggested (2).
In the current investigation, we studied the effect of $GABA_A$ receptor antagonist, bicuculline and $GABA_B$ receptor antagonist, saclofen on the extracellular concentration of NO and the effect of propofol on NO release under GABAergic inhibition.
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. NO_2^- and NO_3^- (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 and propofol was administered intraperitoneally. Bicuculline and saclofen was applied with perfusate.
Results and Discussion: Propofol decreased NO_3^- and NOx in a dose dependent manner. Perfusion with bicuculline increased NO release and counteracted propofol-induced NOx decrease. Saclofen itself showed no effect on NO release, however, significantly attenuated the reduction of NOx by administration of propofol.

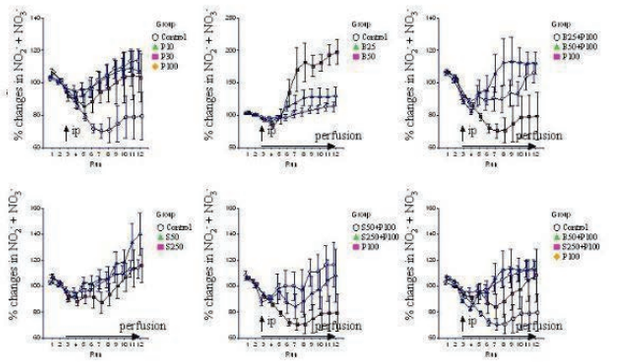

Figure. % changes in NO_2^- and NO_3^- were shown in the each graph. Propofol decreased NO release in a dose dependent manner. Perfusion of bicuculline increased NO release and counteracted the effect of propofol. Saclofen showed no effect on NO release and attenuated the effect of propofol-induced NO release reduction. P10, P30, P100: propofol 10, 30 and 100 mg kg^{-1}. B25, B50: bicuculline 25 and 50 μM perfusion. S50, S250 : saclofen 50 and 250 μM perfusion.

[Figure]

Conclusion: The results of current investigation demonstrated that NO release was enhanced by the $GABA_A$ receptor inhibition, not by $GABA_B$. However, propofol might reduce NO release by the potentiation of not only $GABA_A$ergic activity but also simultaneous $GABA_B$ergic activation.
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7AP4-9

Neonatal exposure to phenobarbital results in increased susceptibility to corneal kindling and pilocarpine-induced seizures in rats

Czuczwar M., Nieoczym D., Borys M., Socala K., Mioduski M., Turski W.A.
Medical University of Lublin, Department of Anaesthesiology and Intensive Care, Lublin, Poland

Background and Goal of Study: It has been shown in many experimental studies that exposure of immature brain to certain anesthetic agents may trigger apoptosis leading to increased neuronal death.
Therefore general anesthetics may have potentially long lasting and profound effects that might cause severe morbidity long after exposure to anesthesia[1]. Our previous experiments investigating the impact of increased neuronal damage in early stages of development on learning and memory clearly showed that neonatal exposure to phenobarbital results in decreased learning and memory skills in rats of various age[2].
The aim of the present study was to evaluate the role of neonatal exposure to phenobarbital on epileptogenesis with the use of two experimental models of epilepsy in the rat.
Materials and Methods: The experimental protocol was approved by the Ethical Committee of the Medical University in Lublin, and all the procedures were in compliance with the European Communities Council Directive of 24 November 1986 (86/609/EEC).
All experiments were carried on male Wistar rats. In order to induce apoptosis we treated rat pups with phenobarbital during the first two postnatal weeks (50mg/kg *ip* on day 3,5,7, and 9). Long-term effects of treatment with phenobarbital on epileptogenesis in adulthood (at the age of 2-3 months) were assessed with the use of the corneal kindling and pilocarpine-induced seizures tests. The protective activity of selected antiepileptic drugs against pilocarpine-induced seziures and corneal kindling was also assessed in both phenobarbital and saline treated rats.
Results: Phenobarbital administration in the neonatal period resulted in a decreased latency to corneal kindling seizures and in increased susceptibility to pilocarpine-induced seizures in the rat.
Conclusion(s): The experimental evidence we present here calls for an increased level of caution with the use of GABA receptor agonists in neonatal, pediatric, and obstetric anesthesia.
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7AP5-1

Oxygenation concern after Onyx embolization for brain lesions based on pulse oxymetry monitoring

Asouhidou I., Katsaridis V., Meng L., Zilianaki D., Vaidis G., Ioannou P.
University Irvine of California and ‚G.Papanikolaou', Department of Anaesthesiology, Thessaloniki, Greece

Background and Goal of Study: Endovascular embolization of brain vascular malformations is increasingly applied. Onyx is a new embolic material that is involved in a controversy about the 'toxicity' of its solvent, dimethyl sulfoxide (DMSO). In this study we evaluated oxygen saturation in patients treated for arteriovenous malformations (AVMs) and dural arteriovenous fistulas (DAVFs) with Onyx.
Materials and Methods: Sixty-nine patients were treated for AVMs and DAVFs under general anesthesia. Heart rate, invasive blood pressure, end-tidal CO_2 ($EtCO_2$), and oxygen saturation (SpO_2) changes in response to DMSO and Onyx injection were recorded throughout the intervention. None of the patients had any past medical history of pulmonary or cardiac disease.
Results and Discussion: Twenty-three patients exhibited O_2 desaturation following injection of Onyx/DMSO: seventeen with less than 3% decrease below baseline SpO_2 values and six with more than 3%. At the end of the operation the saturation returned to normal levels. One patient exhibited severe desaturation in the early postoperative period.
Conclusion(s): The frequency of oxygen desaturation during Onyx embolization is significant (34,7%), but in most cases without clinical consequence. However anesthesiologists need to be prepared since it might lead to life-threatening situations.
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7AP5-3

PONV prevention: Colloids vs normal saline in anesthesia for brain tumor resection

Hoxha A., Pilika K., Demneri M., Saraci M.
University Clinical Centre ‚Mother Theresa', Department of Anaesthesiology and Intensive Care, Tirana, Albania

Background and Goal of Study: Intravenous fluid administration has been shown to reduce PONV. There are evidences that use of colloids decrease it frequency (1). In early postoperative period after the resection of tumors, especially in the presence of increased intracranial pressure, it is reported increased frequency of PONV. The aim of the study is to show the influence of different regimens of infusion of colloids and normal saline on the frequency of PONV in patients after anesthesia for hemispheric brain tumor resection.
Materials and Methods: After ethic committee approval 138 patients with hemispheric brain tumors with increased intracranial pressure waiting for surgery were enrolled in the study. Patients were divided into two groups (H and C) which had the similar ratio F:M. Group H : 500ml Haes 10%/200 were infused prior to induction and 3ml/kg/h during the procedure. Group C received at induction of anesthesia the same amount of normal saline with the same rate during operation as group H. The same anesthesia protocol was administered in both groups (sevoflurane, tiopenton 5-6mg/kg, fentanyl 6-8 μg/kg, pancuronium 0.8-1.0 mg/kg, manitol 0.5-0.75g/kg). Postoperatively nausea, vomiting and pain score according to VAS were recorded at 0.5, 1st, 4th, 8th, 12th and 24th hour. Antiemetic and analgesic therapies were recorded during the first postoperative day. Fisher and Chi-tests were used and $p \leq 0.05$ is considered significant.

	Number of patients.	F/M ratio (%)	Nausea (%)	Vomiting (%)	Antiemetics (%)
Group H	72	34/38	41.6*	27.9*	30.6*
Group C	66	30/36	72.7	59	65.2

*[Incidence of PONV after colloid and NS (*p<0.05)]*

Results and Discussion: Nausea and VAS scores were statistically lower in the group H during 4-8 hours after operation. Nausea VAS percentage was presented with significantly statistical low compared to other group during the first day after operation. During the first hour after operation group C showed significantly higher frequency of vomiting and nausea. Use of anti emetics was significantly higher in this group. Pain score recorded during the study period were similar in both groups.
Conclusion(s): Preoperative use of colloid intravenous infusions showed to be effective as preventive treatment of PONV. Amount and osmotic characteristics of fluid administration is subject to more profound studies.
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7AP5-4

Serum anticholinergic activity and postoperative cognitive dysfunction in elderly patients

Rossi A., Burkhart C.S., Dell-Kuster S., Monsch A.U., Strebel S.P., Steiner L.A.
Centre Hospitalier Universitaire Vaudois (CHUV) et Université de Lausanne (UNIL), Department of Anaesthesiology, Lausanne, Switzerland

Background and Goal of Study: Cerebral cholinergic transmission plays a key role in cognitive function and anticholinergic drugs are associated with impaired cognitive function. In the perioperative phase, many substances with anticholinergic effects are administered and disturbed cholinergic transmission is a hypothetical cause of postoperative cognitive dysfunction (POCD). Increased serum anticholinergic activity (SAA) has been shown to be associated with cognitive impairment in elderly patients taking anticholinergic drugs regularly. Increased SAA has also been suggested as a possible cause of POCD. SAA can be measured as a marker of anticholinergic activity in an individual patient's blood. We hypothesised that an increase in SAA from preoperatively to one week postoperatively is associated with POCD in elderly patients.
Materials and Methods: 49 patients aged > 65 yrs undergoing elective major surgery under standardized general anaesthesia (thiopental, atracurium, fentanyl, sevoflurane) were investigated. Cognitive functions were assessed preoperatively and 7 days postoperatively using the extended version of the CERAD-Neuropsychological Assessment Battery. POCD was defined as a postoperative decline > 1 z-score in at least 2 cognitive domains. SAA was measured preoperatively and 7 days postoperatively at the time of cognitive testing.
Results and Discussion: 47% of the investigated patients developed POCD. Patients with POCD were slightly older than patients without POCD. There were no statistically significant differences between patients with and without POCD regarding education, baseline cognitive function, duration of anesthesia, SAA preoperatively (median (range) 1.07 (0.29 to 5.03) vs 1.16 (0.20 to 4.96)), SAA 7 days postoperatively (median (range) 1.29 (0.02 to 6.95) vs 0.83 (0.30 to 5.53)) or changes in SAA (median (range) -0.18 (-1.57 to 2.23) vs 0.01 (-2.88 to 2.80)). The variability of SAA between patients was considerable and marked changes in SAA between the two examinations were observed in some patients. However, there was no statistically significant relationship between changes in SAA and changes in cognitive function.
Conclusion(s): While a relationship between SAA and POCD cannot be excluded in some patients, our analysis suggests that anticholinergic activity due to anticholinergic medications administered in the perioperative phase is not a key factor in the development of POCD.
Acknowledgements: SNF Grant 32003B-121956

7AP5-5

Comparison of 20% mannitol and 7.5% hypertonic saline for supratentorial craniotomy

Demneri M., Hoxha A., Pilika K., Saraci M.
University Hospital Center, Department of Anaesthesiology and Intensive Care, Tirana, Albania

Background and Goal of Study: In a randomized, double blinded, controlled trial we compared the efficacy and safety of HTS with mannitol in patients undergoing craniotomy for excision of supratentorial brain tumor in the period between 2007-2009.
Materials and Methods: In this study, 140 consenting patients were randomly allocated to receive either HTS 7.5%, 2 ml/kg, or mannitol 20%, 4.75 ml/kg over 30 min after induction of anesthesia.
Total osmolar dose was 5.1 mOsmol/kg in all patients. Subdural intracranial pressure (ICP) was measured after removal of bone flap. Attending neurosurgeon rated the brain bulk according to a four-point scale:1=excellent with no swelling; 2=minimal swelling, acceptable; 3=swollen but no treatment required; 4=swollen, needing treatment. Changes in electrolyte and fluid balance were recorded.

Results and Discussion: Patient characteristics and operation details were similar between groups. The number of patients with brain swelling (brain bulk grades 3 and 4) was significantly less after HTS compared with mannitol infusion; 21(30%) *vs* 33(47.1%); odds ratio = 0.40 (95%CI: 0.19-0.86); P = 0.02. The absolute risk reduction in the incidence of brain swelling was 16.8% (95%CI: 1.9-31.7). The type of anesthetic (propofol *vs* volatile) had no measurable effect on brain bulk assessment. ICP was lower after HTS compared mannitol infusion (mean difference 2.6 mmHg; 95%CI: 0.8-4.5 mmHg, P = 0.006). Mannitol produced more profound diuretic effect compared with HTS, $P < 0.001$. There was an increase in plasma and urine sodium concentration in the HTS group compared with mannitol, $P < 0.001$.
Conclusion(s): HTS 7.5% provided better operating conditions and lower ICP than mannitol 20% in supratentorial craniotomy.

7AP5-6

Rapid ventricular pacing to optimize cerebral aneurysm clipping conditions

Rommens M., Menovsky T., Mott C., Van der Steen G., Saldien V.
University Hospital of Antwerp, Department of Anaesthesiology, Edegem, Belgium

Background and Goal of Study: Intraoperative aneurysm rupture increases morbidity and mortality after cerebral aneurysm surgery (CAS). Short periods of circulatory arrest facilitates aneurysm dissection and hemostasis of an intraoperative aneurism rupture(1). Rapid ventricular pacing is used for creating low output conditions during aortic valvuloplasties (2). The aim of this study was to investigate efficacy and safety of rapid ventricular pacing during CAS.
Materials and Methods: After local Ethics committee approval, 12 patients undergoing CAS were included. Anesthesia was standardized. Correct positioning of the transjugular pacing catheter was confirmed by radioscopy and ventricular capture test set at less than 4.0 mA. During exposure and clipping of the aneurysm, rapid pacing periods were performed. Datex Ohmeda S5 Collect sampled hemodynamic variables at 5 measurements per second. Pacing duration (tp), time onset to minimal blood pressure (to), maximal, minimal and mean arterial pressure (AP) achieved and time from offset to full blood pressure recovery (tr) were registered. Results are presented as mean ± SD. Multi-level models were used for statistical analysis.
Results and Discussion: Patients were paced at 160 - 220 bpm for 20.0 ± 11.7s (tp). During rapid ventricular pacing a significant drop in blood pressure was established (Table 1).

	Pre-pacing	Pacing	Post-pacing
Min AP (mmHg)	49.8±7.1	28.9±6.6	46.9±5.9
Mean AP (mmHg)	63.4±8.8	36.9±5.3	58.8±6.5
Max AP (mmHg)	93.4±12.4	44.3±8.7	86.9±10.0

[Table 1: p < 0.0001 pre-pacing versus pacing]

This low output condition was obtained in 3.2 ± 0.8s (to) and reversed instantaneously (tr< 1s) and rendered a bleeding less abundant and better manageable. As a result, a better surgical exposure of a collapsed and mobile aneurysm allows a safer dissection and clip positioning.
Conclusion(s): Rapid ventricular pacing represents a promising and safe technique for low cardiac output conditions in elective clipping of cerebral aneurysms. The blood pressure lowers significantly in a controlled and directly reversible manner.
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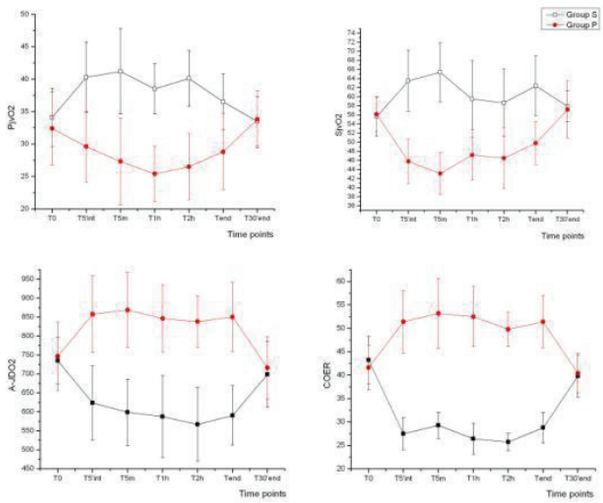
7AP5-7

Comparison of sevoflurane-remifentanil anesthesia and propofol-remifentanil anesthesia in patients undergoing elective craniotomy

Liao R.
West China Hospital, Sichuan University, Department of Anaesthesiology, Chengdu, China

Background: Sevoflurane and propofol are widely used in neuroanesthesia. The aim of this prospective, pilot clinical trial was to compare the effects of sevoflurane-remifentanil and propofol-remifentanil anesthesia on clinical properties,mean arterial blood pressure (MAP), heart rate (HR),and jugular venous oxygen partial pressure ($PjvO_2$) in patients undergoing craniotomy. Besides, we determined jugular bulb venous oxygen saturation ($SjvO_2$) as a measure of the $CBF/CMRO_2$ ratio at different time points.
Methods: 28 adult patients undergoing elective craniotomy were randomly allocated to either sevoflurane-remifentanil group (Group S) or propofol-remifentanil group (Group P).Induction and recovery profiles, HR, MAP, $PjvO_2$, $SjvO_2$, arteriojugular venous oxygen content difference ($A\text{-}JDO_2$), and cerebral oxygen extraction rate (COER) were compared in two groups at different time points.
Results: Time for loss of consciousness (64.7±10.3 (Group S) sec vs.61.5±12.2(Group P) sec; p>0.05), time to extubation (6.9±1.4 (Group S) min vs.6.6±1.2 (Group P) min; p>0.05), and time to eyes opening (8.7±3.3 (Group S) min vs.7.5±3.2 (Group P) min; p>0.05) were comparable in the two groups. HR and MAP were not significantly different in the two groups after induction(p>0.05).$PjvO_2$ and $SjvO_2$ were kept in normal range in Group S and decreased significantly in Group P after induction,and were significantly higher in Group S than in Group R after intubation. $AJDO_2$ and COER were significantly lower in Group S compared with Group P after intubation.



Changes of PjvO2, SjvO2, A-JDO2,and COER at different time points

[Changes of PjvO2, SjvO2, A-JDO2,and COER]

Conclusions: There were no significant differences in induction time, emergence time, and hemodynamic profiles between sevoflurane-remifentanil and propofol-remifentanil anesthesia for craniotomy. $PjvO_2$,$SjvO_2$, $AJDO_2$ and COER were in normal range in sevoflurane-remifentanil anesthesia. Propofol-remifentanil anesthesia was associated with decreased $PjvO_2$ and $SjvO_2$ and increased $AJDO_2$ and COER, which suggested the risk of cerebral hypoperfusion.

7AP5-8

Changes in serum electrolytes after intracranial neurosurgical procedures

Demneri M., Hoxha A., Pilika K., Saraci M.
University Hospital Center 'Mother Theresa', Department of Anaesthesiology and Intensive Care, Tirana, Albania

Background and Goal of Study: Brain relaxation therapy is frequently employed for intracranial neurosurgical procedures. In this retrospective cohort study, we examined the short- and long-term effects of this treatment on important serum electrolytes.
Materials and Methods: Preoperative, intraoperative and postoperative values of serum osmolality, sodium, chloride, potassium and magnesium levels and blood gas parameters were examined in 956 patients who underwent elective craniotomy at our hospital between 2005 and 2009. We compared patients who received brain relaxation therapy with mannitol (n=801), furosemide with mannitol (n=713) or no therapy (n=155).
Results and Discussion: After mannitol administration with or without furosemide, a numerical increase in serum osmolality (from 299±13 to 305±6) and serum levels of sodium (139±3 to 141±2), and chloride (106±5 to 112±4) were observed during the intraoperative period. However, the above change in serum electrolytes did not reach statistical or clinical significance. With the exception of magnesium, no significant difference was found between the preoperative and the postoperative levels of any the studied electrolytes.

Postoperative magnesium was lower (decreased from 1.7±0.2 to 1.5±0.2) in all patients, with or without mannitol treatment (P< 0.0001). Female patients had statistically lower magnesium levels than males (P< 0.0001).
Conclusion(s): Brain relaxation therapy does not cause significant alterations in serum electrolytes or blood gas parameters. Serum magnesium levels should, nevertheless, be followed in all patients who undergo craniotomy (in female patients in particular), and corrected if clinically indicated.

7AP5-9

Intraoperative cerebral perfusion, autoregulation and oxygenation: A comparison between young and elderly patients under general anesthesia

Rossi A., Burkhart C.S., Dell-Kuster S., Strebel S.P., Steiner L.A.
Centre Hospitalier Universitaire Vaudois (CHUV) et Université de Lausanne (UNIL), Department of Anaesthesiology, Lausanne, Switzerland

Background and Goal of Study: Inadequate intraoperative cerebral perfusion is often suspected in patients who present with postoperative cerebral complications such as stroke, delirium and postoperative cognitive dysfunction.
We non-invasively compared cerebral perfusion in young and elderly patients under general anesthesia. We hypothesised that with increasing age, cerebrovascular autoregulation is less efficient and oxygenation lower thus increasing the brain's vulnerability to intraoperative insults such as hypotension.
Materials and Methods: 119 patients (18-40 yrs: 48, >65 yrs: 71) undergoing elective major surgery under standardized general anaesthesia (penthotal, fentanyl, atracurium, sevoflurane) were investigated. Cerebral blood flow velocity (FV) was assessed in the middle cerebral artery using transcranial Doppler. Cerebral oxygenation was measured with near-infrared spectroscopy (NIRS) and expressed as a tissue oxygenation index (TOI). Cerebrovascular autoregulation was determined by calculating the Mx-index, which is based on the correlation of changes in MAP and FV. Values for Mx range from -1 to +1. Higher values represent less efficient autoregulation. Data represent mean values during the surgical procedure. Induction and emergence were excluded from analysis.
Results and Discussion: The results are shown in Table 1. MAP: mean arterial pressure, MACEQ: age corrected MAC equivalents.

	18 - 40 yrs (n = 48)	> 65 yrs (n = 71)	p-value
Age (yrs)	31 ± 6	73 ± 7	
MAP (mmHg)	77 ± 12	75 ± 11	0.42
ETCO2 (kPa)	4.74 ± 0.32	4.55 ± 0.31	0.002
MACAEQ	1.02 ± 0.12	1.17 ± 0.18	<0.001
FV (cm/s)	45.9 ± 13.9	40.8 ± 16.9	0.082
Mx	0.41 ± 0.18	0.49 ± 0.17	0.017
TOI (%)	70 ± 5	67 ± 5	0.016

[Table 1]

In a multiple regression model including age, $ETCO_2$, and MACEQ, only age was significantly associated with Mx (p= 0.004).

Conclusion(s): We found a statistically significant better autoregulation and oxygenation in younger patients, suggesting an increased vulnerability of elderly patients for intraoperative insults. However, the differences are small and of questionable clinical significance.
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7AP5-10

Comparison of sevoflurane added remifentanil or dexmedetomidine with different recovery scores in intracranial surgery

Tezcankeles G., Topcu I., Uysal C., Duransoy Y., Barutcuoglu M.
Celal Bayar University, Department of Anaesthesiology, Manisa, Turkey

Background and Goal of Study: Early postoperative recovery of neurologic and cognitive functions is especially advantageous after intracranial neurosurgical procedures because it expedites the diagnosis of a life-threatening complication such as hematoma formation, cerebral herniation, and cerebrovascular ischemia (1,2).
We aim to compare remifentanil and dexmedetomidine with sevoflurane in the operating room (OR) and post-anaesthesia care unit (PACU) by using Fast-Tract -Criteria (FTC) and Aldrete Criteria (AC) for intacranial surgery patients.
Materials and Methods: After obtaining the approval from Faculty Ethics Committee, 60 ASA I-II patients, aged 18-65, were randomly divided into two groups.
Following the standard anaesthesia induction, Group (S+D) (n = 30) received 1-3 % sevoflurane + 0.2 μg $kg^{-1}h^{-1}$ dexmedetomidine and Group (S+R) (n = 30) received 1-3 % sevoflurane + 0.05 μg $kg^{-1}h^{-1}$ remifentanil in 60 % N_2O for anaesthesia management. Extubation times, and FTC and AC were evaluated in the OR at the 5th and 10th minutes and in PACU at the 1st, 5th, 15th and 25th minutes. P< 0.05 was considered significant.
Results: Extubation time in Group (S+R) was shorter than in Group (S+D) (4.8 ± 1.6 and 6.4 ± 2.7 min respectively, p=0.006). In OR at the 10th min, Group (S+R) had a higher FTC (p=0.02) and AC (p=0.003) score than did Group (S+D). In PACU, at the 1st, and 5th min; Group (S+R) had a higher FTC and AC score than did Group (S+D) (p=0.000 and p=0.015 respectively), and at the 15th min, Group (S+R) had a higher AC (P=0.008) than Group (S+D). In all patients, targeted discharge points were achieved at the 25th minute in PACU.
Conclusion: Sevoflurane / remifentanil neuroanesthesia is superior to sevoflurane / dexmedetomidine in extubation time and time to reach an AC ≥ 9 and FTC ≥ 13 in intracranial surgery.
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Local and Regional Anaesthesia

8AP1-1

The effects of different injection techniques for epidural anesthesia on patients undergoing elective transuretral prostate resection (TUR-P)

Soyal Ö.B., Özcan E., Baydar M., Göğüş N.
Ankara Numune Education and Research Hospital, Department of Anaesthesiology and Intensive Care, Ankara, Turkey

Background and Goal of Study: Aim of this study is to compare different techniques of epidural local anesthesic injection in means of hemodynamics, side effects, complications, patient and surgeon satisfaction.
Materials and Methods: After the approval of the hospital ethics committee, 60 ASA I-III, 40-75 year old male patients scheduled for TUR-P were randomly assigned into three groups. After reaching the epidural space with the Tuohy needle, patients received local anesthesia via the needle in Group N, half of the local anesthetic via the needle and the other half through the epidural catheter in Group NC and only through the catheter in Group C. Hemodynamic parameters, sensorial and motor block level, side effects were recorded. Also patient and surgeon satisfaction were graded with a 3 point scale (0=not satisfied, 1=uncertain, 2=very-well satisfied) which was recorded by a blinded observer. Statistical analysis was made by one-way Anova and Kruskal-Wallis for comparison between groups and Wilcoxon Signed Ranks test for evaluation in the groups. p< 0,05 was regarded as significant.
Results and Discussion: The demographical data were comparable between groups. Patients in Group N and Group NC showed statistically, but not clinically significant decrease in mean arterial pressures and pulse rates at 20th and 35th minutes following epidural anesthesia respectively, but Group C remained stable throughout the procedure. Mean surgery onset times (time to reach sensorial block level of T10 dermatome) were 10 minutes in Groups NC and C while 15 minutes in Group N (p< 0,05). Side effects, complications and patient-surgeon satisfaction scores were similar between groups.
Conclusion(s): In our study we compared different injection techniques for epidural anesthesia and declare that although there weren't major differenses between groups, injection through the epidural catheter achieved more stable hemodynamics and fast surgery onset time.

8AP1-2

Failure of neuraxial blocks and causes

Özdemir H., Kayhan Z.
Faculty of Medicine Baskent University, Department of Anaesthesiology, Ankara, Turkey

Background and Goal of Study: Neuraxial blocks are widely used for anesthesia, postoperative analgesia and pain management. In spite of advancements, difficulty or failure to obtain satisfactory block is still the case. Data on the issue differ due to the variability of the criteria taken as predictors. In this study we aimed to determine the rates of failure and the risk factors to predict the difficulty or failure with neuraxial blocks.
Materials and Methods: After the approval of Research Committee, records of 7263 patients aged ≥18 years (1998-2008), receiving neuraxial blocks were examined. Patients (n=297) given general anesthesia in addition were excluded. From the records of remaining 6966 patiens demographic and historical data, coexisting health problems, block techniques, causes and criteria of failure, as well as surgical features were noted. Chi-Square, Student-T and Mann-Whitney U tests were used for statistical evaluations. By using significant parameters as indicator of failure, independent risk factors were determined with logistic regression analysis.
Results and Discussion: The neuraxial blocks constituted 10,69% of our surgical anesthesia cases.Total failure rate was 5,4%, being 3,9% in spinal, 10,9% in epidural, 6,4% in combined spinal epidural blocks.
When necessary to change the anesthetic technique 83,7% general anesthesia, 8.4% another block technique and 7,9% deep sedation were used. Most common causes of failure in records of patients were found as unsatisfactory block in spite of entering the space successfully for spinal and epidural blocks, and inability to enter the space in combined spinal epidural block.
With regard to surgery, urgency of the case (p=0,002) and cardiovascular surgery (p=0,001) in spinal blocks; urological and cardiovascular surgery (p=0,001) in combined spinal epidural blocks were found to be related with the increased rate of failure.
Independent risk factors were paramedian approach (p< 0,001/OR 30,8), peripheral vascular disease (p< 0,001/OR 2,5), epidural block (p< 0,001/OR 2,6), duration of surgery (p< 0,001/OR 2,3), expert requirement (p< 0,001/OR 1,9), chronic obstructive pulmonary disease (p=0,014/OR 1,7), body weight (p=0,023/OR,1,0).
Conclusion(s): In conclusion, careful patient evaluation, selection of anesthetic technique appropriate for surgical procedure and seeking help of an expert early will decrease the rate of failure and increase the safety of the patient.

8AP1-3

Combination of epidural anaesthesia and general anaesthesia attenuates insulin resistance and inflammatory activation in patients undergoing renal transplantation

Hadimioğlu N., Ulugöl H., Akbaş H., Coşkunfırat N., Ertug Z., Dinçkan A.
Akdeniz University, Department of Anaesthesiology and Intensive Care, Antalya, Turkey

Background and Goal of Study: Every operation elicits a stress response, mediated by neuroendocrine and immunological factors. Insulin resistance is the failure of the usual cellular response to insulin, due to stress response. This response to surgery, may have positive effects but stimulation of the production of cytokines are associated with a risk of postoperative organ dysfunction and increased morbidity and mortality and length of hospital stay. Different anaesthetic procedures can eliminate the stress response and decrease the incidence of surgical complications and improve outcomes.
We aimed to test the hypotheses: epidural+general anesthesia results in a less pronounced stress reaction than general anesthesia alone and that combined anesthesia therefore has the potential to influence the post-transplant insulin resistance and cytokine activation.
Materials and Methods: 47 non-diabetic patients undergoing renal transplantation were prospectively randomized to epidural anesthesia + general anesthesia (EG)group n=22, or general anesthesia (G) n=25. Haemodynamics and plasma levels of glucose, insulin, HOMA-IR, interleukin (IL)-6, tumour necrosis factor(TNF)- , resistine and adiponectin were measured at T1: baseline, T2: end of surgery, T3: postoperative 60th minute, T4: postoperative 120th minute, T5: postoperative 24th hour.
Results and Discussion: One factor that may decrease the enthusiasm for using EA+GA is the risks of potential hemodynamic instability that may compromise the newly transplanted organ but hemodynamic parameters were smiliar between groups (p>0.05). Glucose levels at T1 and insulin levels at T2 showed higher values in the G group compared to the EG group. Patients in EG group had a lower HOMA score at T1 and T2 when compared with the G group 1.3 ± 1.4 vs 2.2 ±1.9 (p=0.03) and 4.3± 2.7 vs 8.5±7.5 (p=0.015) respectively.
TNF-α levels at T4 and at T5 and IL-6 levels at T3 were significantly higher in the G group compared to the EG group. The TNF-α levels were significantly less at all postoperative time points compared to baseline only in the EG group (T1: 31.95 vs 37.25, T2: 17.88 vs 76.51, T3: 4.49 vs 78.26, T4: 10.26 vs 66.63, T5: 2.84 vs 36.32).
Hospital stay times were significantly shorter in the EG group (p=0.022).
Conclusion(s): In patients undergoing renal transplantation; general anaesthesia combined with epidural anaesthesia attenuates insulin resistance and cytokine activation when compared to general anaesthesia alone.

8AP1-4

Systematic review of intrathecal magnesium given alone or in combination with LAs and opioids

Morrison A.P., Banerjee A., Hunter J., Mackie C., Grassman C.
Royal Liverpool University Hospital, Department of Anaesthesiology and Intensive Care, Liverpool, United Kingdom

Background and Goal of Study: Duration of spinal analgesia can be prolonged by a number of additives. This meta-analysis explores the effect of adding intrathecal magnesium to the duration of spinal analgesia.
Materials and Methods: Randomized controlled trials (RCTs) on Medline and EMBASE with no year or language restrictions were sought using the following keywords and text words: intrathecal, magnesium, human. Bibliographies of relevant reviews and identified RCTs were searched. Published abstracts from anaesthesia meetings from 2000 to 2010 were reviewed. Unpublished data from Schoeffler et al for secondary outcomes was used with permission. Full manuscripts were rated for quality using the Jadad Scale.[1] RevMan statistical software® utilised inverse variance and random effect to calculate standardized mean difference (SMD) with 95% confidence intervals (CI) for continuous variables. The primary outcome was duration of analgesia (time from intrathecal injection to first analgesic request). Secondary outcomes were: postoperative analgesic consumption; onset of block; and time to maximal sensory block.
Results and Discussion: The search yielded 10 studies and two abstracts of RCTs including 688 patients published between 2002 and 2010 that met the inclusion criteria. The quality of the manuscripts ranged between 3 and 5 according to the Jadad Scale. The addition of intrathecal magnesium significantly prolonged the duration of spinal analgesia (Table 1). It was increased from 264.8 min (SD= 309.2) in controls to 408.5 min (SD= 472.3) with the addition of magnesium. Intrathecal magnesium significantly reduced postoperative analgesic requirements, but delayed onset and time to achieve the maximal height of sensory block.
Conclusions: Intrathecal magnesium prolongs duration of spinal analgesia and decreases postoperative analgesic requirements, but delays onset and time to maximal sensory block. Its use may be advantageous in elective cases where surgery is likely to be prolonged.

Outcomes	Number of studies/participants	Standardized Mean Difference and 95%CI	P-value
Duration of analgesia (min)	8/597	0.88 (0.00, 1.77)	0.05
Postoperative analgesic consumption (mg)	4/211	-1.50 (-2.76, -0.24)	0.02
Onset of sensory block (min)	4/285	-0.77 (-1.09, -0.45)	<0.00001
Time to maximal sensory block (min)	5/340	-0.53 (-0.99, -0.08)	0.02

[Summary of outcome measures]

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8AP1-5

Comparative efficacy of patient-controlled epidural analgesia (PCEA) and continuous epidural analgesia (CEA) in thoracotomy patients: A randomized controlled trial

Shyam V., Wilson R., Van Den Kerkhof E., Simchison B.L., Goldstein D., Murdoch J.A.
Queen's University, Department of Anaesthesiology, Kingston, Canada

Background and Goal of Study: Acute postoperative thoracotomy pain has traditionally been managed with a thoracic epidural catheter and continuous

epidural analgesia (CEA).[1] Patient controlled epidural anesthesia (PCEA) has been shown to be more effective than intravenous patient-controlled analgesia (PCA)[2] although, there is little research comparing PCEA to CEA for thoracotomy procedures. The goal of the current investigation was to determine the efficacy of perioperative CEA vs. PCEA for acute pain management following thoracotomy.

Materials and Methods: This was a prospective, randomized, single blinded study. Following institutional ethics approval and informed consent, 46 patients scheduled for thoracotomy were preoperatively sited with a thoracic epidural catheter. They were randomized postoperatively to receive epidural infusions of hydromorphone 10 mcg/mL + bupivacaine 1 mg/mL for 48 hours following surgery as either 1) PCEA or 2) CEA with sham PCEA settings. The CEA infusion rates were chosen as those achieving pain scores less than 3 in the recovery room (PACU). PCEA parameters were adjusted to allow an equivalent hourly dose. The primary outcome was consumption of local anaesthetic/opioids while the secondary outcomes included worst pain scores and pain while coughing, measured on a VAS scale. Scores for worst pain and pain while coughing were compared between treatment groups using binary logistic regression adjusted for time and age. Sample size was based on a 20% change in medication consumption ($p < 0.05$; $\beta = .0.8$).

Results and Discussion: PCEA was associated with non-significant ($p=0.89$) reductions in anaesthetic consumption (Mean±SD,mg - PCEA 24h:163±60, 48h:166±57 vs. CEA 24h:195±76, 48h:201±91). Scores for worst pain ($p=.09$) and pain while coughing ($p=.18$) were not significantly different but PCEA patients had a 2.3 ($CI_{95\%}=0.9\text{-}5.8$) greater odds of experiencing severe pain in general and 1.8 ($CI_{95\%}=0.9\text{-}4.5$) greater odds of experiencing severe pain while coughing. The trend towards reduced anaesthetic consumption with PCEA was consistent with that reported by others who also reported that CEA provides better pain control compared to PCEA in other surgical settings.[2]

Conclusion: This investigation suggests that PCEA does not provide any significant analgesic benefit over CEA in thoracotomy patients, and may result in higher pain levels.

References:

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2. Wu CL et al Anesthesiol 2005; 103(5):1079-88

8AP1-6

Predictors of difficulty in neuroaxial block: A prospective study

Garcia Alvarez M., Martí A., Rodriguez Prieto M., Villamor M., Martínez A., Moral M.V.
Hospital de la Santa Creu i Sant Pau, Department of Anaesthesiology, Barcelona, Spain

Background: Predicting technical difficulties in performing a neuroaxial block can influence the anesthesiologist's decision because multiple punctures increase the risk of postdural puncture headache, epidural haematoma, neural trauma and patient discomfort (1)

Our aim was to describe factors useful in predicting a difficult neuroaxial block (2,3)

Materials and Methods: We designed a prospective observational study in 539 patients undergoing spinal or epidural anaesthesia. For each block we recorded: patient's characteristics (age, gender, height, weight, body mass index, spinal anatomy) and technical features: patient's position (sitting/lateral decubitus), ability to flex the spine adequately (good/bad), quality of anatomical landmarks palpation (good/bad), morphology of the lumbar curvature (convex/rectilinear/concave), anaesthesiologist's experience (resident < 1 year's training/resident >1 years's training/anaesthesiologist). Our outcome was the degree of difficulty found in permorming the neuroaxial block classified as easy or difficult depending on the number of attempts needed to identify the right space and the need to change the provider or the interspace used before completing the puncture.

Predictive difficulty variables that were significant with univariate analysis (using Pearson X^2 or Fisher's exact tests were subjected to logistic multivariate stepwise regression analysis.

Results: Independent predictors (Odds ratio [95 % confidence limits]) of difficulty were the ability to flex the spine adequately (OR 3,40 [2,17-5,33]), anatomical landmarks palpation (OR 2,19 [1,36-3,53]) and morphology of the lumbar curvature (OR 2,06 [1,28-3,33]).

Conclusion(s): The ability to flex the spine, the anatomical landmarks palpation and the morphology of the lumbar curvature are independent predictors of a technically difficult neuroaxial block. Spinal anatomy and provider's level of training do not seem to be predictors of difficulty. Age and BMI were not variables statistically significants. Patient experience was worst in whom the neuroaxial block was difficult. Incidence of complications was very low, but were more frecuent in the difficut cases.

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8AP1-7

Extradural morphine, ketamine and droperidol for postoperative pain and nausea relieves following laparoscopic gynaecological surgery

Kobayashi M., Ando N., Mochidome M., Yoshiyama Y., Kawamata M.
Hata General Hospital of Matsumoto-City, Department of Anaesthesiology, Matsumoto, Japan

Background: Postoperative pain (PP), nausea and vomiting (PONV) are uncomfortable for patients (pts) undergoing laparoscopic gynaecological surgery (LGS). The practice of combining several drugs to administer anaesthesia may be safer than the use of only one or two drugs (1). In this study, we compared the postoperative outcome between two types of extradural anaesthesia (EDA) methods under total intravenous anaesthesia (TIVA).

Methods: After institutional approval and informed consent, 40 pts (ASA PS: I-II) scheduled for LGS were randomly allocated to the two groups (each 20 pts). EDA was performed at the T11-12 or T12-L1 interspace with 3 mg morphine and 1 mL normal saline in 9 mL of 0.75% ropivacaine (Group MR) or with 3 mg morphine, 5 mg ketamine and 1.25 mg droperidol in 9 mL of 0.75% ropivacaine (Group MKDR). After single bolus dose of EDA, general anaesthesia was induced. Pain intensity by the verbal rating scale (VRS) was assessed every three hours during the first 24 hrs and every six hrs during the next 24 hrs postoperatively. PONV was assessed by the dose of antiemetics. Data were analyzed with Chi-squared test and Mann-Whitney U test; $p < 0.05$ significant. Data are means +/- SD.

Results: The demographic data were similar both groups. No pt had ECG changes. VRS in MKDR was higher than in MR in just arrival to the ward(0 hr), three and 15 hr postoperative periods ($p=0.2\text{-}0.7$). In six to twelve hrs and 18 to 48 hrs postoperative period, VRS in MKDR were lower ($p=0.2\text{-}0.7$). Every mean VRS was below 3. Pt's number of PONV in MR was 14 (70%) and that in MKDR were 6 (30%) (Chi-square =4.9; $p < 0.05$).

Discussion: Morphine, low lipid solubility opioid, diffuses readily in cerebrospinal fluid and is effective for relief of post-LGS pain. Ketamine, adminsterd by the extradural route, affects NMDA receptor in the dousal horn and should be able to produce analgesia. Ketamine is high lipid solubility and its half-life value is about three hours. Analgesic action of ketamine may, therefore, be weakened in the postoperative time. Droperidol is effective for PONV when used in low doses. QTc prolongation, however, was reported (2). In this study, no ECG change has shown.

Conclusion: Pre-incisional single bolus dose of EDA with morphine, ketamine, droperidol and ropivacaine under TIVA in LGS was more effective than that with morphine and ropivacaine in preventing PONV.

References:

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8AP1-8

Sex related differences of patient-controlled epidural analgesia (PCEA) requirements: A prospective analysis of 14988 patients

Schnabel A., Poepping D.M., Gerß J., Zahn P.K., Pogatzki-Zahn E.M.
University Hospital Muenster, Department of Anaesthesiology and Intensive Care, Muenster, Germany

Background and Goal of Study: There is an ongoing discussion about gender related differences in pain perception and analgesic consumption following surgery during the last years. Although some evidence demonstrated a lower morphine requirement for women require compared to menn in the early postoperative period, there are conflicting results about differences in pain intensity and pain processing. Aim of the present analysis was to assess gender specific differences of PCEA requirements and to evaluate possible prognostic factors influencing local anaesthetic and opioid consumption.

Materials and Methods: Our prospective cohort study enrolled all patients receiving a PCEA (bupivacaine, sufentanil) for about five days following major surgery from January 1998 till December 2009 at our institution. Demographic data (gender, height, weight, age, surgical site), postoperative measurements including analgesic requirement (ml) at each treatment day and complications were recorded. All statistical analyses were performed using PASW Statistics (18.0). Beyond standard descriptive analyses, gender related differences were investigated using a stepwise multivariate ANOVA (analysis of vari-

ances). In particular, possible interactions of patients' gender with additional prognostic factors (age, surgical site, body mass index (BMI), vomiting) were examined.
Results and Discussion: We included 14988 patients and analysed the mean analgesic PCEA requirements for women (n=6506) and men (n=8482). All demographic data (height, weight, age, surgical site) showed a different distribution between women and men (P< 0.05). The comparison of mean analgesic requirements between women and men showed a lower required mean volume in women at each day of the pain treatment (relative reduction by 1.7-10.2% compared to men). (P=.00) A stepwise multivariate analysis of possible prognostic factors influencing gender related differences in PCEA requirements showed that the factor gender did not interact with surgical site (abdomen, thorax, extremity) (P=.379) and age (< 50, 50-75, >75) (P=.330), but was influenced by BMI (P=.017) and vomiting (P=.011).
Conclusion(s): In the present study, considerable evidence demonstrates a significant lower patient-controlled neuroaxial local anesthetic and opioid requirement for women compared to men following major surgery. Gender differences were influenced by BMI and vomiting, but not by age or surgical site.

8AP1-9

Extraneural versus Intraneural injection of local anesthetic during ultrasound-guided sciatic block

Baciarello M., Franco N., Perrotta M., Sacchetti C., Cerati G.
University Hospital Parma, Department of Anesthesiology,Intensive Care and Pain Medicine, Parma, Italy

Background: It has recently been shown that the use of NS does not prevent intraneural injection of local anesthetic, which occurs in 43%-66%, depending on criteria used to diagnose it. These are the data from a pilot study, aimed to compare perineural versus intentional partially-intraneural injections for sciatic nerve block.
Methods: We enrolled patients scheduled for leg or foot surgery who had indication to anesthetic sciatic nerve blocks.Patients were then kept supine: the operative leg was raised from the bed with a prop,with both the hip and knee joint flexed to about 90°.A linear,12-MHz ultrasound transducer was then applied to the posterior aspect of the thigh,and the sciatic nerve imaged as cranially as possible,or until the posterior cutaneous nerve of the thigh was clearly visible;the local anesthetic (LA;0.75% ropivacaine,30 mL) was injected either all around the nerve (group R:ring) or within the nerve (group I:intraneural);only the first 5 mL of LA were injected intraneurally,with the remaining volume being distributed circumferentially. We analyzed the onset time of sensory block (with ice and pinprick test),as well as that of motor block, and the duration of both levels of blockade postoperatively. The time to the first request for analgesic was also noted.Patients were examined for possible neurological deficits at 1 and 7 days postoperatively.
Results: Our data suggest a clinically relevant difference in both onset and regression times,especially success rate of motor block at 30 minutes and duration of anesthesia.No neurological sequelae were noted on follow-up.Sample power computations will assume a the minimum onset time in group R of 12 minutes for the common peroneal nerve and a maximum median onset time for group I of 5 min. (tibial or peroneal nerve), with a common standard deviation of 10 min. At least 50 patients will have to be enrolled in each group for 95% power and 0.05% risk of type I error,in order to detect such difference between groups.
Conclusions: Our very preliminary data suggest a significant difference in onset and recovery times between perineural and partially-intraneural injections for sciatic nerve block, the latter value being of potentially high clinical relevance:

	Group Donut (n=5)	Group Intraneural (n=5)
Onset of Sensory Block, tibial (min)	19 (3-19)	5 (5-5)
Onset of Sensory Block, peroneal (min)	12 (8-21)	5 (5-5)
Motor Block Success≤30 (n)	1	4
Regression (min)	780 (287-1080)	945 (698-945)

[Tab.1:Data presented as median,except success rate]

8AP2-1

May impedancemetry help to diagnose accidental nerve puncture during ultrasound-guided nerve block?

Bardou P., Béchonnet G., Nathan-Denizot N., Beaulieu P.
CHU - University of Limoges, Department of Anaesthesiology, Limoges, France

Background: Performing peripheral nerve blocks requires precise placement of needles as close as possible but not within nerves to avoid nerve injury. Currently, no nerve localization or monitoring technique has been shown to be clearly superior to reduce the frequency of nerve injury.
The goal of this study was to assess if a rise in electrical impedance (EI) was associated with intraneural needle tip placement. Secondly, we tried to establish a threshold in EI variation that would diagnose nerve puncture with good sensitivity and specificity.
Materials and Methods: We conducted a prospective observational trial between January and May 2010. EI measurements during 158 peripheral nerve blocks were collected. Nerve puncture suspicion was present if at least one of the following signs occurred during block performance: pain or paresthesia in the sensory territory of the targeted nerve, stimulating current < 0.4 mA, visualization of the needle tip inside the nerve or nerve swelling after injection. We compared EI variations between patients with or without suspicion of intraneural puncture. Furthermore, receiver operating characteristic (ROC) curves were constructed from data obtained in an independent group of patients from 86 nerve blocks.
Results: Suspicion criteria of nerve puncture were observed in 18 of the 158 nerve blocks performed. EI variations between *suspected* and *no nerve puncture* groups were significantly different (+15.6% ± 32.6 and -8.6% ± 24.7), respectively; p < 0.001). The area under the ROC curve was 0.680 (95%CI = 0.601 - 0.752 ; p = 0.01). An EI variation threshold of +15% allowed the diagnosis of accidental nerve puncture with sensitivity and specificity of 33.33 and 90.71%, respectively. However, when comparing this threshold value with currently available nerve puncture suspicion signs, poor concordance was found (kappa coefficient 0.029).
Discussion: To our knowledge, this is the first human study that confirms that a rise in EI is associated with intraneural needle tip placement since EI variations were higher when nerve puncture was suspected than when it was not. However, we failed to determine a threshold associated with nerve puncture.
Conclusion: Nerve stimulators allow accidental nerve puncture diagnosis by displaying electrical impedance variations.
Further work is needed to standardize EI measurements and to establish a cut-off value that would diagnose intraneural needle placement with good sensitivity and specificity.

8AP2-2

Optimal volume of ropivacaine for ultrasound-guided retrograde infraclavicular brachial plexus block

Liao J., Zhang X.
Beijing Jishuitan Hospital, Department of Anaesthesiology, Beijing, China

Background and Goal of Study: Brachial plexus block (BP block) via retrograde infraclavicular approach has been proved effective, safe and feasible with less adverse effects and complications as compared with the interscalene and supraclavicular approaches[1].
The aim of this study was to determine the medium effective volume required to produce an effective retrograde infraclavicular BP block using an ultrasound (US)-guided technique[2].
Materials and Methods: Thirty adults undergoing elective upper limb surgery received an US-guided retrograde infaclavicular BP block. The initial concentration of 0.5% ropivacaine injected was 36 ml, which was subsequently varied at a ratio of 1: 1.2 for each consecutive patient according to the response of the previous patient. The medium effective volume (EV50) was determined using the Dixon and Massey up-and-down method[3]. The effective volume in 95% of patients (EV95) was calculated using probit regression[4].
Results and Discussion: The medium effective volume and calculated effective volume in 50% and 95% of patients were 23.6 ml (95% confidence interval, 21.3-26.2 ml) and 32.3ml, respectively.
No patient required a general anesthetic. The result showed that the calculated volume of ropivacaine required for US-guided retrograde infraclavicular block was similar with the conventionally recommended volume for supraclavicular or interscalene approach.
Conclusion: The appropriate volume of 0.5% ropivacaine required for US-guided retrograde infraclavicular BP block was 30ml in clinical practice.
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8AP2-3

Echoguided transversus abdominis plane block and postoperative pain control in pediatric anesthesia

Galante D., Meola S., Matrella P., Rinaldi N., Lambo M.
University Hospital Ospedali Riuniti, Department of Anaesthesiology and Intensive Care, Foggia, Italy

Background: The transversus abdominis plane block (TAP) is a recently described peripheral nerve block for the sensory nerves in the triangle of Petit before they exit transversus abdominis neuro-fascial plane. This technique offers a potential advantage over the rectus sheath and ilioinguinal/iliohypogastric nerve blocks thanks to a complete anterior abdominal wall block. In adults it has been shown to reliably decrease postoperative pain scores and opioid requirement in patients undergoing large bowel resection via midline abdominal incision and in women after cesarean delivery performed through a Pfannenstiel incision. In our study we demonstrated that ultrasound TAP block (1) was safe and efficacious in pediatric population for unilateral inguinal hernia and hydrocele repair together with a reduction in postoperative pain and analgesics requirements.
Methods: 46 children (26 males, 20 females) ASA 1 - 2, 1-10 years old, 9-53 kg, sheduled for unilateral inguinal hernia and hydrocele repair were enrolled in this study after informed consent of parents and IRB approval. Under general anesthesia induced with propofol or sevoflurane and maintained with laryngeal mask airway in a mixture of air/O2/sevoflurane all the patients received echoguided TAP Block before surgery. TAP block was performed under real-time ultrasonographic guidance with 0.30 cc/kg of levobupivacaine 0.25%. Muscle relaxants and opioids were not administered.
Results: All blocks were successfull and no patient required any analgesics as rescue in postoperative period. Surgeons found that muscular relaxation was similar to that observed after the use of neuromuscular blocking agents. The mean duration of postoperative parietal analgesia (time for first analges rescue), evaluted by CHIPPS scale, was 15±2 h. Children had excellent post-operative comfort (moving, coughing, playing and laughing). No complication associated with this ultrasound technique was recorded.
Conclusions: Ultrasonography-guided TAP block in pediatric patients are easy to perform, provides consistent post-operative/intraoperative pain relief and may represent an alternative for epidural/caudal anesthesia.
References:
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8AP2-4

High incidence of nerve puncture in perivascular femoral block: Ultrasound study

Ruiz A., Sala X., Carretero M.J., Martinez-Ocón J., Hurtado P., Sanchez-Etayo G.
Hospital Clínic de Barcelona, Department of Anaesthesiology, Barcelona, Spain

Background and Goal of Study: The classic technique for femoral nerve block guided by a nerve stimulator is one of the most used ones, due to the high efficacy and simplicity of the technique. Our hypothesis suggests that this technique has a high incidence of neural puncture related to the elastic resistance of the iliac fascia when it is perforated by the needle.
Materials and Methods: Ultrasound-guided femoral nerve block was performed in 47 ASA I-III patients with hip fracture, before sitting the patient for the spinal anesthesia.The patients were randomised in two groups depending on the block technique:On the "out of plane" group (OOPG; n:20), the needle was introduced 1cm in caudal plane to the middle point of the ultrasound probe just above the femoral nerve, with a 45 to 60º angle, until you see and fell the needle crossing the iliac fascia. On the "in plane" group (IPG; n=20), the needle was introduced 0,2-0,4cm from the external margin of the probe and introduced through the tissues to the lateral side of the femoral nerve when the iliac fascia was crossed.The depth of the needle after the fascia crossing, the response to the stimulator nerve, the distribution of the injected volume in relationship with the nerve and the clinical effect 20 minutes and 24 hours after the blockade were determinate in our study.
The size of the sample was estimated in 44 patients, identifying an incidence of 35% neural punctures.T student test were applied for independent samples and Chi-square test when precise.
Results and Discussion: A total of 47 patients were included, 16 men and 31 women, mean age of 78±9, mean body weight 66±10Kg and mean high 165±6 cm.
The groups were homogeneous for anthropometrics parameters, ASA and proceedings done. The incidence of nerve puncture and/or the location of the needle posterior to the nerve was significantly higher in the OOPG group (14 patients-56%, vs 2 patients-9%; $p < 0.01$). On the OOPG Group, the parestesia incidence was significantly higher when the needle crossed the nerve (80% vs 40%; $p < 0.05$). Our study suggests that the femoral nerve puncture is frequent when the introduction of the needle is being done on top of the nerve, as has been performed for years with the classic technique using the stimulator nerve. The insertion of the needle and the crossing of the iliac fascia laterally to the nerve done in the iliofascial technique is going to minimize the risk of nerve damage with a similar efficacy

8AP2-5

Minimum local anesthetic dose for obturator nerve block using ultrasound guidance

Kodaka M., Endo N., Nishiyama K., Komori M.
Tokyo Women's Medical University Medical Center East, Department of Anaesthesiology and Intensive Care, Tokyo, Japan

Background and Goal of Study: We hypothesized that ultrasound guidance reduces the minimum effective anesthetic volume ($MEAV_{50}$) of 2% lidocaine needed to block the obturator nerve compared with nerve stimulation guidance alone.
Materials and Methods: After receiving IRB and written informed consent, 24 patients undergoing transurethral resection of bladder tumors were allocated randomly to receive obturator nerve block (ONB) using a nerve stimulator with (US group, $n=12$) or without echo guidance (Control group, $n=12$). First, we administered 0.5% hyperbaric bupivacaine 2.5 ml as a subarachnoid block (SAB) at L2/3 or 3/4 for both groups.
For the US group, the injected lidocaine volume was varied for consecutive patients based on a modified Dixon's up-down method[1] according to the response of the prior patient. The initial volume was 4 ml. Double-blinded observers evaluated adductor muscle contraction. Positive or negative responses within 5 min after the injection determined a 0.5 ml decrease or increase for the subsequent patient.
Two predetermined stopping points were used: a minimum of five consecutive block success/failures, and five consecutive successful blocks at 1 ml for ONB. For the control group, the volume of the agent was evaluated using a nerve stimulator (initial 3 mA and minimum 0.5 mA, 1Hz) in a usual manner without up-down method. We also measured the time from the end of SAB to the ONB finished. The parametric data were analyzed using Student t-test. We inferred that $P < 0.05$ was statistically significant.
Results and Discussion: The study of the US group was terminated when five patients had successful block using 1 ml of 2% lidocaine. The mean (SD) $MEAV_{50}$ for ONB was 11.1(3.6) ml in the control group and 1.8(1.0) ml in US group ($P < 0.0001$). The mean times (SD) from SAB to the end of ONB were, respectively, 12.3(6.9) and 11.2(5.8) min ($P=0.68$). Brain et al.[2] reported that the minimum dose for successful axillary block using echo was 1.0 ml. As described herein, the minimum dose for successful ONB using echo is 1.0 ml as well.
Conclusion(s): We determined the minimum effective anesthetic volumes ($MEAV_{50}$) of lidocaine 2% needed to block the obturator nerve with and without echo guidance. The mean $MEAV_{50}$ in control was 11.1 ml, reduced to 16.2% using echo guidance.
References:
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8AP2-6

Comparison of a simplified ultrasound-guided technique with classical nerve stimulation for continuous lumbar plexus block: A randomized, assessor-blind, controlled trial

Baciarello M., Danelli G., Perrotta M., Cerati G., Sacchetti C., Dallospedale A.
University Hospital Parma, Department of Anaesthesiology, Parma, Italy

Background and aims: Ultrasound (US) guidance is now commonplace in most peripheral nerve block procedures.
However, US guidance in lumbar plexus block (LPB) remains challenging for many anesthesiologists.The aim of this study is to compare a simplified US-guided technique with a classical nerve stimulator (NS) technique.This is a preliminary analysis of the first 100 cases.
Materials: Patients undergoing elective total hip replacement were enrolled with informed consent if scheduled for spinal anesthesia. Patients were randomly allocated to receive a continuous LPB under US (n=50) or NS (n=50) guidance, using 1.5% mepivacaine 20 ml. In the US group, the needle tip was sited between the L4 and L5 transverse processes, 2 cm within the psoas muscle. For the NS group, we followed the approach described by Capdevila

et al. In both groups, the catheter was advanced 2 cm beyond the needle tip. All patients underwent spinal anesthesia. After surgery, a patient-controlled infusion of 0.125% at 8 ml/h with 2 ml boluses available every 20 min was started. Procedural complications were recorded. Morphine 5 mg IM was available as rescue analgesic. Radiograms were taken after contrast injection through the catheter; satisfactory injectate spread was defined as success. Pain was evaluated until 48 h postoperative, and is presented as the area under the curve (AUC) of numerical ratings (NRS) over time.

Results: Data was available for 99 patients. Success rates did not differ significantly between the US and NS group:75% vs. 62% (p=0.27), with similar distributions of ranking (p=0.51). Catheter placement time was significantly shorter in the US group [4 (3-6) min] with respect to the NS group [7 (6-9) min] (p< 0.01). The risk of minor complications was also reduced with US guidance (table 1).

We recorded no significant difference in pain up to 48 h postoperatively: median AUC_{NRS} at rest were 133 (110-157) in group NS and 133 (111-156) in group US (p=0.88).

Conclusions: Ultrasound guidance allowed for faster, less complicated LPB. These preliminary data show comparable efficacy between the techniques.

Variable	Group NS (n=50)	Group US (n=50)	p
Needle Redirections (n)	4 (2-5)	2 (2-2)	0,002
Total Punctures (n)	1 (1-2)	1 (1-1)	<0,001
Blood Aspiration (n)	11 (23)	3 (6)*	0,021
Incidence of Paresthesiae	9 (19)	2 (4)**	0,032
Procedural Pain (NRS)	4 (3-5)	3 (2-4)	0,029

[Tab. 1: Procedural Characteristics]

*RR 0.26(0.08-0.88) OR 0.21(0.06-0.83);**RR 0.21(0.05-0.93) OR 0.18(0.04-0.89).

8AP2-8

Effect of age on anaesthetic volume for ultrasound guided supraclavicular brachial plexus block

Tomulic K., Pavicic Saric J., Acan I.
Clinical Hospital Merkur, Department of Anaesthesiology and Intensive Care, Zagreb, Croatia

Background and Goal of Study: The minimum volume required for effective ultrasound guided supraclavicular brachial plexus block (US-SCB) in 50% of patients is 23 ml, and in 95% of patients is 42 ml[1].

The aim of study was to determine whether a 35 % reduction in anaesthetic volume of levobupivacaine in elderly patients (>70 years), due to involutive changes of brachial plexus (BP) assessed by measuring the cross-sectional area (CSA) of BP at the first rib, could accomplish an effective US-SCB for surgical anaesthesia in comparison with the control group (< 45 years).

Materials and Methods: In this prospective, double-blind study 15 elderly patients undergoing upper limb surgery received a US-SCB with 27 ml of levobupivacaine, based on our previous clinical experience, whereas the control group (N=15) received 42 ml. Prior to the injection three measurements of the cross-sectional area (CSA) of BP were obtained and the mean was considered for the statistical analysis. Effective SCB was defined as complete sensory blockade in the distribution of the radial, ulnar, median and musculocutaneous nerve.

Time to first postoperative analgesic request was recorded. Normal distribution of the variables was assessed using Kolmogorov-Smirnov test. Data are expressed as means ± standard deviations and Student's t-test was used. Values of P< 0.05 were considered statistically significant.

Results and Discussion: The mean age in elderly group was 80.60 (6.82) years and 42.73 (2.60) in the control group.

Patients were comparable in terms of weight, height and duration of surgery. CSA of BP was 0.60 (0.08) cm^2 in elderly and 0.91 (0.13) cm^2 in the control group with significant difference (P< 0.001).

Effective US-SCB was achieved in 14 patients in each group.One patient (elderly group) had incomplete anaesthesia in the radial nerve, the other (control group) in the ulnar nerve distribution and had received supplemental local anaesthetic.Time to first analgesic request was 506 (335) minutes (elderly group) and 575 (255) minutes (control) with no significant difference (P=0.532).

Conclusion: A 35% reduction in anaesthetic volume in elderly patients resulted in a effective US-SCB. CSA of BP was smaller in elderly patients.

References:

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8AP2-9

Ultrasound-guided axillary vs infraclavicular block for upper extremity surgery: Preliminary results

López Morales S., Moreno Martin A., Morgado Muñoz I., Fernandez Carrión J.M., Rodriguez Huertas F.
Hospital de Jerez, Department of Anaesthesiology and Pain Medicine, Jerez de Frontera, Spain

Background and Goal of Study: This prospective, randomized study compared ultrasound guided Axillary (AB) vs ultrasound-guided Infraclavicular (IB) Brachial Plexus Block for upper extremity surgery of the elbow, forearm, wrist and hand

Materials and Methods: Forty patients were randomly allocated to receive an ultrasound-guided AB (n = 20), or IB (n = 20) using the double bubble sign. All blocks were performed under ultrasound guidance performance time (defined as the sum of imaging and needling times). The main outcome variable was the total anesthesia-related time, defined as the sum of performance and onset times. Subsequently, a second observer recorded the onset time, block-related pain scores, success rate (surgical anesthesia), analgesia duration and the incidence of complications.

Results and Discussion: No differences were observed between the two groups in terms of total anesthesia-related time, performance time, success rate (90%-95%), and block-related pain scores. Compared with the infraclavicular approach, ultrasound-guided AB required longer onset time (9,2 vs 5,9 min). However, infraclavicular blocks were associated with a longer analgesia duration (13.7 hrs vs 19.8 hrs). No complications were observed.

Conclusion(s): Compared to ultrasound-guided axillary block, ultrasound-guided infraclavicular block provided a similar efficacy, a shorter onset time and long lasting analgesia.

References:

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8AP2-10

Validation of a clinical assessment tool for ultrasound guided axillary brachial plexus block

Sultan S.F., Iohom G., Shorten G.
Cork University Hospital, Department of Anaesthesiology and Intensive Care, Cork, Ireland

Introduction: Use of ultrasound (US) guidance for peripheral nerve blockade requires intensive formal training. Optimal training in procedural skills requires valid and reliable forms of assessment. Competency in anaesthesia traditionally has been determined subjectively in practice. Objective assessment tools may improve these evaluations.

Objectives: To validate a Clinical Assessment Tool (CAT) for Ultrasound Guided Axillary Brachial Plexus Block (UgABPB) in a clinical setting for construct validity.

Methodology: This was a prospective observational study. A checklist for UgABPB was developed using prior work at our institution

A 63 point task specific check list and a generic GRS with anchors was used as part of the CAT.

After institutional ethical approval, informed consent was obtained from 15 anaesthetists and 30 patients. The anaesthetists belonged to one of three groups. Group 1 were novices (< 10 UgABPB), group 2 were intermediates (50 - 80 UgABPB) and group 3 were experts (>100 independent UgABPB). All participants were supervised by an expert and provided with a trained assistant. Each participant performed two consecutive UgABPB which were videotaped.

Two independent experts who were blinded to the level of the expertise of the participant and who had been trained in the marking of the GRS and Task Specific Checklist evaluated the videotapes.

Results: Both the checklist scores and the GRS were non-normally distributed therefore the median scores per group were analyzed using non-parametric tests.

For the checklist, when the expert group was tested against the intermediate group median p=0.023; expert group against the novice group median gave p< 0.001; intermediate group against the novice group median gave p=0.019. For the GRS, when the expert group was tested against the intermediate group median p< 0.001; the expert group against the novice group median gave p< 0.001; the intermediate group against the novice group median gave p=0.023.

Interclass correlation (ICC) in between assessors for the check list was 0.842 p< 0.001 and for GRS was 0.795 p < 0.001. hence assessments were reliable.
Conclusion(s): The results of this study indicate that an objective task specific checklist and global rating scales are valid and reliable measures of the performance of UgABPB and can discriminate between different levels of expertise.
References:
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8AP3-1

An improvised pressure guage for regional nerve blockade/ anaesthesia injections - an initial study

Patil J.J., Ankireddy H.S., Wilkes A.R., Lim M.W.
University Hospital of Wales, Department of Anaesthesiology, Cardiff, United Kingdom

Background and Goal of Study: Inadvertent intra-neural injection of local anaesthetic during peripheral neural blockade is associated with permanent nerve injury. This risk can be minimised by measuring and limiting injection pressure. Currently available pressure limiting devices have been shown to be effective but may be expensive. We improvised a pressure monitoring system from commonly available clinical components. The aims of the study are to determine the clinical usefulness of our improvised system and the target group of professionals for its use.
Materials and Methods: A 3-way stopcock connects an empty extended 1-ml syringe (S) and the syringe containing local anaesthetic injectate (L). Pressure on L compresses the gas volume in S **(Boyle's law)**. The danger pressure of 69 kPa (as determined from animal studies) that should warn of intra-neural injection is indicated by the fluid meniscus level at 0.47ml mark. After local ethical board approval, we recruited forty anaesthetists and anaesthetic assistants. In phase 1, 20 anaesthetists (group 1) and 20 anaesthetic assistants (group 2) were invited to apply pressure to syringe L on three separate occasions. The fluid meniscal levels were recorded and converted to equivalent pressures. In phase 2, we attached our system during the clinical performance of regional blocks and conducted a survey of 8 practioners about the usefulness of our system. Statistical methods included repeated measures ANOVA and chi-squared tests.
Results and Discussion: Intra-individual **(p=0.072)** and intra-group **(p=0.49)** variabilities were not statistically significant. However the inter-group variability was statistically significant **(p=0.027; mean pressures: anaesthetists=51kPa, anaesthetic assistants=80kPa)**. Participants in both the groups (group 1: 5/20; group 2: 8/20) exceeded the threshold of 69kPa. Our survey showed that the pressure measurements were easily visualised and helpful. 6/8(75%) indicated that our device did not interfere with the clinical procedure and would use it again frequently. A 1ml syringe was used as the fluid meniscus is maintained independent of syringe orientation. We were unable to calibrate it against pressure transducers which were too sensitive to baseline drift.
Conclusion: The "syringe feel" method for injection pressure perception is unreliable. Our improvised system is readily available, easily assembled, clinically useful and a training resource.

8AP3-2

Estimation of the ED_{95} dose of 0.5% bupivacine for the ultrasound guided supraclavicular brachial plexus block using the Continual Reassessment Method

Kant A., Gupta P., Zohar S., Hopkins P.
Leeds General Infirmary, Department of Anaesthesiology and Intensive Care, Leeds, United Kingdom

Background and Goal of Study: Dose finding studies have yet to identifty any credible ED_{95} dose for brachial plexus blocks. We have used the Continual Reassessment Method **(**CRM), already established in oncology drug trials, to find an estimate for the ED_{95} dose of 0.5% bupivacaine for the supraclavicular brachial plexus block.
Materials and Methods: This double blind, prospective dose finding trial was scheduled for 40 ASA1-3 patients presenting for elective upper limb surgery and supraclavicular block. Based on a pilot phase of this trial involving 8 patients,[1] we anticipated that the ED_{95} to be between 21 and 35 ml. We divided this range into six dose levels (21, 24, 27, 30, 33 and 35 ml) to be available within the study and assigned *a priori* probabilities of successful block of 0.8, 0.87, 0.93, 0.95, 0.98 and 0.99 respectively to these levels. The CRM program created an updated dose-response curve that subsequently shifted direction dependent on the success or failure of the block on each cohort of patients (2 patients per cohort). Our starting dose was 30 ml. The allocated dose to the next cohort of patients was re-estimated by the study statistician using the CRM program to be the dose level with the updated (posterior) response probability closest to 0.95.

Results and Discussion:

Cohort number	Dose level (ml)	Outcome of block, (S = Success, F = Fail)
-	35	-
-	33	-
1, 2, 3	30	(SS) (SS) (SS)
4, 5, 11, 16	27	(SS) (SS) (SS) (SS)
6, 7, 8, 9, 12, 13, 14, 15	24	(SS) (SS) (SS) (SS) (SS) (SS) (SS) (FS)
10	21	(FS)

[Results of block outcome for each dose level]

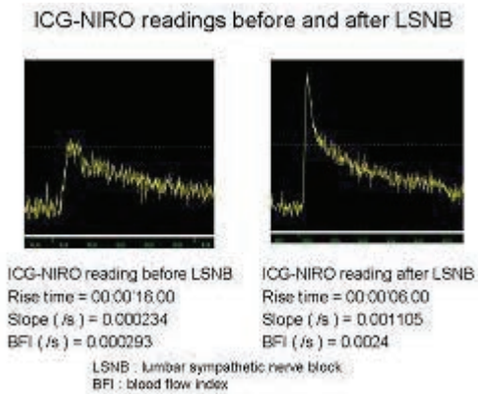
We have recruited 32 of 40 patients with dose level and outcome of block presented in the table. The current estimate of the ED_{95} is 27 ml. Completion of the trial may produce a minor modification to this estimate and will also enable confidence limits to be calculated.
Conclusion: In addition to estimating the ED_{95} dose for this block our study will guide the design for future local anaesthetic dose-finding trials using the CRM.
References:
1. Kant A, Gupta PK, Zohar S, Hopkins PM. Use of the continual reassessment method to estimate the ED_{95} dose of 0.5% bupivacaine for ultrasound-guided supraclavicular brachial plexus block. *BJA* 2010 in press.
Acknowledgement: This study was funded by a grant from the Association of Anaesthetists of Great Britain & Ireland through the National Institute for Academic Anaesthesia.

8AP3-3

Can we evaluate the effectiveness of sympathetic nerve block with ICG-NIRO™ and PDE™ ?

Mizuno K., Igarashi H., Takagi Y., Taniguchi M., Sato S.
Hamamatsu University of Medicine, Department of Anaesthesiology and Intensive Care, Hamamatsu, Japan

Background and Goal of Study: NIRO™ and PDE™ (Hamamatsu Photonics Inc. Hamamatsu, Japan) have been developed to monitor tissue circulation. ICG-NIRO™ evaluates tissue circulation optically, based upon the light absorbance after systemic injection of indocyanine green (ICG). PDE™ can also be used to evaluate tissue circulation based upon the fluorescence emitted after ICG injection. We evaluated the effectiveness of lumbar sympathetic nerve block (LSNB) with ICG-NIRO™ and PDE™.
Materials and Methods: We collected data from three cases that exhibited severe symptoms of ischemia in their legs. We performed LSNB with a local anesthetic followed by thermo-coagulation. In each case, we blocked two of the sympathetic nerve ganglia on one side. We collected the data just before and five minutes after each blockade. After intravenous injection of 1.25 mg ICG, we observed changes of light absorbance of ICG with NIRO™ with probes placed on the both gastrocnemius muscles in each patient, and simultaneous changes of fluorescence light intensity on their soles with PDE™.



[Figure]

Results and Discussion: In each case, we observed apparent change of skin temperature, increase of light absorbance of ICG with NIRO™ (Figure) and increase fluorescence emission with PDE™ after blockade of the 1st ganglion.

After blockade of the 2nd ganglion, although the changes of skin temperature were obscure, we again observed apparent changes with ICG-NIRO™ and PDE™.
Conclusion: We found that both ICG-NIRO™ and PDE™ were useful in evaluating the effectiveness of LSNB, especially in the second blockade. Even when it was difficult to observe changes in skin temperature, these approaches were able to optically detect the apparent change of blood flow.
References:
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8AP3-4

Early inadequate sensory blockade predicts the need for supplemental ‚top up' following infraclavicular block

Jones W.W., Eyre L.R., Berrill A., Caldicott L.F.
Leeds General Infirmary, Leeds University Teaching Hospitals Trust, Department of Anaesthesiology, Leeds, United Kingdom

Background and Goal of Study: Speed of block performance, block success and fast onset time[1]are key issues in regional anaesthesia. Achieving adequate surgical anaesthesia may require local anaesthetic ‚top up'. An observational pilot study was conducted to assess whether early testing of sensory blockade could predict the need for supplemental local anaesthetic block.
Materials and Methods: Following ethical approval, a total of 54 patients underwent infraclavicular block for hand surgery. Correct position of the block needle was confirmed by the presence of wrist/finger extension at a stimulating current of < 0.5mA. A 50:50 mixture of 2% lidocaine with adrenaline and 1% prilocaine was used. Sensory block of the forearm was tested for presence/absence of sensation to cold (ethyl chloride spray) in the lateral and medial cutaneous nerve of forearm, ulnar, median and radial nerve territories. Sensation was assessed in the 5 nerves at 15 and 30 minutes post block. Local anaesthetic top up was performed as necessary following test of block at 30 minutes.
Results and Discussion: 12 patients required supplemental local anaesthesia for inadequate sensory block at 30 minutes. Failed sensory blockade in 3 or more of the 5 cutaneous innervations could be demonstrated in 11 of the 12 top-up patients at 15 minutes, compared to 4 of the 42 non top-up patients. At 30 minutes 6 out of the 12 patients requiring ‚top-up' still had inadequate anaesthesia in 3 or more distributions (Table 1). All patients proceeded to have their surgery successfully under regional anaesthesia. If sensory block was inadequate at 15 minutes in an individual nerve distribution only 49% of these achieved adequate surgical anaesthesia at 30 minutes.

	Number of patients	3+ „missed" nerves at 15 minutes	3+ „missed" nerves at 30 minutes
Top up needed	12	11	6
No top up needed	42	4	0

[Table 1]

Conclusion: This pilot study has demonstrated that it is possible to detect patients who require supplemental local anaesthesia following infraclavicular block at an early stage. Given the low rate of conversion to adequate surgical anaesthesia if sensory blockade at 15 minutes is insufficient, we recommend early consideration of ‚top-up' blocks in those patients with large cutaneous areas of "missed" block to facilitate patient satisfaction and list efficiency.
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8AP3-5

The effects of different anesthesia techniques on free radical production after diagnostic peritoneal lavage in pigs

Papakitsos G., Kapsali A., Papakitsou T., Donta I., Perrea D., Papadimitriou L.
University of Athens, Medical School, Research and Development Department, Arta, Greece

Background and Goal of Study: Skin incision for diagnostic peritoneal lavage (DPL) leads to injuries mediated by reactive oxygen species. The aim of the study was to investigate the effects of different anesthesia techniques on oxidative stress caused by skin incision for DPL in pigs.
Materials and Methods: The study included 30 health Landrace pigs, weight 19+/- 2kg, undergoing DPL. The pigs were randomized into two groups of 15 each: general inhalational anesthesia with isoflurane and propofol (group S) and regional anesthesia (group R). Venous blood samples were obtained at three time points: before induction of general anesthesia (baseline), after general or regional anesthesia and after DPL. Skin incision injury was estimated by measurement of concentration of ImAnOx in plasma as well as PerOx activity.
Results and Discussion: Plasma ImAnOx in the group S was significantly higher after general or regional anesthesia in comparison with the group R (6.78 +/- 0.33 micromolL-1 vs. 4.07 +/- 1.53 micromolL-1). Although not statistically significant, PerOx activity was slightly increased as compared to baseline in both groups S and R. In the group R, PerOx activity decreased at all time points when compared with baseline, but the observed decrease was only statistically significant after DPL (3.70 +/- 1.27 vs. 5.69 +/- 1.29 micromolL-1, $p < 0.05$).
Conclusion: Continuous propofol infusion and regional anesthesia techniques attenuate lipid peroxidation and skin incision injury connected with diagnostic peritoneal lavage in pigs.

8AP3-6

Effect of regional anesthesia on cytokine release in diagnostic peritoneal lavage: A randomized, controlled study in pigs

Papakitsos G., Papakitsou T., Kapsali A., Donta I., Perrea D., Papadimitriou L.
University of Athens, Medical School, Research and Development Department, Arta, Greece

Background and Goal of Study: Tissue injury is associated with the local release of inflammatory and nociceptive mediators and the development of hyperalgesia. It is unclear whether interrupting neuronal signaling using regional anesthetic techniques at the time of the injury modifies local nociceptive and inflammatory processes. The aim of this study was to determine whether regional anesthesia at the time of diagnostic peritoneal lavage (DPL) could modify the development of the local release of inflammatory and nociceptive mediators.
Materials and Methods: Twenty-eight healthy Landrace pigs, weight 19+/- 2kg participated in this controlled, experimental, randomized study and received general anesthesia with propofol. Regional anesthesia (14 pigs) was established before inducing a DPL. Venous blood samples were obtained at three time points: before induction of general anesthesia (baseline), after general or regional anesthesia and after DPL. Concentrations of an array of cytokines (IL4, IL6) were determined.
Results and Discussion: Skin inflammation was associated with the release of inflammatory and nociceptive mediators and resulted in significant inflammatory response ($P < 0.001$). However, the presence of a fully established central block at the time of skin injury of DPL did not alter the development of inflammation after regression of the block. Similarly, the presence of a central block did not modify the release of nociceptive mediators.
Conclusion(s): These findings suggest that regional anesthesia minimally affects inflammation at the time of DPL in pigs. Continuous nerve block techniques may be better suited to alter inflammatory events in wounds beyond the duration of the block.

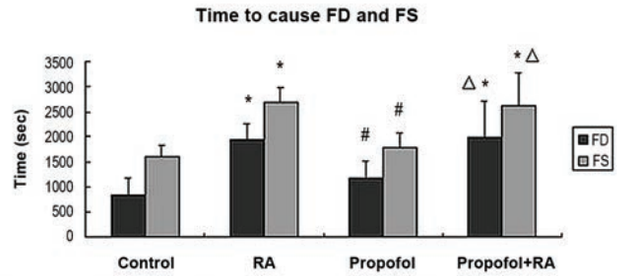
8AP3-7

The effect of propofol on intravenous bupivacaine induced cardiovascular toxicity with respiratory alkalosis in rats

Uozaki N., Sato S., Yu U., Irie S., Katou T.
Hamamatsu University School of Medecine, Department of Anaesthesiology and Intensive Care, Hamamamtsu, Japan

Background and Goal of Study: There are varied reports about respiratory alkalosis (RA) and propofol's effects on local anesthetic-induced cardiovascular toxicity, but it remains unclear as to the effect of combination use of propofol and RA. We studied the effect of propofol, RA and propofol+RA on bupivacaine-induced cardiovascular toxicity.
Materials and Methods: Thirty-six Sprague-Dawley rats were divided into 4 groups randomly. After a 20min stabilization, saline (control and RA group) or 1% propofol (propofol and propofol+ RA group) was continuously infused at a speed of 3.9ml/kg/h, 30min later upon a background infusion of these medicines, 0.25% bupivacaine was infused at a rate of 2mg/kg/min. Respiratory alkalosis was produced by adjusting ventilation.
Results and Discussion: Both RA and propofol+RA greatly prolonged the time to first dysrhythmia, final systole, 50% reduction of heart rate (HR) and 50% reduction of mean arterial blood pressure (MAP) compared to control. RA, propofol and propofol+RA all significantly increased the time to 25% reduction of MAP (MAP-25%) compared to control; propofol+RA showed greater improvement than did propofol. The margins between the time to 25% reduction of HR and MAP-25% in RA, propofol and propofol+RA all

showed great improvement compared to control; propofol+RA showed great improvement compared to propofol.
The mechanism of RA suggested one possibility to explain the RA effect on local anesthetic-induced cardiac toxicity might be that RA increases intracellular pH, which then causes a decrease in intracellular concentration of the active forms of the local anesthetics. The propofol+RA group even made a great improvement compared to the propofol group, which can also be considered an additional effect for propofol and RA in our study. Therefore, in RA, propofol, and propofol+RA treated cases, after the severe HR decrease, clinically there may be much more time available before stopping bupivacaine to avoid the myocardial depression.
Conclusion: Both RA and propofol+RA attenuated bupivacaine-induced cardiovascular toxicity. Propofol enhanced the threshold for bupivacaine-induced contractile depression.



[Figure 1]

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8AP3-8

Haemodynamic effects of low dose spinal hyperbaric bupivacaine for anorectal surgery in lithotomy or jack- knife position, assessed by impedance cardiography

Gudaityte J., Borodiciene J., Zavackiene A.
Lithuanian University of Health Sciences, Department of Anaesthesiology, Kaunas, Lithuania

Background and Goal of Study: Low-dose spinal anaesthesia is associated with stable haemodynamics (1, 2). The goal was to test the hypothesis that haemodynamic changes assessed by impedance cardiography during anorectal surgery under low-dose spinal anaesthesia are comparable in lithotomy and jack-knife position.
Materials and Methods: approved by local Ethics Committee, the randomized controlled study included 61 consecutive ASA I-III adult patients admitted for elective anorectal surgery, randomly assigned to be performed in lithotomy (group L, n=30) or jack-knife position (group J, n=31). After arrival to OR and standard monitoring, impedance cardiography device was connected to the patient , and the following variables were recorded: heart rate, systolic, mean and diastolic BP, Sp O2, cardiac output (CO), systemic vascular resistance (SVR), systolic index (SI), cardiac index (CI), acceleration index (ACI) measured at times of arrival to OR, placement in the sitting position, before, after and 10 min after dural puncture, placement for, start and end of surgery, placement to bed. Spinal block was made in the sitting position with 4 mg of 0.5% hyperbaric bupivacaine+10 mkg of fentanyl injected over 2 min. After sitting for 10 min level of blockade was assessed and surgery was started. Comparison was based on haemodynamic changes between and inside groups over time.
Results and Discussion: Results are presented as mean±SD, *p< 0.05 considered as statistically significant group J vs group L:

Variable	Group	Baseline OR	Laid for surgery	Start of surgery	End of surgery	Placed to bed
CO	L	6.5±1.6	6.4±1.6	6.4±1.6	5.8±1.6	5.8±1.4
CO	J	7±1.7	5.6±1.7	5.1±1.8*	5.4±1.7	6±1.2
SI	L	47±8.3	44.4±8.8	46.7±7.1	44.2±9.2	44.5±7.3
SI	J	51.1±9.5	37.9±8.5*	34±9.1*	37.3±7.2*	48.3±8.4
CI	L	3.5±0.6	3.4±0.6	3.3±0.6	3.1±0.7	3.0±0.6
CI	J	3.8±0.7	3.2±0.9	2.7±0.8*	2.9±0.8	3.4±0.8

[Table 1]

Changes of all hemodynamic variables over time were statistically significant inside both groups, except SpO2 and mean BP. Changes in SVR and ACI over time were comparable between groups.
Conclusion(s): according to impedance cardiography, jack-knife position after low-dose spinal anaesthesia produces transitory, but statistically significant reduction of CO, CI and SI with increase of SVR, compared to increase in CO and SI in lithotomy position.
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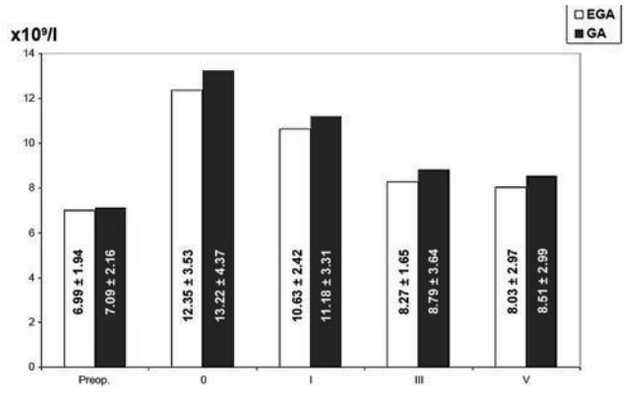
8AP3-9

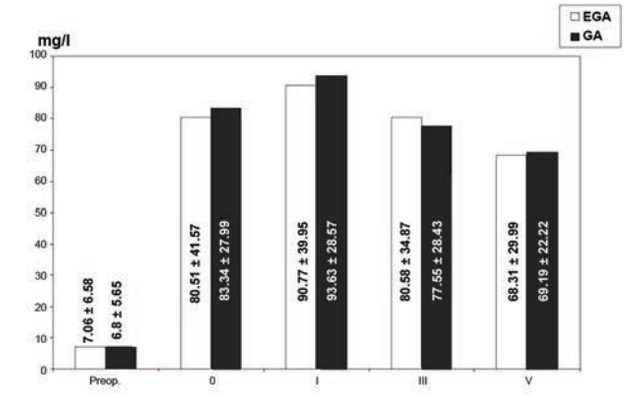
Influence of anesthetic technique on inflammation in radical retropubic prostatectomy

Milic V., Pavlovic S., Vukovic N., Ignjatovic B., Kalcic Z.
Clinical Center Nis, Department of Anaesthesiology and Intensive Care, Nis, Serbia

Background and Goal of Study: Radical retropubic prostatectomy (RRP) is a method of treatment for clinically localized prostate cancer. Many published studies evaluated influence of different anesthetic techniques on intraoperative blood loss, outcome, postoperative course and complication rate in patients undergoing radical prostatectomy.
Radical retropubic prostatectomy induces a systemic inflammatory response. The aim of this study is to evaluate impact of anesthetic technique on non specific inflammation parameters such as leukocyte count (WBC) and C-reactive protein (CRP).
Materials and Methods: Sixty one patients undergoing RRP for prostate cancer were selected in two groups: group EGA = 34 patients, who received epidural anesthesia in association with general anesthesia and group GA = 27 patients with general anesthesia alone. Leukocyte count (WBC) and CRP were evaluated preoperatively, after the surgery, on first, third and fifth postoperative day.
Results and Discussion: There was no statisticaly significant differece between two groups for age, ASA score and Gleason score. The results are shown in figures 1 and 2.



[Figure 1. Leukocyte count]



[Figure 2. C-reactive protein]

There was no statisticaly significant differece between groups EGA i GA in leukocyte count and C-reactive protein.

Conclusion(s): Our results suggest that intraoperative anesthetic technique was not associated with a difference in inflammatory parameters in patients undergoing radical retropubic prostatectomy.

8AP3-10

Effects of interscalene brachial plexus block on heart rate variability

Frassanito L., Fiore V., Messina A., Bronzo V., Gilardi E., Vergari A.
Catholic University of Sacred Heart, Department of Anaesthesiology, Rome, Italy

Background and Goal of Study: Hypotensive-bradycardic events (HBE) have been reported in 13%-28% of patients undergoing shoulder surgery in sitting position (SP) after interscalene block (ISB). Bezold-Jarisch reflex is the most likely mechanism leading to these events, with abrupt withdrawal of sympathetic tone (ST) and enhanced parasympathetic tone (PT). Heart rate variability (HRV) is widely used to measure alterations in the autonomic nervous system.The aim of the study was to determine whether dynamic change of fluctuation patterns of heart rate are modified after ISB.
Materials and Methods: Fifteen ASA I-II patients undergoing shoulder arthroscopy were studied. HRV was assessed by an Holter ECG for 20 min before the block in supine position, then into a 60° head-up tilt position. Ultrasound guided ISB (Ropivacaine 0,75% 20 ml) was performed. ECG was processed automatically by an Holter analyser, and data analysed using Fast-Fourier Transformation. Two spectral components of HRV were calculated: low frequency (LF, 0.06-0.15Hz) and high frequency (HF, 0.15-0.4Hz) component, and LF/HF ratio. This ratio provides a measure of the sympatho-vagal balance. Wilcoxon matched pairs test and Monte Carlo Simulation one-tailed were used for statistical analysis.
Results and Discussion: We observed 8 Horner's sign and 3 HBE. LF/HF significantly changes both in supine position (p= 0.42, c.i. 0.37-0.47) and SP (p=0.54, c.i. 0.49-0.60) after the ISB. The curve trend (in the graphic) shows LF/HF raising in SP, in order to a sympathetic tone dominance, and LF/HF decreasing in order to a predominance of PT and/or a suppression of ST after the block. We may postulate that the ipsilateral stellate ganglion block led to the observed decrease in sympathetic tone.
Conclusion(s): ISB caused an imbalance of autonomic tone activity as indicated by the reduction of LF/HF.
References:
1) Akselrod *Science* 1981.
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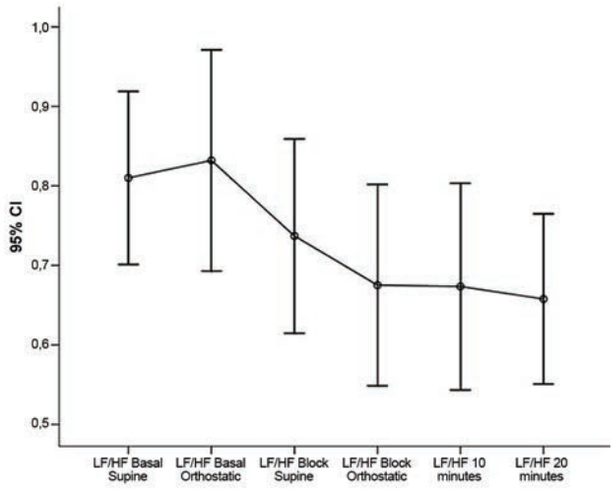

[Graphic]

8AP3-11

Electron microscope imaging of the endothoracic fascia in rats

Stopar Pintaric T., Veranic P., Cvetko E.
University Clinical Centre Ljubljana, Department of Anaesthesiology and Intensive Care, Ljubljana, Slovenia

Background and Goal of Study: Particular importance has recently been put upon the presence of the endothoracic fascia and its impact on the local anaesthestic distribution in the paravertebral space. The focus of our study was to confirm its existence and position in relation to other structures using electronic microscope.
Materials and Methods: In our experiments Wistar rats were used which were housed at room temperature, 22-24°C , with 45-65% humidity and a 12 h:12 h light- dark cycle. After being sacrificed in a CO_2 chamber, their thoracic vertebral spine was transversally sliced and prepared for stereo- and electronic microscopic investigation.
The isolated vertebrae were fixed by immersion in a mixture of 2% glutaraldehyde and 2% formaldehyde (prepared from paraformaldeyde) for 3 h at 4°C and rinsed overnight with 0.2 M cacodylate buffer. After postfixation in buffered 1% osmium tetroxide for 1 h at 4°C, the specimens were dehydrated in graded acetones, pressurized under CO_2 to reached a critical-point and dried and sputter coated with gold. The samples were studied at 15 kV with a scanning electron microscope (Jeol JSM 84 A, Tokyo, Japan).
Results and Discussion: The endothoracic fascia, which extends from the lateral towards the medial side covering the bodies of the vertebra is interposed between parietal pleura and the innermost intercostal muscles in the paravertebral space and attached to the sorrounding structures with loose areolar tissue. It is more or less condensed fibro-elastic lamina with fibres oriented predominantly transvesely and obliquely. It is thickest in the paravertebral space (100 μm) and thinner (20 μm) passing anteriorly to the vertebral body where it seems not to be firmly attached to the perichondrium. It divides the thoracic paravertebral space (TPVS) into outer extrapleural compartment (EPC) and inner subendothoracic compartment (SETC) where we found a sympathetic ganglion in the former and a spinal ganglion in a latter.
Conclusion(s): Paravertebral space is just a part of the entire epidural-paravertebral-intercostal anatomic complex, the nervous block of which can be uni- or bilateral, peripheral and, at the same time, neuraxial. This leads to a variety of clinical expressions, a fact not to forget when assessing the block or using high LA concentrations and doses of opiates or other additives.
References:
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8AP4-1

Aseptic technique during peripheral nerve blockade: A survey of attitudes and practice in the Wessex region

Golding J.A., Burmeister L.
Poole Hospital NHS Foundation Trust, Department of Anaesthesiology, Poole, United Kingdom

Background and Goal of Study: Infectious complications associated with peripheral nerve blockade (PNB) are a potentially devastating complication of regional anaesthesia. There is little evidence regarding the frequency of infection associated with PNB. There is however, at least one reported fatality[1] attributed to infection as a direct consequence of PNB.As the use of PNB increases there is concern that the infectious complication rate may also increase. ASRA recommendations suggest that PNB should be approached in the same manner as any invasive procedure and that aseptic protocols are followed[2].We designed a survey to assess attitudes and practice amongst anaesthetists in Wessex.
Methods: An online survey was sent via email to all grades of anaesthetists in all acute trusts within the Wessex area.
Results and Discussion: A total 463 questionnaires were sent, the response rate was 54%. Only 21% were aware of departmental guidelines for aseptic precautions for single shot PNB and 5% for catheter techniques(CT). 28% do not use gowns or face mask for single shot PNB, whereas 45% use glove, gown and mask for catheter insertion.61% of respondents use the recommended 2% chlorhexidine skin preparation, with the rest using less concentrated solutions. Only 13% report using a sterile drape for single shot PNB whereas 93% do use a drape for CT. 62% do not use sterile ultrasound gel. Probe sterility was maintained by a full cover sheath by 23%, "op-site" by 72%, and not at all by 5%.
Conclusion(s): Given the paucity of evidence it is perhaps unsurprising that a wide variety of practice is found. Despite the lack of robust data available clear guidance exists from expert opinion.The use of ultrasound should not result in any reduction in aseptic standards, as our data shows sterility has been compromised with the advent of ultrasound guided regional anaesthesia. Use of "regional anaesthesia packs" which contain preprepared sterile equipment may help routine adherence to sterile technique.In the absence of absolute data it seems reasonable to follow sensible precautions in order to avoid an entirely avoidable complication.
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8AP4-2

Comparison of three different resuscitation strategies to treat local anaesthetic toxicity - an experimental study in neonatal pigs

Mauch J.Y., Martin-Jurado O., Spielmann N., Bettschart-Wolfensberger R., Weiss M.
University Children's Hospital, Department of Anaesthesiology, Zurich, Switzerland

Background: Local anaesthetic (LA) intoxication with severe haemodynamic compromise is a potential catastrophic complication of regional anaesthesia in anaesthetized children. Recently, lipid-resuscitation for treatment of LA toxicity with cardiac arrest has been promoted (1-3). So far, however there are no studies comparing effectiveness of different rescue strategies using epinephrine or different doses of lipid for severe haemodynamic compromise due to LA intoxication.
Methods: Neonatal pigs were randomized into three groups, anaesthetised with sevoflurane, their trachea intubated and artificially ventilated. Bupivacaine was continuously infused by a syringe infusion pump through a central venous line at rate of 1 mg kg^{-1} min^{-1} until invasively measured mean arterial pressure (MAP) reached 50% of initial value. Then, bupivacaine infusion was stopped (=T_0) and epinephrine 3 μg kg^{-1} (group 1), Intralipid® 2 ml kg^{-1} (group 2) or Intralipid® 4 ml kg^{-1} (group 3) was administered. Haemodynamic course was recorded. Epinephrine 3 μg kg^{-1} was given every 5 minutes if MAP < 75%, and spontaneous course without external cardiac massage was observed. Bupivacaine and triglyceride plasma levels, arterial blood gases and acid-base status were analysed repeatedly. Results are given in median (range).
Results: Twenty-one piglets weighing 4.9 kg (4.3-5.8) were investigated. Total amount of bupivacaine administered was 5.4 (3.8-12.1) mg kg^{-1} in group 1, 4.6 (3.6-8.5) mg kg^{-1} in group 2 and 5.2 (3.4-7.5) mg kg^{-1} in group 3. Bupivacaine plasma level at T_0 was 63.8 (53.7-120.9) μmol l^{-1} in group 1, 81.7 (66.2-116.9) μmol l^{-1} in group 2 and 86.7 (40.4-102.0) μmol l^{-1} in group 3. All subjects in group 1 but only 4 of 7 piglets in group 2 and group 3 respectively survived. Normalisation of haemodynamic parameters (heart rate, MAP) and ET_{CO2} was fastest in group 1 wherein all pigs achieved HR, MAP, ET_{CO2} values at/above base line at T_5. In all groups there was a continuous decrease in bupivacaine as well as in triglyceride plasma level over time. No secondary increase of bupivacaine caused by redistribution was observed.
Conclusion: In severe haemodynamic compromise due to bupivacaine intoxication, rescue with epinephrine was more effective with regard to survival and normalisation of haemodynamic parameters than Intralipid® in this pig model.
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8AP4-3

Comparison of four different rescue regimens to treat cardiac arrest due to bupivacaine intoxication - an experimental study in neonatal pig

Mauch J.Y., Martin-Jurado O., Spielmann N., Bettschart-Wolfensberger R., Weiss M.
University Children's Hospital, Department of Anaesthesiology, Zurich, Switzerland

Background: Local anaesthetic (LA) intoxication with cardio-vascular arrest is a potential fatal complication of regional anaesthesia in anaesthetized children. Recently, lipid-resuscitation for early treatment of LA toxicity with cardiac arrest has been promoted (1,2). Aim of the study was to investigate four different rescue regimens using epinephrine and/or lipids and vasopressin to treat cardiac arrest due to bupivacaine intoxication.
Methods: Neonatal pigs were randomized into four groups, anaesthetised with sevoflurane, their trachea intubated and artificially ventilated. Bupivacaine was continuously infused by a syringe infusion pump through a central venous line at rate of 1 mg kg-1 min-1 until cardiac arrest (pulseless electrical activity was defined as mean arterial pressure (MAP) 25% of initial value, corresponding to 12-13 mmHg). Then, bupivacaine infusion and sevoflurane were stopped, chest compression was started and the pigs were ventilated with 100% oxygen. One minute later epinephrine 10 μg kg-1 (group 1), Intralipid® 4 ml kg-1 (group 2), epinephrine 10 μg kg-1 + Intralipid® 4 ml kg-1 (group 3) or Vasopressin 2 U + Intralipid® 4 ml kg-1 (group 4) was administered. Return of spontaneous circulation was defined as MAP >40% of initial value. Epinephrine rescue 10 μg kg-1 (in case of cardiac arrest) or 3 μg kg-1 (if MAP ≤75%) was given every 5 minutes if necessary. Haemodynamic course was recorded. Results are given in median (range).
Results: Twenty-five piglets aged 27 days (13-36) and weighing 5.1 kg (4.5-6.1) were investigated. Bupivacaine intoxication caused pulseless electrical activity (n=23) or asystole (n=2). Total amount of bupivacaine administered and number of pigs surviving resuscitation are shown in table 1.

	Group 1 (n=7)	Group 2 (n=6)	Group 3 (n=6)	Group 4 (n=6)
Bupivacaine administered (mg/kg)	7.8 (6.0-10.6)	8.3 (5.6-10.5)	10.0 (5.1-13.0)	7.8 (6.4-14.6)
pigs surviving	5	1	5	3

[Table 1]

None of the surviving pig in group 1 and 3 but all of group 2 and 4 needed secondary high dose epinephrine rescue. Low dose epinephrine for haemodynamic support was given in 3 of 5 surviving pigs in group 1 and in 1 surviving pig in group 2.
Conclusion: In cardiac arrest due to bupivacaine intoxication first line rescue with epinephrine and epinephrine+Intralipid® were more effective with regard to survival than Intralipid® alone and vasopressin+Intralipid® in this pig model.
References:
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2) Picard J. Anaesthesia 2009

8AP4-4

Does epidural anesthesia and analgesia reduce mortality following open surgery for colo-rectal cancer? A retrospective analysis of data from 655 patients

Gupta A., Björnsson A., Hallböök O., Söderholm J., Eintrei C.
Örebro University and Linköpings University, Department of Anaesthesiology and Intensive Care, Örebro, Sweden

Background and Goal of Study: There is some evidence from retrospective studies that epidural analgesia reduces the incidence of recurrence following breast and prostatic cancer surgery.
This study was done with the primary aim of assessing whether the use of EDA reduces long-term mortality in patients undergoing surgery for colo-rectal cancer using a database comprising 750 patients operated during 2004-2008 at two University Hospitals in Central Sweden.
Materials and Methods: All patients undergoing surgery for colo-rectal cancer from January 2004 to January 2008 at the University Hospitals in Linköping and Örebro were included in the study. Exclusion criteria included: emergency operations, laparoscopic-assisted colon and rectal resection and Stage 4 cancer (distant metastases) determined at the time of surgery. Medical records of all included patients were obtained and data extracted according to a strict protocol by research nurses who were not involved in any other way with the study or data analysis. All patients with colo-rectal cancer are followed up in a standardized way 1, 3 and 5 years after the operation. We obtained statistical information from the Swedish National Register for Deaths to verify the data on mortality. Patients were divided into two groups, those receiving epidural analgesia (EDA group) perioperatively and those receiving patient controlled analgesia (PCA group) as the primary method of analgesia.
Results and Discussion: A statistically significant difference was found in the mortality following rectal but not colon cancer . Kaplan-Meier, Survival curves for Colon cancer (N=335) and Rectal cancer (N=335) were: Log-rank: P=0.23 and P=0.02 respectively. A significant univariable association was found between rectal cancer deaths and age (> 72 yrs), cancer staging (> stage 1) and use of PCA (compared to EDA).
Conclusions: We found an increase in all-cause mortality following rectal but not colon cancer in patients having EDA compared to PCA technique. A randomized, prospective study is needed in order to confirm our findings.

8AP4-5

A comparison of the incidence and breadth of adverse events between levobupivacaine and racemic bupivacaine in the UK

Burke D., Gill R., Keary I.
St. John's Hospital, Department of Anaesthesiology, Livingston, United Kingdom

Background and Goal of Study: We attempted to examine whether the assumed preclinical advantages of levobupivacaine translate into clinical practice.

Materials and Methods: We conducted a retrospective analysis of adverse events (AE's) reported to the Medicines and Healthcare products Regulatory Agency (MHRA) via the Yellow Card Reporting Scheme between 2001 and 2007. This was correlated with total drug use during the same period provided by the International Medicines Statistics database, thus capturing 96% of hospital pharmacy sales.
Statistical analysis (Yates chi-square test) was performed using AE's per 100kg of drug dispensed. Usage of the 0.5% concentration of each drug was almost equivalent (0.1% difference).
Results and Discussion: When considering the amount of drug dispensed (977.2 kg bupivacaine v 344.6kg levobupivacaine) and the number of procedures performed, the overall incidence of adverse events is low, thus illustrating the good safety profile of both drugs.
Over the study period there were more adverse events reported with bupivacaine (232) than levobupivacaine (44) as to be expected by the greater amount of drug dispensed. When 100kg equivalents of drug were compared, levobupivacaine had 46% fewer AE's (12.8 v 23.8, $p < 0.01$).
AE's were reported in all 20 adverse event headings for bupivacaine compared to only 11 for levobupivacaine. The AE's for bupivacaine exceeded those for levobupivacaine in 17 of these categories, including those most commonly reported-cardiac and nervous system disorders. 4 deaths in total were associated with bupivacaine whereas none were associated with levobupivacaine.
Conclusion(s): Given the tendency for a potential bias towards reporting adverse events with a new drug, the decreased incidence of adverse events and lack of fatalities with levobuopivacaine suggests that some of the putative advantages suggested by its preclinical data are real.
Acknowledgements: We would like to thank the MHRA and IMS.

8AP4-6

A comparison of cardiac and neurological adverse drug reactions (ADRs) between levobupivacaine and bupivacaine in UK clinical practice

Burke D., Gill R., Keary I.
St John's Hospital, Department of Anaesthesiology, Livingston, United Kingdom

Background and Goal of Study: Bupivacaine and levobupivacaine are widely used and largely safe drugs. In overdose or misadministration toxicity may be seen with involvement of the central nervous system (CNS) or cardiovascular system. These effects may be life threatening.This study compares the neurological and cardiovascular ADRs with bupivacaine and levobupivacaine.
Materials and Methods: The study is a retrospective analysis of all ADRs associated with bupivacaine or levobupivacaine reported to the Medicines Health and Regulatory Authority (MHRA) via the Yellow Card Scheme during the period January 2001 - December 2007.
To allow for the different quantities of drugs utilised, data were obtained from the International Medical Statistics (IMS) database on the usage of bupivacaine and levobupivacaine. Adverse incidents per weight of drug supplied were then compared.
Results and Discussion: The overall rate of cardiac ADR's per 100kg equivalents was higher for bupivacaine than levobupivacaine (1.74 vs 0.58). The number of cardiac arrest was higher for bupivacaine than levobupivacaine (4 vs 1), with one fatality reported for bupivacaine and none for levobupivacaine. A greater range of events were reported with bupivacaine including bradycardias, tachycardias, complete atrioventricular block and ventricular asystole.
The overall rate of neurological ADR's was higher for bupivacaine than levobupivacaine (5.53 vs 4.64 per 100kg equivalent).
Seizures were the most frequent neurological ADR and were more frequent with levobupivacaine than bupivacaine (2.32 vs 0.92). There was one report of hypoxic encephalopathy with bupivacaine; this was fatal. No CNS related fatalities were reported with levobupivacaine.
Conclusions: These results confirm that both drugs have a good safety profile. However, cardiac related ADR's were 3 times more common with bupivacaine than with levobupivacaine. The diversity of cardiac related ADRs with bupivacaine suggests significant interference with conduction pathways compared to levobupivacaine.
The overall CNS ADR's were less with levobupivacaine than bupivacaine though there was a higher incidence of seizures with levobupivacaine. This may be explained by the misadministration of the drug resulting in effects limited to the CNS while with bupivacaine cardiac toxicity may be seen.
Acknowledgements: We wish to thank MHRA and the IMS.

8AP4-8

The safety of epidural insertion on anesthetized or awake patients: A retrospective study of 22183 adults

Toba Y., Kokubo S.
Seirei Hamamatsu Hospital, Department of Anaesthesiology, Hamamatsu City, Japan

Background and Goal of Study: Epidural insertion on anesthetized patients is considered dangerous due to the possibility of unrecognized nerve injury. However, in some cases this maneuver can minimize patients' undue stress or discomfort. There are no published data comparing the relative risk of epidural anesthesia performed on anesthetized or awake patients. The purpose of our study is to evaluate the safety and practicality of epidural insertion on anesthetized patients.
Materials and Methods: Retrospective review was conducted on all lumber epidural insertions in adults between 1998 and 2009. We divided them into two groups. Group A, epidural insertion on anesthetized patients; group B, epidural insertion on awake patients. We checked claims of neurological complications received by the safety management committee of our hospital that needed over one month to resolve. Additionally, we looked at the frequency of epidural insertion according to patient age, gender and insertion level.
Results and Discussion: A total of 22183 patients (14843 female and 7340 male) were involved this study, in which there were 9646 patients in group A and 12537 in group B. The large number of female patients in their 20s and 30s in group B may have been due to the inclusion of patients who underwent caesarian section. Most frequent insertion level in both groups was L3-L4. There were 3 serious neurological complications in group A, and 2 in group B. (Table.1) Benefits of epidural insertion on anesthetized patients include easier insertion, greater patient compliance and better condition for teaching and supervising trainees. We suppose that the major factors in preventing serious neurological sequeale are careful patient selection, the skill of anesthetist, proper training and supervision of trainee, avoidance of repeated attempts, and early recognition and treatment of complications.

Group	Age(yr)/ Gender	Operation	Level approach(agent)	Complications
A	70's/m	radical prostatectomy	L3-4 (0.4%tetracaine)	right leg paresthesia and weakeness for 6 months
A	50's/m	colon resection	L3-4 (0.5%bupivacaine)	legs paresthesia and weakeness for over 1 month
A	60's/m	colon resection	L3-4 (0.5%bupivacaine)	legs paresthesia and weakeness for over 1 month
B	50's/f	conization	L3-4 (0.4%tetracaine)	weakeness of big toe
B	20's/f	conization	L3-4 (0.4%tetracaine)	peroneal nerve paralysis

[Table1. Patients with neurologicalcomplications]

Conclusion(s): Our study documented only a small frequency of serious neurological complications associated with epidural insertion on anesthetized patients. Epidural insertion on anesthetized patients is beneficial and may be considered safe.

8AP4-9

Analgesic efficacy of associating a sciatic block to a femoral block in the posotperative period of total knee arthroplasty

Serrano A., Santiveri X., Bisbe E., Ortiz P, Puig L., Castillo J.
Hospital del Mar-Esperança (Parc de Salut Mar), Department of Anaesthesiology and Pain Medicine, Barcelona, Spain

Background and Goal of Study: Femoral block 3-in-1 (FB) is part of the multimodal strategy for analgesia in total knee arthroplasty (TKA). The aim of this study was to determine whether the sciatic block (SB) associated to a FB presents analgesic advantages over the FB alone and to assess the safety of the technique through the analysis of adverse effects.
Materials and Methods: It is a prospective, randomized, double-blind clinical trial in patients scheduled for TKA under spinal anesthesia. 58 patients ASA I-III were randomly assigned to one of two treatment groups: intervention group (IG) (levobupivacaine 0.25% for SB) and control group (CG) (saline for SB). After the operation, we performed, in the two groups, a sciatic block and a femoral block. For the FB 40 mL of levobupivacaine 0.25% were injected as a bolus. For SB we administered a bolus of 20 mL of a solution prepared by pharmacy service, based on randomization. Analgesia during the first two

days consisted in the blocks and the use of patient-controlled analgesia (PCA) morphine bolus (0.025 mg/kg). We recorded pain by visual analogue scale (VAS) and categorical verbal scale (CVS), and adverse effects at 1,2,3,6,12 and 24 hours of the blocks on the first day and every 4 hours the 3 following days

Results and Discussion: We did not obtain significant differences in biological variables between the two groups. Patients in the intervention group had a lower consumption of PCA morphine (34,7± 18,5 vs 55,1 ± 24,8mg) and a reduced need of bolus (18,8± 10,2 vs 29,1± 13,6). Moreover VAS was reduced by 10.88% between the first hour and 18 hours of SB in the intervention group compared with control group. The average percentage of patients with VAS> 3 was 1.2% in intervention group and 8.1% in control group. We did not find significant differences regarding adverse effects.

Conclusion(s): Associating a sciatic block to a femoral block in the total knee arthroplasty postoperative analgesia reduces pain and postoperative morphine requirements without increasing adverse effects.

8AP4-10

Feasibility of fast track strategy for patients undergoing radical nephrectomy: A prospective randomized study

Demanet J., Wattier J.M., Colin P., Fantoni J.C., Villers A., Lebuffe G.
CHRU Lille, Hôpital Huriez, Department of Anaesthesiology and Intensive Care, Lille, France

Background and Goal of Study: A fast track strategy may improve the outcome and reduce the total hospital stay in patients undergoing transperitoneal or laparoscopic radical nephrectomy for renal cell carcinoma.Prevention of side effects, multimodal analgesia, early removal drain and urinary catheter, early mobilization and oral nutrition are the main objective in this program. The objective of this study is to evaluate the impact of a fast-track strategy for patients undergoing radical nephrectomy.

Materials and Methods: Forty five patients undergoing transperitoneal or laparoscopic nephrectomy were randomized in control Group (NPRP) or Fast track Strategy Group (PRP). In NPRP Group, patients received a standardized general anesthesia and patient control analgesia (morphine) for post operative pain control, also patients were managed with traditional post operative care. Fast track strategy's patients benefit from multimodal anesthesia: oral premedication with 1200 mg of gabapentine, 0,5mg/kg IV bolus of ketamine before incisin and wound infiltration with 225 mg of ropivacaine, post operative management is fooding and ambulation on the evening of the operative day, removal drain and urinary catheter on POD1. Demographic data, post operative pain, consumption of morphine, length of stay and complications were measured.

Results and Discussion: Both groups were comparable regarding demographics caracteristics and type of surgery (p=0,55).

In NPRP Group (N=23), fourteen patients (61%) had transperitoneal nephrectomy and nine patients (39%) had lapraroscopic nephrectomy. In PRP group (n=22), so many patients had transperitoneal surgery than coelioscopy. Patients included in fast track strategy had lower pain score and reduced significantly morphine consumption (22,14mg versus 46,17mg; p< 0,01). Also, post operative hospital stay decreased from 5,8 to 4,2 days (p< 0,05).

Results	PRP (n=22)	NPRP (n=23)	P
Age (median) (years)	59 ± 10	62 ± 8	p = 0,18
Coelioscopy / transperitoneal surgery	11(50%) / 11(50%)	9 (39%) / 14(61%)	p = 0,55
Pain score in post operative care unit (Visual Analog Scale 0 to 10)	1,33 ± 1,85	3,52 ± 2,99	p < 0,01
Total Morphine consumption (mg)	22,14 ± 13,25	46,17± 21,41	p < 0,01
Post operative hospital stay (days)	4,182 ± 1,37	5,826 ± 2,59	p < 0,05

[Results]

Conclusion(s): Patients undergoing nephrectomy benefits to have fast track strategy by a reduced of post operative pain and a lower duration of postoperative stay after surgery without increased of complications or readmission.

8AP5-1

Comparison of levobupivacaine 0.5% versus ropivacaine 0.5% for digital nerve blocks in ambulatory surgery

Noulas N., Kaliakmanis D., Graikiotis A., Kouvalakidou A.
General Hospital of Corinth, Department of Anaesthesiology, Corinth, Greece

Background and Goal of Study: Digital nerve block used in the emergency department for various procedures such us nail removal, paronychia drainage etc. We study the efficacy in terms of pain of injection, time of onset and duration of action of digital blocks of L-bupivacaine 0.5% and Ropivacaine 0.5%.

Materials and Methods: In this randomized double-blind prospective study we included 120 patients, ASA I-III coming in emergency department for minor various problems.

Each participant was randomized to receive either L-bupivacaine 0.5% 2 ml (group L, n=60) or Ropivacaine 0.5% 2 ml (group R, n=60) using a modified transthecal digital block. The injection site was first prepared with povidone-iodine and then with alcohol. A 3-mL syringe with a 25-gauge cm needle was inserted perpendicular to the skin surface and advanced until bone resistance was felt. As the withdrawing needle entered the tendon sheath, local anesthetic was infiltrated at the level of the palmar digital crease. Damage to the neurovascular bundle is very rare and we have not found reports in the literature of flexor tendon sheath infection. Pain of injection was measured as the primary outcome using a 0-100 mm visual analogue scale.

The time before anaesthesia to pinpricks was recorded and the duration of anaesthesia was reported by all participants. We used the statistical package SPSS version 17.

Results and Discussion: Median visual analogue scale scores were not significantly different between the group R and group L (26.00 mm (4-52) vs 29mm (10-61), p=0.23). The median time before anaesthesia to pinpricks was not significantly different between the two drugs [9.45 min (7-15) for group L vs 11.30 min (6-15) for group R, p = 0.64]. The duration of action was extended in group L [10.8 h (7-15h) for group L vs 6.7 h (4-8h), p=0.02] significally. There were not reported clinically nerve damage, or infection at the site of the puncture.

Conclusion(s): Both local anesthetics had a similar onset of action for digital nerve block but the difference between L-bupivacaine and Ropivacaine is on the duration of action witch mean prolonged postoperative analgesia and better comfort for patient.

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8AP5-2

Transversus abdominis plane (TAP) block in adults: How safe is the landmark-based "double-pop" technique?

Mc Dermott G., Korba E., Mata U., Jaigadir M., Boylan J., Conlon N.
St Vincent's University Hospital, Department of Anaesthesiology and Intensive Care, Dublin, Ireland

Background and Goal of Study: Any "blind" regional anaesthetic technique raises two important issues. The first is the degree of accuracy of placement of the needle and local anaesthetic. In the paediatric population, a landmark-based approach to the ilioinguinal/iliohypogastric nerve block was shown to result in inaccurate injection in 86% of cases. The second issue is the potential for visceral damage from blind placement of the needle. Inadvertent liver puncture has been reported after a blind approach to the TAP block.

We designed a prospective, blinded study in an adult general surgical population to observe the placement of the needle tip and local anaesthetic using ultrasonography during TAP blocks using the standard landmark-based technique.

Materials and Methods: 36 adult patients scheduled for elective abdominal surgery were included in the study. Patients with infection at the proposed site of injection, coagulation disorders, allergy to bupivacaine, pregnancy, BMI greater than 35 and planned post-operative ICU admission were excluded.

After induction of general anaesthesia, patients had bilateral TAP blocks performed using a landmark technique. Local anaesthetic solution was injected under ultrasound imaging to detect both the position of the needle tip and the spread of local anaesthetic.

The anaesthetist performing the block was blinded to the ultrasound image.

Results and Discussion: The needle tip and local anaesthetic were in the correct plane in only 23.6% of blocks. In the remaining 76.4% the needle was in adjoining structures; subcutaneous tissue 1.38%, external oblique muscle 1.38%, plane between external and internal oblique muscles 6.94%, internal oblique muscle 36.1%, transversus abdominis muscle 12.5% and peritoneum 18%.

Logistic regression analysis was used to determine both patient and operator factors contributing to inaccurate needle placement.

46% of blocks by consultants but only 5% of blocks by trainees were in the correct plane. Peritoneal needle placement was much more likely to occur when the operator was a trainee (p=0.0008).

Conclusion: We observed a surprisingly high rate of peritoneal needle placements using a blind technique. Our findings indicate that inadvertent intra-

peritoneal injection is probably more common than thought. This is despite all trainees having performed 50 TAP blocks prior to the study. This study raises concerns about the safety of a blind approach to the TAP.

8AP5-3

Optimal positioning of local anaesthetic in femoral nerve block prior to operative fixation of fractured neck of femur

Szucs S., Morau D., Iohom G.
Cork University Hospital, Department of Anaesthesiology and Intensive Care, Cork, Ireland

Background: Positioning the patient prior to administering spinal anaesthesia for operative fixation of fractured neck of femur is painful due to the movement of the fractured bone. Femoral nerve block is one option for pain relief (1) but the optimal positioning of the local anaesthetic remains unclear. We proposed to study the analgesic effects of ultrasound guided femoral nerve block (UG-FNB) in relation to different patterns of local anaesthetic injection.
Methods: Patients were randomized to one of three groups: injection of 15 ml (2) of lidocaine 2% through the needle tip positioned inferior (I) to the femoral nerve, superior (S) to it under the fascia iliaca, or by repositioning the needle tip until the nerve was completely (C) surrounded.An independent blinded observer assessed the block at 5-minute intervals up to 30 minutes. The modified Bromage score was applied to innervation areas of terminal branches of the femoral nerve using cold sensation. Pain during block performance, on standardized passive movement and at positioning for spinal anaesthesia was assessed using verbal rating scale (VRS) scores (0-10). Overall patient satisfaction with analgesia was also recorded using a visual analogue scale (VAS) scores (0-100).
Results and Discussion: Twentyfive patients were recruited out of the planned 60, 7/7/11 to groups C/I/S respectively. Pain was greater during block performance in group C compared to either group S or I [4.57(2.6) vs. 1.81(1.7), P=0.008 or 1.83(1.4), P=0.022 respectively], presumably due to the higher number of needle passes.
There was no difference in block onset time, VRS during passive movement or positioning for spinal anaesthesia between groups. Patient satisfaction with analgesia was higher is group C compared to group S [97(4.3) vs 80(16.9), P=0.02].
Conclusions: This planned interim analysis suggests that sensory block characteristics following injection of 15 ml lidocaine 2% above, below or around the femoral nerve are similar. Although performance of circumferencial injection was associated with higher pain scores, it yielded higher overall patient satisfaction with analgesia during positioning for spinal analgesia.
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8AP5-4

Hypnosis and videoscopy combination as less invasive technique for thyroidectomy

Watremez C., Docquier M.-A., Brui B., Mourad M., Roelants F.
Cliniques Universitaires St Luc Université Catholique de Louvain, Department of Anaesthesiology, Brussels, Belgium

Background and Goal of Study: Until a few years, there has been movement toward development of minimally invasive procedures for thyroidectomy such as videoscopy[1]. Hypnosis (hyp) used as less invasive technique than general anesthesia (GA) can be successfully used for conventional thyroidectomy[2]. The goal of our study was to compare hyp to classical GA for video-assisted thyroidectomy (VAT) to further decrease the invasiveness of the surgery.
Materials and Methods: 54 patients undergoing partial or total VAT were included. In the hyp group (n=18) hypnosis was induced using an eye fixation procedure and progressive muscle relaxation as described by Erickson. Local anesthesia (LA) was performed step by step by the surgeon (lidocaine 0.5%+ levobupivacaine 0.25%). A 0.05 µg/kg/min continuous infusion of remifentanil was started and increased as needed. In the GA group (n=36), anesthesia was induced classically with propofol and remifentanil. Operative time, time spent in the operating room, peroperative ephedrine consumption, pain scores, nausea, opioids consumption in the recovery room as well as patient satisfaction and the potential discharge at 6 hours were noted. Statistical analysis used Man Withney U test and Fisher exact test; p< 0.05 considered (*) significant.
Results and Discussion: Demographic data were similar among the groups with a majority of females in each group. Results are seen in the Table. There was no difference in the pain scores in the recovery room. No conversion to GA was required. The mean quantity of LA used was 16 ± 4 ml.

	hyp	GA
Operative time (min)	109 ± 22*	91 ±2 6
Time spent in operating room (min)	148 ± 18	144 ± 26
Ephedrine consumption (mg)	0 ± 0*	5.4 ± 7.0
Recovery room:VAS nausea(0-10)	0.2 ± 0*	1.86 ± 3
Recovery room:Time spent (min)	89 ± 48*	134 ± 34
Recovery room: Piritramide consumption (mg)	2.9 ± 2.9	3.7 ± 3.3
Satisfaction score	4.36 ± 0.7	3.9 ± 0.6
Potential discharge at 6 h (%)	11/18 (61)*	7/36 (20)
Hospital stay >1 day (n)	0/18*	14/36

[Table]

Conclusions: Hypnosis and local anesthesia combined with VAT can be safely proposed to obtain a less invasive technique for thyroidectomy. Hypnosis presents less side effects than GA and could potentially decrease the cost of the procedure shortening the hospital stay.
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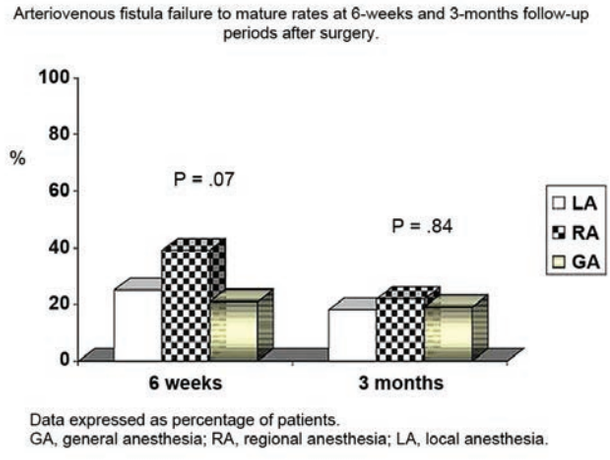
8AP5-6

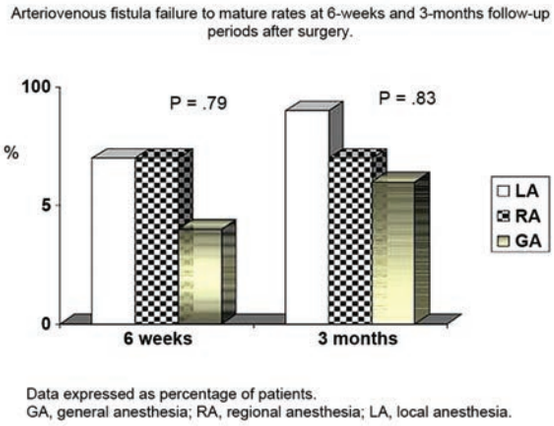
Different anesthetic techniques for arteriovenous fistula formation: Early and late fistula failure rates

Lee C., Toppin J., Snyman A., Oreopoulos G., Bhola C., Djaiani G.
Toronto General Hospital, Departments of Anesthesia and Vascular Surgery, Toronto, Canada

Background and Goal of Study: Arteriovenous fistula(AVF) creation is the method of choice for long term vascular access for hemodialysis. However it has been reported that up to 50% of AVFs can fail to develop enough to support this. Regional anesthesia offers sympathetic blockade that may improve surgical conditions by increasing venous diameter and improving blood flow to the fistula site. We explore different anesthetic techniques and their association with early and late failure rates of AVFs.
Materials and Methods: Following REB approval prospective data was reviewed from patients undergoing primary AVF creation from Jan 2008 to Dec 2009. Demographic data, and surgical characteristics including AVF usability rates at 6-weeks and 3-months after surgery. Patients were divided into 3 groups: general anesthesia (GA), regional anesthesia (RA), and local anesthesia (LA). Chi-square and Fishers Exact tests were used for categorical data, ANOVA for continuous data. P < 0.05 was considered statistically significant.
Results and Discussion: 220 patients underwent primary AVF creation. 114(52%), 59(27%), and 47(21%) patients received local, regional or general anesthesia respectively.
Demographic data and surgical characteristics were similar. There was no significant difference in failure to mature or thrombosis rates between the 3 groups at 6 weeks or 3 months post surgery.



[Figure 1]



[Figure 2]

Conclusion(s): Anesthetic technique does not appear to be associated with the early or late failure or thrombosis of AVFs.

8AP5-7

The interest of the transversus abdominis plane block for postoperative analgesia during hysterectomy

Ayedi M., Zouari J., Smaoui M., Abidi S., Jarraya A., Kolsi K.
Hopital Hedi Chaker, Department of Anaesthesiology and Intensive Care, Sfax, Tunisia

Background and Goal of Study: The abdominal wall is a significant source of pain after abdominal surgery. Several methods are performed to control the pain after a total abdominal hysterectomy. The transversus abdominis plane (TAP) block is an expanding regional anesthesia technique that provides analgesia following abdominal surgery. The aim of this study is to evaluate analgesic efficacy of the TAP block in patients undergoing total abdominal hysterectomy via laparotomy.
Materials and Methods: Thirty-six patients aged between 20 and 65 years with ASA I-II physical status, proposed to elective total abdominal hysterectomy were included in this prospective, randomized, double-blind study. All patients received general anesthesia induction by thiopental 5mg/kg, cisatracurium 0.15 mg/kg and remifentanil 1μg/kg. Then the patients were randomized into two groups, G1: injection of 20 ml bupivacaine0.25% in the plane of the transversus abdominis on each side and G2 : injection of 20 ml saline. Maintenance of anesthesia with propofol 6mg/kg/h, remifentanil 0.1μg/kg/min set according to the hemodynamic changes and cistracrium. In addition a standard postoperative analgesia by 1g paracetamol, 0,1mg/kg morphine and 100mg ketoprofen was given to both groups. In postanesthesia care unit, complementary analgesia was made by morphine titration 2mg every 5min if the verbal numerical rating scale (VNRS)>3, the first request and total doses of morphine was recorded. VNRS was evaluated at rest and after mobilizing the knees for the 48 postoperative hours. Statistical study was performed using SPSS 18.0 for Windows, the analyses of data by chi-square and t-test , the results were considered as significant for $p< 0.05$.
Results and Discussion: The demographic characteristics and duration of the surgery were comparable between the two groups. The TAP block reduced the VNRS at rest and at mobilizing knees until 48h ($p< 0.05$), the total doses of morphine (2.56mg vs 7.50mg; $p< 0,001$) and the intraoperative use of remifentanil (512μg vs 804μg; $p< 0.001$).There was no difference in side effects of morphine, except for vomiting after 60, 90 and 120min which were lower for G1 ($P< 0,05$). We didn't observe any complications related to the TAP block.
Conclusion(s): The TAP block with 0,25% bupivacaine significantly reduced pain after elective total abdominal hysterectomy. It also reduced perioperative use of opioids.

8AP5-8

Breast cancer surgery under hypnosis and local anesthesia: Feasibility and potential benefits

Roelants F., Georges P., Ponchon F., Berlière M., Watremez C.
Cliniques Universitaires St Luc Université Catholique de Louvain, Department of Anaesthesiology, Brussels, Belgium

Background and Goal of Study: Anesthetic technique can influence breast cancer reccurrence.[1]Locoregional anesthesia reduces postoperative incisional pain, opioid consumption and eliminates surgical stress response after breast cancer surgery influencing oncological outcome[2]. In this context, performing surgery under local anesthesia (LA) and hypnosis seems to be very attractive.
Furthermore, in breast biopsy, a brief presurgery hypnosis session decreases intraoperative analgesic and sedative need, side effects and is cost effective[3]. We retrospectively compared our series of breast cancer surgery patients (quadrantectomy and sentinel node biopsy (QSN) or axillary dissection (QAD)) under hypnosis and LA with those operated under general anesthesia (GA).
Materials and Methods: 78 consecutive women who underwent QSN or QAD under GA or LA and hypnosis between January and October 2010 were included . In the hyp group (n=18) hypnosis was induced using progressive muscle relaxation as described by Erickson. LA was performed by the surgeon (lidocaine 0.5%+ levobupivacaine 0.25%). A 0.05 μg/kg/min continuous infusion of remifentanil was started and increased as needed. In the GA group (n=60), anesthesia was induced with propofol, ketamine, clonidine, lidocaine and sufentanil. The main objectives were to compare the length of surgery, time spent in the operative room, perioperative drugs consumption, postoperative lymphatic drainage, and hospital stay. Statistical analysis used Man Withney U test and Fischer exact test; $p< 0.05$ was considered significant.
Results and Discussion: Demographic data were similar among the groups. Results are in the Table.

	hyp	GA	p
Operative time (min)	81±18	80.5±16.4	ns
Time spent in operative room (min)	122±20.5	116.2±19.7	ns
Ephedrine consumption (mg)	0±0	6±8.4	0.001
Recovery room: paracetamol consumption (mg)	0.33±0.49	0.05±0.22	0.004
Recovery room: piritramide consumption (mg)	1.78±2.46	3.83±3.14	0.02
Drain (ml)	24.7±52.4	61.4±75.3	0.02
Lymphatic ponction (ml)	5.3±12.3	6.5±20.7	ns
Hospital stay (d)	2.38±0.72	3.1±0.81	0.004

[Table]

The fluid drainage reduction may be the result of posthypnotic suggestions.
Conclusion: Hypnosis and LA can be safely proposed for breast cancer surgery reducing opioid use, hospital stay and is cost effective.
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8AP5-9

The position of the femoral nerve in patients with a proximal femoral fracture

Wiles M.D., Emery D.K., Moppett I.K.
University of Nottingham, Department of Anaesthesiology and Intensive Care, Nottingham, United Kingdom

Background and Goal of Study: Hip fracture is a common problem within the elderly population and is associated with significant morbidity and mortality. Analgesia is an important component in the management of these high-risk patients. Femoral nerve blocks can be performed to provide peri-operative analgesia. In this procedure anatomical landmarks, in particular the femoral artery, are used to locate the femoral nerve. However, these may be altered after hip fracture. One small study (n=10) using MRI found a lateral deviation in the position of the femoral nerve in femoral neck fractures. [1]
This study aimed to further investigate the position of the femoral nerve relative to the femoral artery in neck of femur fractures. We hypothesised that the distance between the midpoint of these two structures would be increase after a hip fracture.
Method: After Ethics Committee approval 30 patients with neck of femur fractures were recruited. Ultrasound (Sonosite S-nerve, Sonosite, Bothell, WA, USA) was used to record an image of the femoral artery and femoral nerve in both the fractured and non-fractured hip, at the level of the inguinal ligament. The horizontal distance between the midpoint of the femoral nerve and the midpoint of the femoral artery was then independently measured by two blinded observers.
The data were analysed using a paired t-test, with $p< 0.05$ taken as significant.
Results and Discussion: Two participants were excluded as the femoral nerve could not be visualised, leaving 28 participants for analysis, of which

17 were female. The mean age of participants was 76 years and mean weight 66 kg.
The intra-observer variation in measurement was 0.17 cm (0.26) on the side of the fracture and 0.14 cm (0.34) on the non-fractured side. The difference between the midpoint of the femoral nerve and femoral artery was 1.78 cm (0.44) on the side of the fracture and 1.66 cm (0.39) on the non-fractured side (p= 0.311). All values are mean (SD).
Conclusion: Proximal femoral fractures do not result in a clinically significant alteration in the position of the femoral nerve relative to the femoral artery at the inguinal ligament. This knowledge is useful when performing femoral nerve blocks using landmark techniques.
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8AP5-10

Peritonsillar injection of ropivacaine may increase the risk of inspiratory pneumonia after tonsillectomy in infants

Zen N., Fujino H., Hosoi R., Itoda S., Yokoyama T.
Kyushu University, Department of Dental Anesthesiology, Fukuoka, Japan

Background and Goal of Study: Peritonsillar injection of ropivacaine is useful not only for analgesia during tonsillectomy but also for postoperative pain control especially in infants. However, we experienced two cases of facial nerve palsy after tonsillectomy with peritonsillar injection of ropivacaine. The distance between the tonsil and glossopharyngeal and vagus nerves is shorter than that between the tonsil and the facial nerve. Peritonsillar injection of ropivacaine, thus, may cause palsy of glossopharyngeal and vagus nerves and may increase the risk of inspiratory pneumonia. In the current study, we investigated the occurrence of inspiratory pneumonia retrospectively.
Materials and Methods: Infants received tonsillectomy were divided into two groups retrospectively; 60 infants received peritonsillar injection of ropivacaine (R group) and 66 infants received saline (C group). Two radiologists checked postoperative chest X-p taken on the next day blindly. WBC, CRP, CPK, LDH and use of antibiotics were also checked.
Results and Discussion: There was no significant difference of patient's background between R group and C group; 4.2±1.2 vs 4.2±1.3 year-old, 104±9 vs 104±10 cm, and 17.1±4.4 vs 17.4±4.8 kg. In the R group, 16 infants (26.7%) were diagnosed pneumonia from postoperative chest X-p findings, while 9 infants (13.6%) were diagnosed pneumonia in the C group, although it did not reach the statistical significance. In the R group, CRP significantly increased from 0.25±0.6 to 4.4±3.3, while it increased from 0.17±0.4 to 2.3±2.5 in the C group (p< 0.002), although there was no significant difference in WBC, CPK and LDH. In the R group, 32 infants (53.3%) received antibiotics, while 14 infants (21.2%) received antibiotics in the C group (p< 0.001).
Conclusion(s): WBC, CPK and LDH did not reach the statistical significance. However, results of X-p findings and CRP suggested that infiltration anesthesia with ropivacaine for tonsillectomy might increase the risk of postoperative inspiratory pneumonia in infants.

8AP5-11

Peritoneal block analgesia after laparoscopic cholecystectomy

Kallel S., Ben Soltana M.H., Djemal W., Triki Z., Chaari M., Karoui A.
Academic Medical Center Habib Bourguiba of SFAX, Department of Anaesthesiology, SFAX, Tunisia

Background and Goal of Study: The laparoscopic approach to cholecystectomy offers several advantages.
However, the postoperative pain remains the main problem of the postoperative morbidity. The effectiveness of peritoneal blocks for analgesia after laparoscopic cholecystectomy is currently subject to many controversies. The aim of our study is to assess the analgesic effects of intraperitoneal administration of 40 mL of lidocaine 1% after laparoscopic cholecystectomy.
Materials and Methods: This is a prospective, randomized, double-blind study including 40 patients. Informed *written consent* and approval of the ethics committee were obtained.
Inclusion criteria included women between 20 and 60 years old, weighing over 50 kg with ASA physical status I-II. Patients were randomly assigned into 2 equal groups after induction of anesthesia. Group 1 (lidocaine) : comprising patients who received instillation of 40 ml of 1% lidocaine ; 20 ml under the right diaphragm and 20 ml on *the gallbladder bed* ; group 2 (placebo) : instillation in the same way but with 40 ml of saline serum. The instillation was practiced at the end of the intervention in Trendelenburg position maintained for 10 min, by the surgeon guided by his camera. Postoperative pain was assessed by visual analogue scale (VAS)
Results and Discussion: The two groups were comparable regarding demographic data, the total intraoperative fentanyl dose and the duration of the intervention. The mean VAS scores at rest were significantly lower in the lidocaine group (p < 0.05). Patients with severe pain (VAS > 50) were greater in the placebo group (17/20) than in the lidocain one (9/20), and this was significantly (p < 0.05).
There were no side effects associated with intraperitoneal administration of lidocaine which pharmacokinetic study showed plasma concentrations below the toxic threshold (6ч g/ml)
Conclusion(s): Post laparoscopic cholecystectomy Analgesia provided by intraperitoneal administration of 40 mL of 1% lidocaine is an effective non-invasive and safety method, allowing in some cases, to perform these interventions in ambulatory.

8AP6-1

The relative potency ratio of intrachecal 0.5% and 0.4% ropivacaine for lower limb surgery

Xu T., Wang J., Li S.
Beijing Jishuitan Hospital, Department of Anaesthesiology, Beijing, China

Background and Goal of Study: Previous studies reported that varying the concentration of local anesthetic may affect the potency of spinal anesthesia. However, there are no reports about the relative potency ratio of intrachecal 0.5% and 0.4% ropivacaine for lower limb surgery. So we carried out this study in order to calculated the median effective dose (ED_{50}) of intrachecal 0.5% and 0.4% ropivacaine for lower limb surgery ,then defined relative potency ratio.
Materials and Methods: We enrolled 52 patients undergoing lower limb surgery (approximately 60 min) with combined spinal- epidural anesthesia. They were randomly allocated into two groups and received either intrathecal 0.5%(wt/vol) ropivacaine or intrathecal 0.4%(wt/vol) ropivacaine. The initial dose of spinal ropivacaine was 12 mg, and the testing interval was set at 1 mg. The effective dose was defined as the sensory block at the T12 dermatome within 20 min after the spinal injection and without supplemental epidural anaesthetic administered for at least 60 min. The ED_{50} was calculated by the up-down sequential analysis.
Results and Discussion: The ED_{50} of spinal ropivacaine was 9.2 mg (95%CI 8.6-9.8) for 0.5% concentration, 12.2mg (95%CI 11.5-12.9) for 0.4% concentration, the potency ratio of spinal 0.4% and 0.5% ropivacaine was 0.75 (95%CI 0.71-0.79).
Conclusion(s): We conclude that the efficacy of intrathecal ropivacaine for lower limb surgery was influenced by the concentration of local anesthetic, the relative potency ratio of intrathecal 0.4% and 0.5% ropivacaine was 0.75.
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8AP6-2

Comparison of the antinociceptive potency between intrathecal ropivacaine and bupivacaine in rats

Nishiyama T., Kohno Y., Koishi K.
Higashi Omiya General Hospital, Department of Anaesthesiology and Intensive Care, Arakawa-ku, Japan

Background and Goal of Study: Ropivacaine is less cardiotoxic than bupivacaine. However, ropivacaine is reported to be approximately 40% less potent than bupivacaine in labor (1). The purpose of this study was to compare antinociceptive potency between ropivacaine and bupivacaine for two different nociceptive stimuli when administered intrathecally using rat model.
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 administration of ropivacaine or bupivacaine. Fifty % effective dose (ED50) of each agent was calculated. Eight rats were used in each dose group. Behavioral side effects were also investigated.
Results and Discussion: ED_{50} values are shown as mean and 95% confidence interval (in parenthesis) in the table.

	Tail flick	Formalin phase 1	Formalin phase 2
Ropivacaine (μg)	30.5 (20.8-44.6)	0.05 (0.01-0.12)	0.005 (0.0002-0.01)
Bupivacaine (μg)	7.0 (3.7-13.1)	5.5 (1.9-15.4)	3.3 (0.1-12.0)

[Table]

Intrathecal ropivacaine was about 4 times less potent than bupivacaine in nociception for acute thermal stimuli. However, intrathecal ropivacaine was 110

and 660 times more potent than bupivacaine in nociception for acute and facilitated inflammatory stimuli.
Conclusion(s): Intrathecal ropivacaine was less potent for acute thermal stimuli, but more potent for inflammatory stimuli than bupivacaine.
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8AP6-3

A comparison of the efficacy of local anaesthetic wound infiltration versus intrathecal morphine for postoperative analgesia following total knee arthroplasty

McCarthy D.M., Galbraith J., Loughnane F., Shorten G., Iohom G.
Cork University Hospital, Department of Anaesthesiology, Cork, Ireland

Background: Effective analgesia following total knee arthroplasty may be provided using intrathecal opioids, epidural analgesia or continuous peripheral nerve blockade [(1)]. Local anaesthetic infiltration has proved superior to epidural analgesia and femoral nerve blockade [(2, 3)].
To date, no study comparing this technique with intrathecal morphine has been published.
Objective: To evaluate the analgesic efficacy of intra- and peri-articular plus wound infiltration with levobupivacaine in comparison with intrathecal morphine following total knee arthroplasty. The primary outcome measure was analgesia in the first 48 postoperative hours as assessed by visual analogue scale (VAS) scores for pain. A secondary outcome measure was morphine consumption.
Methodology: In this prospective, randomized controlled trial patients were randomized to one of two groups. Patients in the standard group (S) received spinal anaesthesia with intrathecal bupivacaine and morphine 0.3 mg. Patients in the infiltration group (I) received spinal anaesthesia with intrathecal bupivacaine without morphine, and infiltration with levobupivacaine 0.5% 2mg/kg body weight plus 0.5mg epinephrine made up to a volume of 100ml with normal saline. An intra-articular catheter was sited prior to wound closure and a bolus of 15 ml levobupivacaine 0.5% was given on the first postoperative day. Patients' VAS for pain was assessed at 2, 6, 12, 24 and 48 hours both at rest and on movement (passive flexion to 30°). Total analgesic consumption in the form of morphine PCA use was recorded.
Results: Out of the planned 36 patients 20 have been recruited to date (10 to group S, 10 to group I). Mean VAS scores for pain show a trend towards being lower in the infiltration group Vs the standard group at both 24 and 48 hours (Table 1).

	24 hours			48 hours		
	Group S	Group I	p	Group S	Group I	p
At rest	32 (35.2)	9.3 (16.50)	0.08	16 (30.8)	3.7 (6.1)	0.23
On movement	49.8 (30.3)	26.9 (18.3)	0.06	33.4 (30.7)	24 (20.8)	0.43

[Table 1: VAS scores for pain [mean, SD]]

Morphine consumption was similar in the two groups (25.6mg Vs 44.2mg, p=0.36).
Conclusion: The preliminary findings of this planned interim analysis suggest that the local anaesthetic infiltration technique has no advantage over intrathecal morphine with regards to analgesia up to 48 hours following TKA.
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8AP6-4

Opioids added to local anaesthestics for single shot intrathecal anaesthesia

Pöpping D.M., Elia N., Marret E., Wenk M., Tramèr M.R.
University Hospital of Muenster, Department of Anaesthesiology and Intensive Care, Muenster, Germany

Background: Opioids are used as additives to local anaesthetics for intrathecal anaesthesia. Their benefit and adverse effects profile remain unclear.
Methods: We performed a systematic search in databases and bibliographies (to 10.2010) for randomised trials comparing any opioid added to any intrathecal local anaesthetic, compared with the local anaesthetic alone. We included full reports in adults undergoing any surgery, except caesarean section, using single-shot intrathecal anaesthesia without general anaesthesia. We estimated weighted mean differences for continuous, and odds ratios (OR) for dichotomous data with 95% confidence intervals (CI). Analyses were stratified according to opioids.
Results: We included 65 trials (3,550 patients, 1,895 received opioids), published between 1983 and 2010. With hypophilic opioids (fentanyl, sufentanil, buprenorphine, tramadol) the increase in the duration of postoperative analgesia was 137 min [95%CI, 103 to 171], with hydrophilic opioids (morphine, diamorphine) was 585 [418 to 752]. Time to onset of sensory block (9 studies), and to onset of motor block (10) was not significantly different between groups. Six studies reported on desaturation, and 10 on respiratory depression: both risks were increased with opioids (OR 1.97 [0.99 to 3.89] and 3.61 [1.67 to 7.81], respectively). Twenty-one studies reported on PONV, 54 on pruritus, and 18 on urinary retention; all risks were increased with opioids (OR 2.53 [1.82 to 3.50], 8.02 [6.40 to 10.04] and 1.92 [1.28 to 2.86], respectively).
Conclusion: Opioids added to local anaesthetics for single-shot intrathecal anaesthesia prolong the duration of postoperative analgesia, by about 2 hours with lipophilic opioids, and by about 10 hours with hydrophilic opioids. Minor and potentially major adverse effects may limit their usefulness.

8AP6-5

The colour doppler flow as a valid alternative to better visualize the spread of local anesthetic during pediatric neuraxial anesthesia

Galante D., Meola S., Matrella P., Rinaldi N., Lambo M.
University Hospital Ospedali Riuniti, Department of Anaesthesiology and Intensive Care, Foggia, Italy

Introduction: Caudal anesthesia is generally considered safe to perform. Nevertheless, complications have been reported. Additionally, failure rates up to 11% may occur related to difficult identification of the epidural space1. Performing caudal anesthesia under ultrasound imaging allows the identification of the epidural space, visualisation of needle advancement and real time colour doppler flow (CDF) observation of local anesthetic (LA) spread. We report our experience with ultrasound caudal anesthesia together with the use of CDF in neonates and infants.
Methods: 35 ASA 1 and 2 neonates and infants [0-6 month, 2.1-8.4 kg] undergoing infraumbilical urological procedures received a caudal block after sedation with sevoflurane. Using a high frequency linear probe the neuraxial structures were identified. Puncture was performed with the transducer placed longitudinally.
A 25 or 22 gauge needle was advanced through the sacral hiatus in an in-line technique. Needle position was confirmed and LA was slowly injected under ultrasound CDF observation. The transducer was slowly shifted cranially and anesthetic CDF spread was observed up to the thoracolumbar junction.
Results: The neuraxial structures and the needle were clearly observed in all patients. The local anestheticspread was directly visible during injection in 90% of patients with both the techniques (traditional and CDF) and in the other 10% of patients the use of CDF allowed to identify the spread. This allowed a great precision of the assessment of the cranial extension of the block in all patients. In transverse ultrasound scanning the CDF allowed to demonstrate that the needle can largely deviate into the caudal space respect to the median line.
Discussion: CDF in neonates and infants allowed the reliable identification of the target structures in 100% of patients without complications. Observation of CDF spread up to the thoracolumbar junction allowed prediction of block success and the observation of needle deviation that can cause failure.
References:
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8AP6-6

Low dose intrathecal morphine for postoperative analgesia after vaginal hysterectomy: Comparative clinical examination of two different small doses

Palashevska L., Jovcevski S., Popovska S., Popovska R., Curlinov K.
Gynecology, Obstetric Clinic Center, Department of Anaesthesiology, Skopje, Macedonia, the Former Yugoslav Republic of

Background and Goal of Study: To prospectively compare the spinal analgesia with two different small doses of morphium chydrochloride after vaginal hysterectomy.
In this study, we examined analgesia and side effects of intrathecal morphium chydrochloride (MCh) after vaginal hysterectomy in the following two small doses: 0,05mg and 0,1mg.
Materials and Methods: Fourty patients were randomized to receive either 0,5ml/0,05mg or 0,5ml/0,1mg of MCh inrathecaly together with 3,5ml, 0,5%

isobaric bupivacaine hydrochloride. The duration of postoperative analgesia, the intensity of the initial pain sensation and the frequensy of opoid side effects were recorded for the first 24 hours.
Results and Discussion: The mean duration of analgesia in the group M 0,05 was 14.3 ± 1.1 hours and was significantly shorter than 19.7 ± 1.7 hours in the M 0,1 group ($p < 0.05$). Visual analoque scale (VAS) score for the initial pain intensity in the M 0.05 group was 5 (central value). That in the M 0.1 group was 3 (central value). The difference was not significant ($p < 0.05$). There was no respiratory depression in the groups. The difference in the frequency of nausea and vomiting was not significant, but that in the frequency of itching was ($p < 0.05$).
Conclusion(s): Intrathecal usage of 0.05 mg and 0.1 mg of MCh provides long lasting postoperative analgesia. It is a practical method for providing it after vaginal hysterectomy. The efficasy of 0.1 mg of MCh is greater compared to that of 0.05 mg of MCh. These doses of MCh do not cause respiratory depression, but cause nausea, vomiting and itching.
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8AP6-7

Patient-controlled epidural analgesia following gynecological surgery: Ropivacaine with fentanyl 2μg/ml provides excellent postoperative pain relief without side effects

Suzuki Y., Sato M., Nakajima K., Kanma T., Tokutake I., Yokoi M.
Keiyu Hospital, Department of Anaesthesiology, Yokohama, Japan

Background and Goal of Study: According to some protocols like ERAS (Enhanced Recovery After Surgery), the demand for enhanced recovery from surgery has been increasing recently. Patient-controlled epidural analgesia (PCEA) is widely used after gynecological surgery because PCEA not only provides excellent pain relief, but also promotes recovery after surgery. It is important to know the minimum effective concentrations of local anesthetics and opioids in order to avoid their side effects such as PONV, motor block and hypotension, but no study has evaluated these values so far.
The aims of this study were to evaluate ED50 and ED95 of ropivacaine (R) for pain at rest with three different concentrations of fentanyl (F) and determine the most useful concentrations of R and F after gynecological surgery.
Materials and Methods: 120 ASA 1 or 2 patients undergoing elective open gynecological surgery via a lower abdominal incision were randomly allocated to receive one of three solutions for PCEA (R group : R+droperidol(D)0.02mg/ml, RF2 group : R+F2μg/ml+D0.02mg/ml, RF4 group : R+F4μg/ml+D0.02mg/ml). Before induction of general anesthesia,an epidural catheter was inserted at the level of Th12/L1.
Anesthesia was maintained with sevoflurane,remifentanil and rocuronium. At skin closure,we administered 8ml of 0.5%ropivacaine and started PCEA infusion. The concentration of R for the first patient was set at 0.15%. We increased or decreased the concentration for each patient by 0.01% based on whether the previous patient felt pain at rest on the next morning after surgery (up-and-down sequential method). PCEA pump was set for 5ml/hr basal rate, 1ml bolus and 20min lockout. Side effects were checked on the next morning. Probit regression was used to evaluate ED50,ED95 and their 95%CI. Logistic regression was used to determine predicting factors of PONV. Statistical analyses were performed using R for Windows.
Results and Discussion: ED50 was 0.16% in R group,0.00% in RF2 group and 0.00% in RF4 group. ED50 in R group was significantly higher than that in other groups. ED95 was 0.23% in R group,0.14% in RF2 group and 0.15% in RF4 group.
Although there was a correlation between PONV and the use of fentanyl,no patient complained of severe PONV.
Conclusions:
Plain ropivacaine does not provide sufficient postoperative pain relief without motor block.
1. Fentanyl 2μg/ml was as effective as fentanyl 4μg/ml.
2. Ropivacaine 0.14% with fentanyl 2μg/ml was considered the most useful.

8AP6-8

Comparison of propofol and ketamine infusions as sedatives used in patients going under spinal anesthesia for elective repair of unilateral inguinal hernia

Soyal O.B., Atasoy S., Gogus N.
Ankara Numune Hospital, Department of Anaesthesiology and Intensive Care, Ankara, Turkey

Background and Goal of Study: Patients going under regional anesthesia are prone to stress and discomfort throughout the surgical procedure due to vigilance. Our aim is to compare infusion of two different agents for sedation in spinal anesthesia performed for elective repair of unilateral inguinal hernia.
Materials and Methods: ASA I-II 60 male patients were included in this study. Each patient was evaluated by the Trait Anxiety Inventory of Spielberger (STAI-I) both preoperatively and postoperatively when totally awake and oriented. After infusion of 500 mL lactated ringer solution and premedication with 0,01 mg/kg midasolam, patients in Group K (n 30) received 1,8 mg/kg/hr ketamine and patients in Group P (n 30) received 6 mg/kg/hr propofol infusion. 5 minutes after starting the infusion, spinal anesthesia was performed. Following the positioning of the patient, the drug infusion rates in Group K and Group P were decreased to 0,3 mg/kg/hr and 1,5 mg/kg/hr respectively. These rates were increased or decreased by %50 according to the sedation score (eyes closed, but ersponsive to verbal commands) and hemodynamics of the patient. Hemodynamic parameters, sedation scores, bromage scales, patient-surgeon satisfaction and side affects of the drugs were recorded.
Results and Discussion: Mean arterial pressures of patients in Group P were lower then the ones in Group K. While the patients in Group K had neither hypo or hypertension, 4 patients in Group P had hypotension during the procedure. Sedation scores remained similar in both groups. NRS for pain on spinal injection was low for both groups. Preoperative anxiety was higher in both groups, but anxiety didn't differ among the groups. Side effects observed in Group K were; nystagmus (n 3), dysphasia (n 2) ¸irritating dreams (n 1) and in Group P; hypotension (n 3), involuntary movement (n 2), pain on the injection site (n 4), dreaming (n 4).
Conclusion(s): In our study, we evaluated that although subanesthetic doses of ketamine causes less side effects, dreams and involuntary movement caused by propofol is thought to be due to its subanesthetic dosage.Both surgeon and patient satisfaction was high in both groups. Because our patients showed no anxiety preoperatively, we couldn't show the affect of sedation on anxiety. We conclude that subanesthetic doses of ketamine can be a good alternative to subanesthetic propofol for sedation.

8AP6-9

Improved postoperative analgesia with local infiltration analgesia (LIA) compared to intrathecal morphine following total knee arthroplasty

Essving P., Axelsson K., Åberg E., Spännar H., Gupta A., Lundin A.
Örebro University Hospital, Dept. of Orthopedic Surgery and Anesthesiology, Örebro, Sweden

Background and Goal of Study: Postoperative pain management using local infiltration analgesia (LIA) following total knee arthroplasty (TKA) has gained increasing popularity over the last decade. We compared the LIA technique with intrathecal morphine following TKA.
Materials and Methods: Fifty patients undergoing TKA under spinal anesthesia were randomized into two groups in a double-blinded way. In group LIA, a solution of ropivacaine, ketorolac and epinephrine was infiltrated in the knee during the operation and two bolus injections were given via an intraarticular catheter postoperatively after 21 and 45 h. In group M, 0.1 mg morphine was added to the spinal local anesthetic.
Results and Discussion: Median (range) morphine consumption was significantly lower in group LIA compared to group M during the first 48 postoperative hours: 23 (2-80) mg vs. 42 (19-138) mg ($p = 0.001$). Pain scores were lower in group LIA compared to group M at rest up to 24 h as well as on movement up to 46 h ($p < 0.01$). The patients in the LIA group were mobilized quicker and could be discharged home earlier; after 3 vs. 4 days ($p = 0.03$). Patient satisfaction was greater in group LIA compared to the patients receiving intrathecal morphine ($p = 0.001$). We found no differences in knee function, side effects or in patient-related outcomes using Oxford Knee score or EQ-5D during the three month follow-up.
Conclusion: Local infiltration analgesia provided superior postoperative analgesia, resulting in earlier mobilization and shorter hospital stay, compared to intrathecal morphine following total knee arthroplasty.

8AP7-1

BBraun Perifix ONE shows better ultrasound visibility and spends less scan time than BBraun soft tip: An in vivo study of regional anesthesia catheters

Takatani J., Takeshima N., Okuda K., Noguchi T.
Oita University Faculty of Medicine, Department of Anaesthesiology and Intensive Care, Oita, Japan

Background and Goal of Study: Several studies have reported the ultrasound visibility of regional anesthesia needles, but none for the catheters. This study examined the ultrasound visibility and the efficacy of Perifix ONE (BBraun), which is promoted as a catheter with good ultrasound visibility.
Materials and Methods: Patients with chronic upper limb pain were selected for this double-blind randomized controlled trial, excluding whom with a history of operation at the site. We compared Perifix One with Soft Tip (BBraun) in the same size (20-gauge). One of the 2 catheters was placed beside the brachial plexus via a needle with ultrasound, at a depth of 1 cm, parallel to the surface, with in-plane approach.
Long axis images of the catheter and the required time to scan the catheter were recorded. The procedure was finished after the injection of the anesthetics. The same procedure was repeated using the other catheter in the next block. Success of the block was defined by the reduction of pain score to 0 within 1 hour. Subjective visibility was described on a scale (from 0 = invisible to 3 = excellent). Pixel intensity was defined as the gray-scale value between 0 (black) and 255 (white), and the objective visibility was estimated as the difference in mean pixel intensity.
We used paired *t* test for continuous variables; the Wilcoxon signed ranks test were used for ordinal variables. Data were described as means ± standard deviation, 95% confidence intervals.
Results and Discussion: Demographic data were as follows: there were 7 patients (3 males and 4 females) with mean age of 62.9±9.29 years, mean height of 157.3±8.83 cm and mean weight of 61.0±3.83 kg. Results are shown in Table 1.

		Perifix ONE	Soft Tip	P value
Subjective visibility (0-3) [Subjective Visibility Units]		2.5±0.8	1.4±0.9*	<0.0001
Objective visibility (0-255) [Pixel Intensity Units]				
	The difference between the surface and the background	75±14	69±25	0.64
	The difference between the surface and the center	59±11	20±14*	0.0003
Scan time [second]		27±13	50±18*	0.013
Success rate [%]		100	71	0.18

The values are reported as mean ± standard deviation.
*P<0.05 is considered as significant.

[Table 1]

The large gap in gray-scale value on Perifix ONE delineated the dark center line, and this may make it more visible and reduce the scan time.
Conclusion: Perifix ONE is considered visible and useful for ultrasound-guided nerve block. Further study under various condition is necessary.

8AP7-2

Efficacy of ropivacaine continuous wound infusion versus single shot after spine fusion surgery

Ruggiu G., Rezzadori G., Carles M., Litrico S., Raucoules M., Service de Neurochirurgie Hopital Pasteur NICE
Centre Antoine Lacassagne, Department of Anaesthesiology and Intensive Care, Drap, France

Background and Goal of Study: Spine fusion surgery is among the most painful surgeries, with a high risk of persistence of pain. Because local anesthetic infiltration has not been compared to continuous infusion, we have designed this study (1) to determine whether such a technique could enhance analgesia and improve outcome in patients after posterior lumbar arthrodesis.
Materials and Methods: Prospective, randomized controlled, monocentric study. We include patients for whom posterior lumbar spine arthrodesis has been scheduled.
We exclude surgery linked to an infectious, tumoral or traumatological cause and patients suffering from chronic pain.
The Main Objective is to compare the evolution of the postoperative levels of pain by means of the EVA measured at H2, H8, H16, H24, H48 until D2, between 2 groups of patients: one receiving a local analgesic “single shot” infiltration (ropivacaine 0.5%), the other receiving a single shot infiltration and a continuous infiltration of ropivacaine 0.2% at 5ml/h for 48 hours.
The secondary outcomes are:
- Morphine consumption 24hrs and 48hrs after surgery
- Post-Operative Nausea and Vomiting rate
- Delay up to when the patient first stands up
- Quality of sleep
- Stay duration
-Persistence of residual pains at 3 and 6 months after de surgery
Data are expressed as the mean ± standard deviation (sd). The results were analyzed by using the nonparametric Mann-Whitney *U*-test, the Student's *t*-test, or the χ^2 test. A P value < 0.05 was considered to represent statistical significance.
Results and Discussion: 59 patients with comparable demographic data were included, 29 in the catheter group, 30 in the control group.
There is a trend towards reduced pain in immediate and late postoperative data, less morphine consumption, early first standing position, better sleep and less pain at 3 and 6 months in the continuous group.
Incidence of nausea is significantly lower in the catheter group (8 patients *versus* 22 *p=0.01*).
Length of stay is significantly lower in the catheter group (mean 4.97±0.63 days *versus* 5.63±1.19 days, *p=0.008)*.
Conclusion: Continuous wound infusion, in relay of single shot infiltration, is a safe an effective technique as part of a multimodal analgesic regimen for postoperative pain management after spine fusion surgery.
References:
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8AP7-3

Threading the femoral catheter through the stimulating needle tip: Comparison between bevel up and down positions

Vo Van J.M., Nguyen N.C., Eid G., Shacoori V., Dpt of Anesthesiology and Intensive Care and Group A.R.R.E - University of Rennes I
Universitary Hospital of Rennes, Department of Anaesthesiology and Intensive Care, Rennes, France

Background and Goal of Study: To determine whether threading a femoral catheter past a needle tip with the bevel down (facing the femoral nerve perineural space) ensures more solid and effective analgesia than with the bevel up (customary needle position) after total knee prosthesis in the first 48 hours.
Materials and Methods: This was a prospective and randomized controlled trial. Forty patients undergoing total knee prosthesis were studied.
After ultrasound visualization of femoral nerve and local anaesthesia of the skin, a 5 cm stimulating needle was introduced 2 cm under the level of the inguinal crease at a 45° degree angle. After patellar twitch was achieved at the lowest intensity stimulation (0.3 - 0.5 mA), the needle was immobilized. Five ml of ropivacaine 0.5% was injected through the needle, then the catheter was inserted with the bevel up (group I, n = 20) or down (group II, n = 20) to a length of 5 cm. Ipsilateral sciatic nerve block was placed with a single shot 20 ml of ropivacaine 0.5%.
General anaesthesia was induced. Catheter position was confirmed by dye injection and x-ray in the recovery room before starting 0.2% ropivacaine 6 ml/h continuous infusion. Morphine consumption via patient controlled analgesia system and VAS scores were recorded at equal time intervals in the first 48 hours.
Results and Discussion: No difference of ease between threading of the catheter to a length of 5 cm with the bevel up or down was noted. All catheters had a cephalic course. Catheter opacification showed that in group II, only 3 catheters were incorrectly situated versus 7 in group I.
Analgesia was satisfactory (VAS ≤ 3) with 17 patients in group II and 14 in group I. Morphine consumption in group II was 8 ± 4 mg /24h versus 17 ± 3 mg /24h in group I. Pain control during knee mobilization with continuous movement device was adequate in 18 patients in group II and 16 in group I. Some discrepancy occurred in 2 cases where the analgesia was adequate with the catheter in poor position.
Conclusion(s): Femoral catheter placement through the stimulating needle with the bevel down ensures a better catheter position on the nerve progression plane among the perineural structures and is an effective method for providing satisfactory postoperative analgesia for patients after total knee replacement.

8AP7-4

Antimicrobial effect of continuous lidocaine infusion in a staphylococcus aureus induced wound infection mice model

Lin T.-Y., Chiu K.-M., Chu S.-H.
Far Eastern Memorial Hospital, Department of Anaesthesiology, Taipei, Taiwan, Republic of China

Background and Goal of Study: The continuous infusion of local anesthetics in the wound is an established simple and safe technique for the control of postoperative pain after surgery. It has been tested in various sites and proved to be effective. In our previous study, local anesthetics infused in subcutaneous layer of thoracotomy or sternotomy after cardiac surgery would significantly decreased acute and chronic pain.[1] In addition to the conventional use, local anesthetics have been shown to possess anti-bacterial property in several studies. However, the effect of continuous infusion of local anesthetics on surgical wound in the presence of infection remains unclear. Therefore, we developed a mouse model of surgical wound infection to examine the effect of continuous infusion of lidocaine on anti-bacterial response.
Materials and Methods: In vitro antimicrobial activity of lidocaine was first determined. Staphylococcus aureus bacterial cultures with various concentrations of lidocaine were incubated for 6, 24 or 48 hours at 37°C. The cultures of different incubation time were further incubated for 24 hours and then colony counts were determined. In our wound infection model, thirty male balb/c mice were randomized into two groups. An 1 cm incision wound was made over dorsal flank. The wound was instilled with an inoculum of S. aureus and then a mini osmotic pump (ALZET Osmotic Pumps 1003D 1ml/hour) with normal saline or 2% lidocaine was placed into the intracapsular area. Swabs were taken from each wound and cultured at 2 days postoperatively and colony counts were determined.
Results and Discussion: Lidocaine exhibited a dose-dependent antimicrobial activity in vitro antimicrobial assay. In wound infection mice model, after 48 hours of continuous lidocaine infusion, the number of colony-forming units (CFUs) of the S. aureus measured in wounds displayed a nearly 10-fold reduction ($7.34\pm1.02\times10^6$ CFUs/g) compared with saline group ($6.85\pm1.66\times10^5$CFUs/g, $p=0.008$).
Conclusion(s): These data provides evidence that local anesthetic infusion is not only an effective and safe method of pain control but also has effect on controlling the postoperative wound infection.
References:
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8AP7-5

Postoperative analgesia with continuous infraclavicular brachial plexus block by coracoid approach allows early mobilization after elbow osteocapsular arthroplasty

Pagazaurtundúa A., Calvete I., Leal V., Ortiz P., Muñoz L.
Fundacion Jiménez Díaz, Department of Anaesthesiology, Madrid, Spain

Background and Goal of Study: Immediate postoperative mobilization by Continuous Passive Motion (CPM) after elbow release prevents development of stiffness and is therefore a key determinant of the joint's long-term mobility. However, postoperative pain compromises early start of physical therapy. Continuous brachial plexus block is an excellent technique for local pain management. It is reported to provide better analgesia than opioid-based patient-controlled analgesia, has minimal side effects and promotes faster postoperative rehabilitation.
Here, we evaluated the use of continuous infraclavicular brachial plexus block by coracoid approach for pain control during CPM after elbow osteocapsular arthroplasty.
Materials and Methods: This pilot study comprised 10 patients (4 females, 6 males; range 18 to 73 years; ASA I-II) who underwent osteocapsular arthroplasty by arthroscopic approach and initiated CPM on the day of surgery. Preoperatively, a nerve stimulator guided infraclavicular block was performed by the coracoid approach using an 18G-50mm needle and placing a 20G-300 mm catheter SILVERSTIM with a single injection of 15 ml of Levobupivacain 0.5% and 15 ml of Mepivacain 1.5% for intraoperative pain control.
After surgery, a continuous infusion of levobupivacain 0.2% (basal 5 ml/h; bolus 3 ml) was administered through the infraclavicular catheter. At 4, 8, 12, 24 and 48 hours postoperatively, we assesed the pain at rest and during CPM using the Visual Analog Scale (VAS), and the necessity of additional opioids.
Results and Discussion: All patients achieved full range of joint motion with CPM therapy during hospital stay and were satisfied or very satisfied with pain management.
The patients VAS scores were 0 at rest and between 2 and 4 during CPM. Two patients required an additional single dose of analgesia with tramadol 100 mg the first postoperative day. Accidental removal of catheter ocurred in one patient at the second postoperative day. No complications related to the technique were observed.
Conclusion(s): In patients undergoing elbow osteocapsular arthroplasty, the continuous infraclavicular block by coracoid approach provides effective postoperative pain control. This allows early CPM therapy and reduction of opioid doses, and is associated with high patient satisfaction.

8AP7-6

Role of continuous peripheral nerve blocks (cPNB) on the PACU incidence of PONV in major joint replacement (MJR)

Ben-Ari A., Marr L.
University of Pittsburgh, Department of Anaesthesiology, Pittsburgh, United States

Background and Goal of Study: Many studies identified risk factors for PONV, none examined specifically the impact of peripheral nerve blocks on PONV. This report quantifies the impact of cPNB on the risk for PONV following MJR.
Materials and Methods: Following IRB approval records of MJR patients were pulled from PACU pharmacology registry. We recorded age, gender, smoking , history of PONV, anesthetic (General/Spinal Anesthesia and presence/absence of peripheral nerve blocks). cPNB were placed before surgery: TKR group a continuous femoral nerve block primed w/ 20cc of ropivacaine 0.2%, continuous sciatic nerve block primed w/ normal saline. THR group were placed with a continuous lumbar plexus block primed w/ 20cc ropivacaine 0.2%.
Drug choice for spinal anesthetic as well as PONV prophylaxis were determined by the attending anesthesiologist. A PONV event was noted when a patient consumed any anti-nausea medications PACU.
We aimed at quantifying the risk reduction/ augmentation of PONV for different anesthetic regimes.
In model 1 we estimated the coefficient of logistic regression without adjusting for the different anesthetics. In model 2 and model 3 we examined the effects of anesthetics given gender and PONV history respectively and obtained the probabilities for developing PONV.
Results and Discussion: Total of 828 patients.. In agreement with previous studies analysis revealed female gender,mean (IQR) 0.8 (0.4 1.2) history of PONV 0.9 (0.3 1.4) to be significant risk factors for PONV. Smoking history was not a significant risk factor for PONV. For models 2 and 3 results (difference in risk mean (IQR),test mean(IQR)) are summarized in tables 1 and 2 respectively showong the advantage of of adding cPNB to general anesthesia only.
Conclusion(s): We found that cPNB when combined with general anesthetics have a protective effect against PONV. But not when combined with spinal anesthesia.

Delta General to General. block	**0.2**	**(0.1 0.4)**	**test General to General.block**	**1.0**	**(1.0 1.0)**
Delta General to Spinal	0.2	(-0.1 0.4)	test General to Spinal	0.9	(0.0 1.0)
Delta Spinal to Spinal.block	0.0	(-0.2 0.2)	test General to Spinal.block	0.4	(0.0 1.0)

[Table1]

Delta General to General. block	**0.3**	**(-0.1 0.6)**	**test General to General.block**	**0.9**	**(0.0 1.0)**
Delta General to Spinal	0.4	(0.0 0.7)	test General to Spinal	1.0	(1.0 1.0)
Delta General to Spinal. block	-0.3	(-0.4 -0.1)	test Spinal to Spinal.block	0.0	(0.0 0.0)

[Table 2]

Pharmacology

9AP1-1

The difference between individual effect-site concentrations of propofol at recovery and loss of consciousness is influenced by propofol injection pain

Iseki S., Ikeda M., Setoguchi H.
Kyushu Medical Center, Department of Anaesthesiology, Fukuoka, Japan

Background and Goal of Study: Previous studies reported that individual propofol effect-site concentrations (Ce) at loss of consciousness (LOC) and recovery of consciousness (ROC) were similar in volunteers. However, we have often experienced striking differences between Ce at LOC and at awakening in clinically. The purpose of this study was to investigate the effect of propofol injection pain on the difference between individual propofol Ce at LOC and ROC.
Design: Prospective study.
Materials and Methods: We enrolled 56 ASA physical status Ⅰ and Ⅱ patients, scheduled to receive total intravenous anesthesia with target controlled infusion (TCI) of propofol. The propofol was infused at a target Ce of 3.0 μg ml^{-1} until LOC. Pain caused by propofol was evaluated using a four-point scale during the propofol infusion. During the operation, we controlled TCI of propofol to maintain the BIS® value in the range of 40 - 60. LOC and ROC were defined as a 3 in the Observer's Assessment of Alertness / Sedation scale (OAA/S). The Ce at LOC and ROC were noted. Linear regression analysis was used to estimate the mean difference of Ce between LOC and ROC according to pain score. Statistical adjustment was made for age, body mass index (BMI), remifentanil and propofol usage. Data distribution is expressed as mean ± SD. The results were shown 95 % confidence interval (CI). A *P* - value less than 0.05 was considered significant.
Results and Discussion: The mean predicted Ce of propofol at LOC and ROC were 1.4 ± 0.5 μg ml^{-1} and 1.1 ± 0.3 μg ml^{-1}.The average difference between individual Ce at LOC and ROC was 0.33 ± 0.45 μg ml^{-1}. Compared with those who did not feel pain during propofol infusion, the difference of Ce between LOC and ROC were 0.56 and 0.84 greater in those who feel moderate or severe pain, respectively. The adjusted mean difference of Ce between LOC and ROC for pain categories of none, mild, moderate and severe were 0.04 (95 % CI 0.10 - 0.19) , 0.28 (95 % CI 0.20 - 0.36) , 0.52 (95 % CI 0.41 - 0.63) , and 0.76 (95 % CI 0.57 - 0.95) respectively ($P < 0.05$ for trend). Previous studies have shown that the Ce of propofol required to obliterate consciousness is larger in the presence of pain or surgical stimulation. Our result suggested that propofol injection pain increased the propofol requirements to LOC.
Conclusion(s): The correlation between propofol Ce at LOC and ROC was improved by prevention of propofol injection pain.

9AP1-2

How to assess the individual sensitivity to propofol

Hagihira S., Hassan M.H.M., Yamanaka H., Takashina M., Mori T., Mashimo T.
Osaka University Graduate School of Medicine, Department of Anaesthesiology and Intensive Care, Suita City, Japan

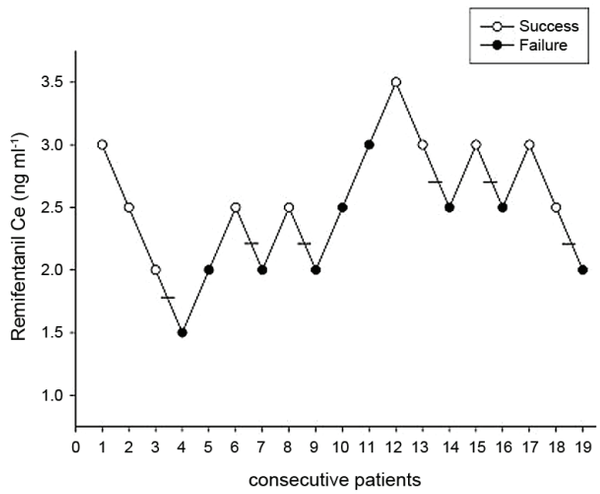
Background and Goal of Study: As sensitivity to propofol is widely varied among individuals, it is important to assess the individual sensitivity to propofol in total intravenous anesthesia. Although BIS™ monitor (ASPECT MS INC., Newton, MA, USA) is widely used, it doesn't always show reasonable value, because BIS value is not a measured value but merely a predicted value. EEG waveform dramatically changes with increase of propofol concentration. However, it is rather difficult to assess the effect of propofol precisely from EEG that is observed at one point, because EEG is widely varied among individuals. Among the various EEG patterns, only "burst and suppression" would obviously indicate the effect of propofol. Namely, it indicates deep anesthesia. We defined Ce-Burst as the effect-site concentration (Ce) when burst pattern was first observed. When the concentration of propofol is gradually increased, power in the alpha range (9-14Hz) transiently becomes large. Such changing pattern seemed to be common in each patient. We defined Ce-Alpha as the Ce when peak of alpha power (9-14Hz) became highest. We also defined Ce-LOR as the Ce at loss of response to verbal command and eyelash reflex . Then we made a hypothesis that we could assess the individual sensitivity to propofol by Ce-Alpha and Ce-LOR. We investigated the relationship between Ce-LOR, Ce-Alpha and Ce-Burst.
Materials and Methods: After approval of the ethical committee of our institute and obtained written informed consent from the participants, we enrolled 26 female patients (aged 33-65) who were scheduled mammectomy for breast cancer. Besides the standard monitors, we used BIS™ monitor (BIS-XP) and all raw EEG packet as well as EEG derived parameters were recorded on a computer using our original software "BSA for BIS". Propofol was infused using TCI pump (TE-371; TERUMO, TOKYO, JAPAN). Target concentration was adjusted so that Ce of propofol was gradually increased (about 0.3 μg/mL/min) until burst pattern was observed. Ce-LOR, Ce-Alpha and Ce-Burst were calculated by computer simulation and offline analysis of EEG.
Results and Discussion: Ce-LOR, Ce-Alpha and Ce-Burst were closely correlated; Ce-Burst vs. Ce-Alpha (R = 0.98), Ce-Burst vs. Ce-LOR (R = 0.89), Ce-Alpha vs. Ce-LOR (R=0.95). Averaged BIS was 50.7±7.3 when peak alpha power became highest.
Conclusion(s): We would be able to estimate the individual sensitivity to propofol by both Ce-LOR and Ce-Alpha.

9AP1-3

The Effect site concentration of remifentanil for suppressing severe cough and defensive movement during awake fibreoptic nasotracheal intubation in patients undergoing cervical spine surgery

Song J.W., Shin Y.-S., Shim Y.H.
Yonsei University College of Medicine, Department of Anaesthesiology and Pain Medicine, Seoul, Korea, Republic of

Background: Remifentanil has been suggested as a suitable agent for conscious sedation during fibreoptic intubation. We evaluated the optimal effect site concentration (Ce) of remifentanil target-controlled infusion (TCI) for suppressing severe cough and defensive movement during awake nasotracheal fibreoptic intubation in patients undergoing cervical spine surgery.
Materials and Methods: Nineteen ASA I-II patients undergoing cervical spine surgery were enrolled. The EC_{50} and EC_{95} of remifentanil for suppressing severe cough and defensive movement were determined using Dixon's up-and-down method and isotonic regression. Smooth intubation was considered to have failed when patients exhibited severe cough and defensive movement during the procedure. Intubation time, number of attempts, adverse events, and haemodynamic variables were also recorded and compared between smooth intubation and failed smooth intubation. Patients were asked to recall the procedure and grade satisfaction at postoperative 24 h.
Results: The EC_{50} of remifentanil Ce for smooth intubation was 2.33 (SD 0.38) ng ml^{-1} as calculated by Dixon's method. The estimated EC_{95} of remifentanil Ce was 3.38 (95% confidence interval 2.90-3.46) ng ml^{-1}. Median intubation time (min) was longer in failed smooth intubation than in smooth intubation (8.0 vs. 6.1, P = 0.048). Eleven patients (58%) recalled the fibreoptic intubation procedure and 16 patients (84%) rated their satisfaction score as good or excellent.



[Data for consecutive smooth and failed intubation]

Conclusion(s): The estimated EC_{95} of remifentanil Ce for suppressing severe cough and defensive movement during awake nasotracheal fibreoptic intubation was 3.38 ng ml^{-1} (95% CI 2.90-3.46). Remifentanil TCI may provide a tolerable experience of awake fibreoptic intubation despite the high incidence of recall.

9AP1-4

Evaluation of the effect of intravenous lidocaine on propofol requirements during total intravenous anesthesia (TIVA), as measured by bispectral index (BIS)

Altermatt FR., Bugedo D.A., Delfino A.E., Cortínez L.I., Muñoz H.R.
Pontificia Universidad Católica de Chile, Department of Anaesthesiology, Santiago, Chile

Background: Although there are studies showing increased depth of sedation and anesthesia associated with epidural and intramuscular administration of lidocaine,[1,2] the evidence demonstrating this effect using intravenous lidocaine is controversial.[3] The aim of this study was to evaluate the effect of intravenous lidocaine in reducing propofol anesthetic requirements for the maintenance of hypnosis, during TIVA.
Materials and Methods: We included 14 adult patients, scheduled for elective laparoscopic cholecystectomy. Patients were randomly allocated into two groups: Group L, receiving lidocaine 1.5 mg/kg in 5 minutes, followed by 2 mg/kg/h and Group C, receiving an equal volume of saline. The infusion was started after the intubation, and maintained until the last skin suture. Propofol infusion was administered using an effect- site target controlled infusion to maintain BIS values between 40 and 60, using 2.5 μg/ml as the lower predicted effect site concentration (C_e) limit. We calculated the area under the curve (AUC) determined by the estimated propofol C_e versus time, for each group. We compared AUC values between them, using a Wilcoxon test. A P value < 0.05 was considered as statistically significant.
Results: Patient demographics were similar in both groups. The estimated propofol C_e was significantly lower in patients receiving lidocaine, compared with controls during the first 20 minutes of anesthesia maintenance (AUC Group L: 76.25 versus AUC Group C: 90.0 μg*min/ml) (P = 0.04) (Fig.1).
Conclusions: In this study, the administration of intravenous lidocaine resulted in a significant reduction of propofol requirements during the first 20 minutes of administration. This sparing effect can be related to either a pharmacokinetic or pharmacodynamic interaction of lidocaine with propofol.
References:
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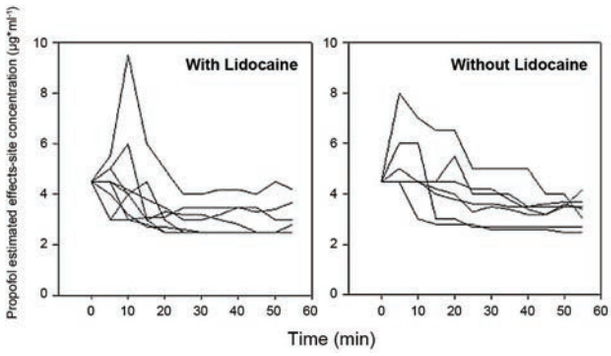


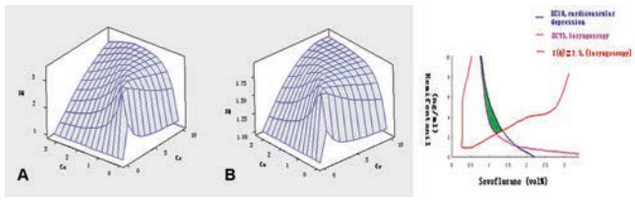
[Fig. 1.]

9AP1-6

A qualitative and quantitative analysis of remifentanil-sevoflurane pharmacodynamic interaction with response surface model

Lu Y., Li-Ping Z., Bin W., Xiang-Yang G.
Peking University Third Hospital, Department of Anaesthesiology, Beijing, China

Background and Goal of Study: Response surface model (RSM) is a new method to study the pharmacodynamic interactions. The objective was to apply RSM to analyze the interactions between sevoflurane and remifentanil on tolerance of laryngoscopy and cardiovascular side effects.
Materials and Methods: The study was an open-label, randomized, prospective study. 65 patients inhaled sevoflurane (0-3.4vol%) and received a target-controlled infusion of remifentanil (0-10ng/ml) at various target concentration pairs. After reaching pseudo-steady state drug levels, the response to laryngoscopy and cardiovascular side effects were observed. The pharmacodynamic interactions were analyzed by RSM. NONMEM software was used to estimate the parameter values. The response surfaces of laryngoscopy and cardiovascular side effects were combined to identify target concentration range of remifentanil and sevoflurane that provided a high probability of non-responsiveness to larygoscopy and a low probability of cardiovascular side effects.
Results and Discussion: 30 men and 35 women were enrolled. The height, weight, Body Mass Index, and age were 166.3±8.3cm, 64.2±11.3 kg, 23.2±3.1kg/m^2, and 35.9±8.6yr, respectively. Fig1 showed the relations between sevoflurane-remifentanil concentration and the interaction index (I(Q)) for response to laryngoscopy(A) and cardiovascular side effects(B). I(Q) described the pharmacodynamic interactions qualitatively and quantitatively, which indicated the strong synergy between remifentanil and sevoflurane($P < 0.001$). The green area in Fig1(C) showed the optical combinations of remifentanil and sevoflurane.



[Fig 1]

Conclusion(s): RSM can analyze the pharmacodynamic interactions qualitatively and quantitatively. RSM reveal the tremendous synergy between remifentanil and sevoflurane in cardiovascular side effects and blunting responses to laryngoscopy. The response surface model can be used to identify the optical target concentration range of sevoflurane and remifentanil.

9AP1-7

The effect site concentration of remifentanil for preventing cough during emergence from sevoflurane and desflurane anaesthesia

Chae Y.J., Kim J.Y., Kim D.H.
Ajou University Medical Center, Department of Anaesthesiology and Pain Medicine, Suwon, Korea, Republic of

Background and Goal of Study: Smooth emergence from general anaesthesia without coughing is of great advantage in many situations, such as after ocular surgery and neurosurgery in need of prevention of coughing and a sudden increase in intraocular and intracranial pressure and in patients with coronary artery disease requiring prevention of hypertension and tachycardia. Remifentanil is an ultra-short acting opioid characterized by rapid on and offset that has the merit of being maintained during emergence. The purpose of this study was to evaluate the effect site concentration of remifentanil for preventing cough during emergence from sevoflurane and desflurane anaesthesia respectively.
Materials and Methods: Fifty two patients, aged 20-64 yrs undergoing elective thyroidectomy were assigned to be anaesthetized with either remifentanil and sevoflurane or remifentanil and desflurane. By the end of surgery, sevoflurane and desflurane were set at 0.5 MAC and effect-site TCI of remifentanil was titrated to a predetermined concentration for 10 mins. Then sevoflurane and desflurane were discontinued while remifentanil was maintained until extubation. EC_{50} and EC_{95} of remifentanil for preventing cough were determined using the Dixon's up-and-down method and probit analysis with sigmoid curve.
Results and Discussion: The EC_{50} of remifentanil that suppressed coughing was 1.11 ng/ml in the sevoflurane group and 1.54 ng/ml in the desflurane group by Dixon's up-and-down method. Using probit analysis with sigmoid curve, the EC_{95} was 2.22 ng/ml in the sevoflurane group and 2.79 ng/ml in the desflurane group. However, there was no significant difference between the groups.
Conclusion(s): We found that the EC_{50} of effect site concentration of remifentanil for preventing cough during emergence from sevoflurane and desflurane anaesthesia were 1.11 and 1.54 ng/ml respectively. EC_{50} and EC_{95} of effect site concentration of remifentanil in the desflurane group were higher than those in the sevoflurane, but there was no significant difference. Maintaining an established effect site concentration of remifentanil during emergence is one of efficient methods for smooth emergence from sevoflurane and desflurane anaesthesia
References:
Lee B, Lee JR, Na S. Targeting smooth emergence: the effect site concentration of remifentanil for preventing cough during emergence during propofol-remifentanil anaesthesia for thyroid surgery. Br J Anaesth. 2009 Jun;102(6):775-8.

9AP1-9

Bimodal action of propofol on TRPA1

Karashima Y., Hoka S.
Kyushu University Hospital, Department of Anaesthesiology, Fukuoka, Japan

Background and Goal of Study: Propofol is an intravenous anesthetic which is widely used for sedation and general anesthesia.
However, despite using various strategies to reduce propofol injection pain, this still represents a clinical problem in both adults and children, with reported incidences of injection pain of 30-90%. This pain can, in some cases, be quite severe and distressing for the patient. Transient receptor potential ankyrin subfamily type 1 (TRPA1) receptor is a non-selective cation channel, mainly expressed in nociceptive neurons of dorsal root ganglia (DRG) and trigeminal ganglia (TG) where they serve as noxious stimulus detectors and are critically involved in acute and inflammatory pain. TRPA1 is activated by pungent or irritating electrophilic substances such as mustard oil and acrolein. Moreover, we have previously reported that TRPA1 is also activated by non-electrophilic compound, menthol (Karashima et al., J Neurosci, 2007). Interestingly, the action of menthol on TRPA1 is bimodal, i.e., activation at low concentrations and block at high concentrations. Because of the structural similarities between menthol and propofol, we investigated the effect of propofol on TRPA1.
Material and Methods: An overexpression system of mouse TRPA1 in CHO cells and transiently transfected HEK293 cells of mouse TRPV1, TRPV2, TRPV3, TRPV4, and TRPM8 were used. Intracellular calcium imaging and whole-cell patch clamp measurements were performed at room temperature.
Results and Discussion: Intracellular calcium imaging experiment revealed that while application of 10 microM propofol increased, 300 microM decreases intracellular calcium. Interestingly, discontinuation of propofol increased intracellular calcium. In accordance with the calcium imaging experiment, electropysiological analysis revealed bimodal action of propofol with the EC_{50} value of 2.4 microM for activation and IC_{50} of 19.5 microM for channel block. We also investigated whether propofol modulates other TRP channels expressed in sensory neurons. In intracellular Ca^{2+} measurement experiment, TRPV1, TRPV3, and TRPV4-expressing HEK293 cells showed propofol-induced increase of intracellular calcium, while TRPM8-expressing HEK293 cells showed decrease.
Conclusion: Propofol has a bimodal action on TRPA1 which might explain the pain on injection of propofol.

9AP2-1

Effect of ulinastatin on neuromuscular blockade by rocuronium

Lim Y.-H., Yoo B.-H., Yon J.-H.
Sanggye Paik Hospital, Inje University, Department of Anaesthesiology and Pain Medicine, Seoul, Korea, Republic of

Background and Goal of Study: Ulinastatin, an urinary trypsin inhibitor, is a glycoprotein derivered from human urine and a serine protease inhibitor found in human urine or blood. Ulinastatin increases liver blood flow and urine output and rocuronium is eliminated mainly in the liver and partially in the kidney, hepatic elimination of rocuronium might be enhanced.
We examined the effect of ulinastatin on neuromuscular block caused by rocuronium.
Materials and Methods: Forty four adult patients were randomly divided into two groups of 22 patients each: ulinastatin train-of-four / posttetanic count (U-TP) and control train-of-four / posttetanic count (C-TP) group. In the U-TP group, a bolus dose of ulinastatin 5000 U/kg was administered 2 minute before the injection of rocuronium 0.6 mg/kg. In the C-TP group, normal saline was administered instead of ulinastatin. After induction, TOF Watch SX was used to monitor onset and recovery of neuromuscular response induced by train-of-four (when present) count at 12 seconds interval and posttetanic count was measured at three minute intervals until the presence of at least one posttetanic count. All patients underwent general anesthesia with total intravenous anesthesia using target controlled infusion of propofol and remifentanil.
Results and Discussion: The onset of neuromuscular block in the U-TP group was significantly slower than in the C-TP group (268 ± 49 vs. 151 ± 35 sec, mean ± SD, $P < 0.05$). The time from the rocuronium injection to the return of posttetanic count in the U-TP group was significantly shorter than in the C-TP group (730.6 ± 2.8 vs. 920.7 ± 6.8 sec, $P< 0.05$). Similarly, times to the returns of T1, T2, T3, and T4 (first, second, third, and fourth stimulation of train-of-four) in the U-TP group were sgnificantly shorter than in the C-TP group (1433.4 ± 5.0 vs. 1925.4 ± 9.1 sec for T1, $P < 0.05$).
Conclusion(s): Ulinastatin delays the onset of neuromuscular block and quicken the recovery caused by rocuronium.

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9AP2-2

Factors affecting the intubation conditions provided by suxamethonium: A meta-regression analysis

Vanlinthout L.E., van Egmond J., Booij L.H., Hens N.
University Medical Center of Nijmegen, Department of Anaesthesiology, Nijmegen, Netherlands

Background and Goal of Study: Many anaesthesiologists still prefer suxamethonium (SUX) during rapid sequence induction (RSI) of anaesthesia. In literature, considerable between study differences in excellent intubation conditions (EIC) can be found following a given dose (D) of SUX. We therefore conducted a meta-regression analysis to assess whether patient characteristics or methodological issues can explain any of the heterogeneity in the results across studies.
Materials and Methods: Medline and Google were used to search for randomized or controlled clinical trials relating to the use of SUX to facilitate tracheal intubation. The outcome variable selected was EIC[1]. A logistic meta-regression model was used: $^{e}\log(p/(1-p)) = B_0 + B_1X_1 + B_2X_2 + \ldots + B_nX_n$, with p: probability of EIC, X_n: candidate factors contributing to variability i.e. $^{e}\log(D)$, age, gender, use of opioids, RSI and nasotracheal intubation (NTI). B_n: the regression coefficients. First a random effects estimate across all studies was established. Furthermore dose groups were stratified into age based categories (mean age ≤ 40 y or >40y). In each category fixed effects estimates were determined. Factors were selected using Bayesian and non-Bayesian methods.
Results and Discussion: We identified 78 eligible studies comprising 3373 patients in 96 dose groups. The overall random estimate for EIC in 50%, 90% and 95% of the patients was 0.52, 1.08 and 1.39 $mg \cdot kg^{-1}$ of SUX, respectively. Factors significant to between study differences in EIC are listed in table 1. B_n are mean [95% confidence interval]. The probability of EIC was higher in younger females and with NTI. In patients>40 y, the probability of EIC decreases with increasing age, with the use of opioids and during RSI.

X_n	B_n: Mean age<40y	B_n: Mean age>40y
$^{e}\log(D)$	1.31 [1.08 - 1.55] p<0.0001	2.65 [2.25 - 3.05] p<0.0001
Age(y)	ns	-0.28 [-0.05 - -0.01] p=0.013
Females(%)	1.41 [0.29 - 2.52] p=0.014	ns
Short acting opioids (Y/N)	ns	-0.60 [-1.08 - -0.011] p=0.016
RSI (Y/N)	ns	-0.61 [-0.87 - -0.35] p<0.0001
Nasal intubation (Y/N)	0.82 [0.33 - 1.30] p=0.001	1.69 [0.58 - 2.79] p=0.003

[Factors explaining between study variability]

Conclusion(s): With ageing circulatory reserve decreases. This can explain the delayed onset of SUX during anaesthesia induction, especially when an opioid has been given. Delayed onset of SUX can result in incomplete neuromuscular block at the time of intubation, accounting for the lower probability of EIC in ageing patients.

References:
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9AP2-3

Intravenous lidocaine has no impact on rocuronium-induced neuromuscular block but improves intubation conditions: Randomised study

Czarnetzki C., Lysakowski C., Elia N., Tramèr M.R.
University Hospitals of Geneva, Department of Anaesthesiology, Geneva, Switzerland

Background and Goal of Study: Lidocaine has neuromuscular blocking properties.[1,2] We studied the effect of a perioperative intravenous lidocaine infusion on the time course of the neuromuscular blockade after an intubation dose of rocuronium. A secondary outcome was intubation conditions.
Materials and Methods: Fifty-two adults undergoing surgery were randomly allocated to receive before induction an intravenous bolus of lidocaine 1.5 mg

kg^{-1} followed by an infusion of 2 mg kg^{-1} h^{-1} throughout surgery, or physiological saline (control). Anaesthesia was induced and maintained with a target controlled propofol infusion and sufentanil. After loss of consciousness, a single dose of rocuronium 0.6 mg kg^{-1} was given. Neuromuscular transmission was measured using TOF-watch SX acceleromyography. Intubation conditions were scored by a blinded observer using a three-item scale.

Results and Discussion: Onset time was analysed in 26 lidocaine patients and 26 controls, recovery in 26 lidocaine patients and 25 controls, and intubation conditions in 26 lidocaine patients and 26 controls. Onset time (to 95% depression of T1) was on average 113.9 [SD 35.3] sec after lidocaine and 119.5 [44.9] sec with saline (P=0.618). Total recovery time (to TOF 0.9) was on average 58.1 [15.1] min with lidocaine and 54.3 [16.9] min with saline (P=0.394). Clinical duration was on average 33.3 [7.2] min with lidocaine and 30.6 [8.1] min with saline (P=0.21). Recovery index was on average 11.5 [5.0] min with lidocaine and 10.6 [4.1] min with saline (P=0.458). Total recovery time was on average 24.8 [9.3] min with lidocaine and 23.2 [9.2] min with saline (P=0.541). Of 26 lidocaine patients, 22 (85%) had excellent and 4 (15%) had good intubation conditions; of 26 controls, 14 (54%) had excellent and 12 (46%) had good intubation conditions (P< 0.016).

Conclusion(s): An intravenous lidocaine infusion has no impact on onset or recovery times after a single intubation dose of rocuronium but significantly improves intubation conditions.

References:

[1] Matsuo S et al. Interaction of muscle relaxants and local anesthetics at the neuromuscular junction. *Anesth Analg* 1978;57:580-7.

[2] Suzuki T et al. Epidurally administered mepivacaine delays recovery of train-of-four ratio from vecuronium-induced neuromuscular block. *Br J Anaesth* 2007;99:721-5.

Acknowledgements: We thank Ms B. Gil-Wey and Mr P. Huwiler, Division of Anaesthesiology, Geneva University Hospitals, for their role as research assistants.

9AP2-4

Influence of age and gender on the pharmacodynamic parameters of rocuronium during total intravenous anaesthesia

Adamus M., Konupcikova K., Wanek T., Hrabalek L.
University Hospital, Department of Anaesthesiology and Intensive Care, Olomouc, Czech Republic

Background and Goal of Study: The effect of aminosteroid neuromuscular blocking agents (NMBA) is influenced by many factors, gender and age being some of them. The aim of this study was to compare the pharmacodynamics of rocuronium following a single dose (0.6 mg/kg) in young and elderly males and females during total intravenous anaesthesia (TIVA).

Materials and Methods: Following local ethics committee approval and patients' informed consent, we studied two age groups (20-40, 60-75 yr) of both male and female patients scheduled for surgery under TIVA (midazolam, propofol, sufentanil, O_2/air, low-flow circuit, controlled ventilation). After setting up the NMB monitoring (Datex-Ohmeda S/5 Anaesthesia Monitor with an NMT module, train-of-four [TOF] stimulation of the ulnar nerve at 12-second intervals, electromyographic response of the adductor pollicis muscle), rocuronium (0.6 mg/kg) was used to facilitate tracheal intubation.

The onset time (an interval from application of NMBA to maximum depression of T1), clinical duration (from application to 25% recovery of T1) and time to full spontaneous recovery (from application to TOF-ratio ≥ 0.9) were determined for each patient. The Kruskal-Wallis test with Dunn's post-test was used to compare differences between young and elderly males and females.

Results: The results are summarized in Table 1.

	M (20-40 yr)	M (60-75 yr)	F (20-40 yr)	F (60-75 yr)
n	31	38	39	34
age (yr)	29 ± 6$^{§\#}$	65 ± 3*†	31 ± 6$^{§\#}$	66 ± 4*†
BMI (kg/m2)	24.81 ± 3.28	25.63 ± 2.72	25.23 ± 2.99	26.27 ± 1.33
onset time (sec)	95 (80;110)$^{§\dagger\#}$	135 (120;155)*†	75 (55;80)$^{*§\#}$	120 (115;135)*†
clin. duration (min)	36 (27;44)$^{§\dagger\#}$	58 (53;61)$^{*\#}$	53 (41;65)$^{*\#}$	85 (70;90)*§†
full recovery (min)	60 (52;68)$^{§\dagger\#}$	103 (86;106)*	78 (55;88)$^{*\#}$	120 (88;135)*†

[Table 1. Pharmacodynamics of rocuronium]

Data are presented as mean ± SD or median (interquartile range)
M males, F females, BMI body mass index
$^{*}p < 0.05$ *vs.* M (20-40), $^{§}p < 0.05$ *vs.* M (60-75), $^{\dagger}p < 0.05$ *vs.* F (20-40), $^{\#}p < 0.05$ *vs.* F (60-75)

Conclusion: Females were more sensitive than males to a single bolus dose of rocuronium. In females, the onset time was shorter and the clinical duration and interval to full recovery were increased compared to males. Moreover, the effect of gender was further potentiated by age so the difference in pharmacodynamic parameters between younger males and elderly females may be as high as 50%. Due to the large variability of the rocuronium effect, the monitoring of the NMB is recommended.

Acknowledgements: Supported by the Czech Ministry of Health IGA (project NS9618-4/2008).

9AP2-5

A probabilistic model to study magnitude and time course of short-acting neuromuscular blocking agents: Suxamethonium as an example

Vanlinthout L., van Egmond J., Booij L.H., Hens N.
University Medical Center of Nijmegen, Department of Anaesthesiology, Nijmegen, Netherlands

Background and Goal of Study: Knowing the probability of neuromuscular block (NMB) would aid in choosing the dose of a neuromuscular blocking agent (NMBA), when profound NMB of fast onset and short duration can be life saving, e.g. during rapid sequence induction of anaesthesia . Because of considerable between patients variability in the response to NMBAs, NMB of the individual patient is difficult to predict. We therefore aimed to elaborate a probabilistic model for onset or recovery of any desired effect.

Materials and Methods: 132 healthy patients (18-65y) were randomized over 11 dosage groups (n=12) to receive 0.15 to 2.00 mg·kg^{-1} of suxamethonium (SUX). NMB was monitored using evoked mechanomyography of the isometric thumb twitch. Every 10 s, NMB was scored as 0 if t1/tc>5% or as 1 if t1/tc≤5%. At each of these 10s intervals, the dose required for t1/tc≤5% in 95% of the population (D_{95}) was calculated using logistic regression. The consecutive D_{95} values were fitted to the simulated effect-site concentration (ESC). ESC with time was conceived as a gamma distributed function[1].

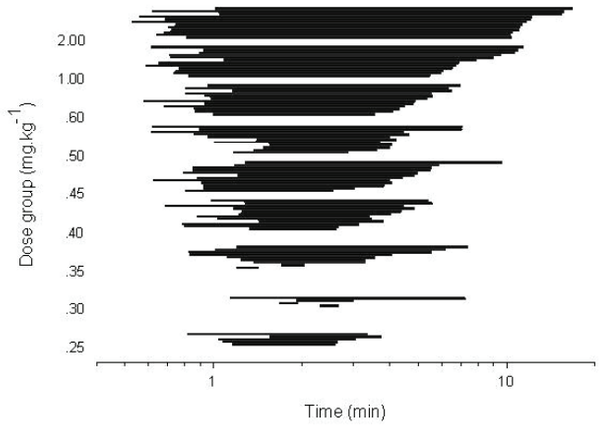

Figure 1: Onset and duration of t1/tc≤5% following suxamethonium

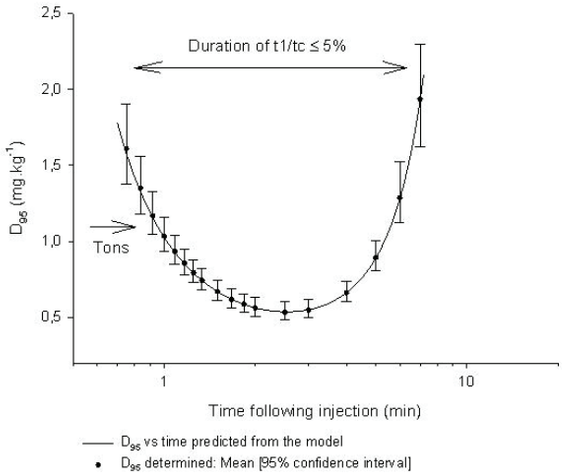

Figure 2: Suxamethonium dose required for t1/tc=5% in 95% of patients (D_{95}) vs time

Results and Discussion: The time course of t1/tc≤5% of the patients investigated is shown in figure 1. The model is represented in figure 2.
Conclusion(s): The probabilistic model presented allows estimating the dose that should be necessary for onset or recovery of a desired effect within any given time for a specified level of probability.
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9AP2-6

The influence of age and gender on the time course of profound neuromuscular block induced by mivacurium: A probabilistic approach

Vanlinthout L., van Egmond J., Booij L.H., Hens N.
University Medical Center of Nijmegen, Department of Anaesthesiology, Nijmegen, Netherlands

Background and Goal of Study: Mivacurium (MIV) distributes into the extracellular fluid (ECF) and is metabolized by butyrylcholinesterase (BChE). Because both, age and gender, can affect ECF and BChE[1,2], we investigated the influence of these factors on the time course of MIV induced neuromuscular block (NMB). Due to considerable between patient variability in the response to MIV, a probabilistic approach was applied.

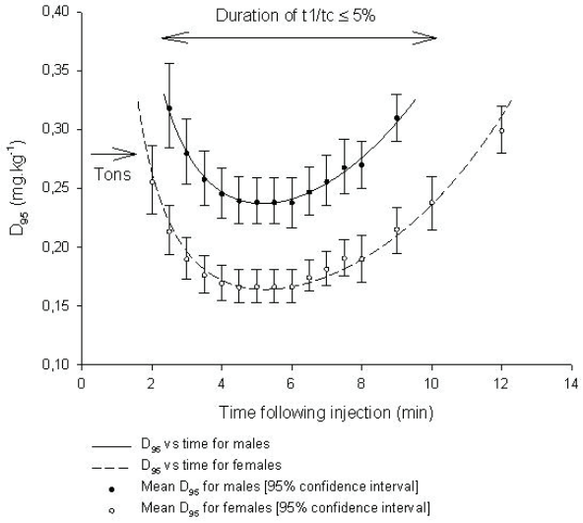

Figure 1: Mivacurium dose required for t1/tc=5% in 95% of patients (D_{95}) vs time in the younger age group.

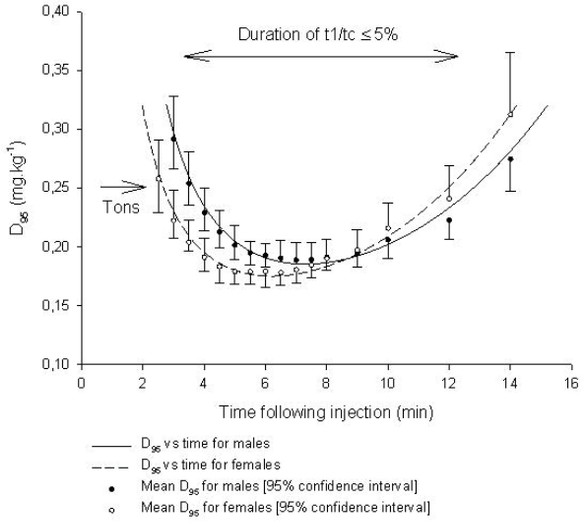

Figure 2: Mivacurium dose required for t1/tc=5% in 95% of patients (D_{95}) vs time in the elderly age group.

Materials and Methods: We randomized 84 younger (18-45 yr) and 84 elderly (>65 yr) healthy patients, over 7 dosage groups (n=12) to receive 0.04 - 0.30 mg·kg^{-1} of MIV. NMB was monitored using mechanomyography of the isometric thumb adduction to TOF stimulation. At 30s intervals, NMB was scored as 0 if t1/tc>5% or as 1 if t1/tc≤5%. At each of these 30s intervals, the dose required for t1/tc≤5% in 95% of the population (D_{95}) was calculated in both age groups for men and women separately. This was done using logistic regression. The consecutive D_{95} values were related to the simulated effect site concentration with time.
Results: D_{95} vs time curves are shown for males and females in the younger (figure 1) and elderly (figure 2) age groups.
Conclusion(s): Younger females were more susceptible towards MIV (fig 1). With ageing, onset and recovery of MIV induced NMB were prolonged and gender related differences tended to disappear .
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9AP2-7

Efficacy and safety of sugammadex reversal of deep rocuronium-induced blockade in patients with severe renal impairment: A case-control study

Snoeck M.M.J., Hollmann M.W., Buerkle C., Prins M.E., Harper N.J.
Canisius-Wilhelmina Ziekenhuis, Department of Anaesthesiology, Nijmegen, Netherlands

Background: Sugammadex reverses effects of rocuronium by encapsulation and is excreted mainly via the kidneys. Sugammadex (2 mg/kg) is well tolerated and effective in reversing moderate (reappearance of T_2) rocuronium-induced neuromuscular blockade (NMB) in patients with severe renal impairment (SRI).[1] The current study compared efficacy of sugammadex 4 mg/kg for reversal of deep NMB in patients with SRI vs those with normal renal function.
Methods: This was a case-control study (NCT00702715) in adults of ASA Class I-III. The SRI group included patients with creatinine clearance (CL_{CR}) < 30 mL/min and no anticipated need for haemodialysis during first 24 h after sugammadex, while the control group comprised patients with $CL_{CR} \geq 80$ mL/min. Rocuronium 0.6 mg/kg was given for intubation, with maintenance doses of 0.1-0.2 mg/kg as needed for deep NMB (PTC ≤ 5). Sugammadex 4 mg/kg was administered at recovery of 1-2 PTC. Primary efficacy variable was time from start of sugammadex administration to recovery of the train-of-four (TOF) ratio to 0.9. Median difference in recovery time between the groups and corresponding two-sided 95% CI were calculated (Hodges-Lehmann and Moses): Equivalence between SRI and control efficacy was demonstrated when CI for the difference was within a -1 to +1 min interval. Safety was assessed 4-weeks postoperatively.
Results: The intent-to-treat group comprised 67 patients (SRI n=35; control n=32). Mean (SD) CL_{CR} was 13 (5) and 126 (41) mL/min for SRI and controls. Median (95% CI) time from start of sugammadex to recovery of the TOF ratio to 0.9 was 3.1 (2.4-4.6) and 1.9 (1.6-2.8) min for SRI and controls, respectively, with estimated median (95% CI) difference of 1.3 (0.6-2.4) min; thus, not meeting the pre-specified bounds for equivalence. No drug-related adverse events (AEs) occurred in the SRI group. One control experienced a possibly drug-related AE (recurrence of NMB [according to TOF-Watch]); likely due to deviation from the protocol (sugammadex administration before recovery to 1-2 PTC), together with use of desflurane. No clinical evidence of recurrence of NMB was observed.
Conclusions: Although efficacy was not equivalent in the two groups, sugammadex 4 mg/kg resulted in complete and rapid reversal of deep rocuronium-induced NMB both in patients with SRI and with normal renal function, and was generally well tolerated in both groups.
Reference:
1. Staals LM et al. *Br J Anaesth.* 2008;101:492-497.

9AP2-8

Pharmacokinetics of sugammadex 4 mg/kg given for reversal of deep rocuronium-induced blockade in patients with severe renal impairment versus patients with normal renal function

Macnab W.R., Snoeck M.M., Buerkle C., van den Heuvel M.W., Hollmann M.W.
Manchester Royal Infirmary, Department of Anaesthesia, Manchester, United Kingdom

Background: Sugammadex encapsulates rocuronium and the complex is cleared by renal excretion. Sugammadex 2 mg/kg (for reversal of moderate neuromuscular blockade [NMB]) has been shown to undergo reduced plasma clearance in patients with severe renal impairment (SRI) vs those with normal renal function; [1] however the pharmacokinetics and dialysability of

sugammadex 4 mg/kg administered at 1-2 post-tetanic-counts ([PTC]; deep NMB) have not been reported in SRI patients.
Methods: This was a case-control, comparative study (NCT00702715) of ASA Class I-III patients with SRI (creatinine clearance [CL_{CR}] < 30 mL/min and no anticipated need for haemodialysis during first 24 h after sugammadex) vs a control group (CL_{CR}
≥ 80 mL/min). Patients received rocuronium 0.6 mg/kg for intubation, with maintenance doses 0.1-0.2 mg/kg as needed, followed by sugammadex 4 mg/kg at 1-2 PTC. Plasma concentrations of sugammadex and rocuronium were assessed at a sparse set of pre-defined timepoints, including pre- and post-dialysis for patients undergoing haemodialysis 0-72 h after sugammadex. Pharmacokinetics were assessed 4-weeks postoperatively.
Results: Of 68 treated patients, 59 were evaluable for assessment of the main sugammadex pharmacokinetic parameters (Table).

Geometric mean (CV)	SRI (n=33)	Controls (n=26)
$t_{1/2}$ (h)	29.2 (113)	2.3 (49)
CL (mL/min)	6.6 (83)	63.3[a] (33)

CL=clearance; CV=coefficient of variation (%); $t_{1/2}$=terminal half-life. [a]Due to sparse sampling, CL is underestimated for the control group.

[Table]

Plasma sugammadex levels were similar in both groups 5 min after sugammadex administration, but thereafter decreased faster in the control vs the SRI group; in line with the renal status of both groups. Nine SRI patients still had measurable sugammadex levels (above 0.1 μg/mL) on Day 28. Ten of 12 SRI patients who received haemodialysis (18-47 h post-surgery; duration 3-4 h) had evaluable dialysis data. Median reduction in (complexed plus non-complexed) sugammadex plasma concentration post-dialysis was 70% and 30% for the high (n=5) and low-flux filter (n=5), respectively.
Conclusions: Sugammadex clearance was reduced at least 10-fold and terminal half-life increased ~13-fold in patients with SRI vs those with normal renal function, resulting in prolonged sugammadex exposure in the SRI group. High-flux haemodialysis filters are more effective than low-flux in removing sugammadex and its complex with rocuronium from the circulation.
Reference:
1. Staals LM et al. *Br J Anaesth.* 2010;104:31-39.

9AP2-9

Effective dose 50 of sugammadex required at term pregnancy to reverse neuromuscular blocked at a train-of-four count of four

Stamatakis E., Saiti A., Iliopoulou C., Valsamidis D.
General Hospital of Athens 'Alexandra', Department of Anaesthesiology, Athens, Greece

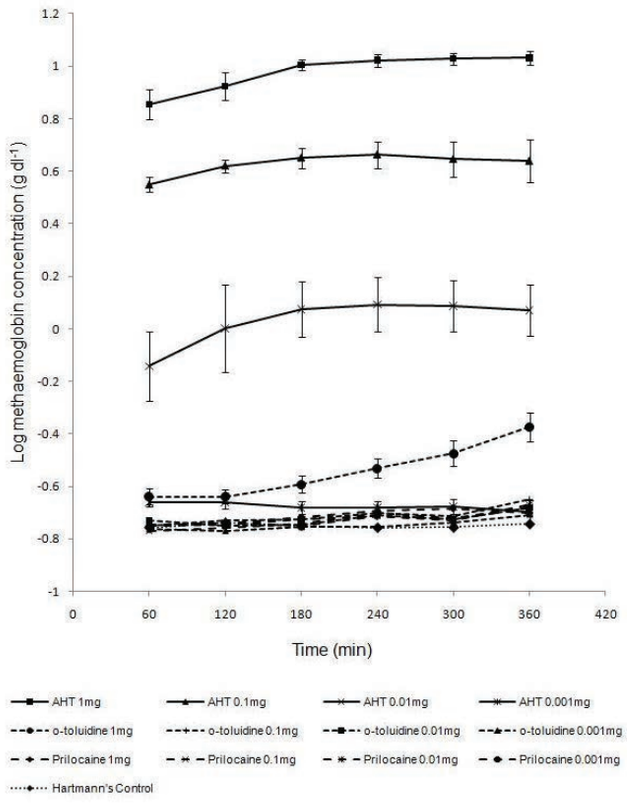
Background and Goal of Study: The dose of sugammadex required to reverse the level of neuromuscular blockade at a train-of-four count of four in pregnancy is not known. We measured the effective dose 50 (ED50) of sugammadex required to reverse this depth of neuromuscular block in term pregnancy using the Dixon Massay up-and-down method (1).
Materials and Methods: Following informed patient consent we recruited 35 healthy pregnant women at term aged between 20 and 40 years old, scheduled for elective caesarean section.
After 3 min of preoxygenation and anesthesia induction with thiopental, all parturients received a single bolus dose of rocuronium 0.8 mg/kg, followed by maintenance doses (rocuronium 0.15 mg/kg) as needed. Neuromuscular blockade was monitored using kinemyography. After the last dose of rocuronium and at train-of-four count of four, a single bolus dose of sugammadex was administered. The primary efficacy variable was the recovery of T4/T1 ratio of 0.9 in 5 min from the start of sugammadex administration. The dose of sugammadex was given according to the Dixon and Massey up-and-down method (1). The dose for the first patient in each group was 0,5 mg/Kg. An ineffective dose was defined as recovery of the T4/T1 ratio < 0.9 in 5 min, directed an increase of 0.1 mg/Kg to the next woman and vice versa. The ED(50) was calculated using the method of Dixon and Massey. In all women the prepregnacy weight was used for the calculations
Results and Discussion: The ED50 of sugammadex to reverse a light level of neuromuscular block was calculated as 0,69 mg/Kg with SD 0.26 mg/Kg, SE 0.06 mg/Kg and Confidence Interval (CI) 95% 0.80-0.57 mg/Kg. There were no adverse effects related to study treatments.
In a previous unpublished study(2), the ED50 dose of sugammadex in non pregnant population was calculated as 1.03 mg/Kg, 40% bigger than in this study. We can not give some possible explanation for this difference.
Conclusion(s): The effective dose 50 (ED50) of sugammadex required to reverse the level of neuromuscular block at a train-of-four count of four in term pregnancy seems to be lower in pregnant women than in non pregnant and is calculated in this study as 0.69 mg/Kg. .
References:
1. Dixon WJ, Massey FJ. In: Introduction to statistical analysis. 1983:426-41
2. Valsamidis D,Tsekoura V, Loukeri A, Diakaki A. Effective Dose 50 of sugammadex required to reverse neuromuscular block at a train-of-four count of four. EJA. 2010;27(47): 151

9AP3-1

2-amino-5-hydroxytoluene and not *ortho*-toluidine is the principal cause of methaemoglobinaemia associated with prilocaine administration

Willers J.W., Uncles D.R., Samuels T.L., WEARSAS (Worthing Education And Research Staff and Associate Specialists) Study Group
Worthing Hospital, Department of Anaesthesiology and Intensive Care, Worthing, United Kingdom

Background and Goal of Study: Methaemoglobin (MetHb) following prilocaine use is commonly assumed to be due to the primary metabolite *ortho*-toluidine (*o*T).
Original studies infer *o*T is associated with MetHb formation in red cells and free haemoglobin but do not prove absolute causation(1). About 85% of *o*T is converted to the secondary metabolite 2-amino-5-hydroxytoluene (AHT). We compared the MetHb forming ability of these metabolic products with the parent compound *in vitro*.
Materials and Methods: Following ethical approval, blood from 5 volunteers was divided into 13 samples containing 4ml. Prilocaine, AHT and *o*T each at concentrations of 1mg ml^{-1}, 0.1mg ml^{-1}, 0.01mg ml^{-1}, 0.001mg ml^{-1} were added to 12 tubes (0.8ml). The 13th received Hartmann's solution (0.8ml) as a control. All tubes were mixed and kept at 37°C. MetHb concentrations were measured by a Radiometer ABL 725 blood gas analyser at 60 minute intervals for 360 minutes. Paired MetHb values for each respective sample were compared against the Hartmann's control using the Wilcoxon signed rank test.
Results and Discussion: Our results demonstrated that AHT at each of the above concentrations and *o*T at 1 mg ml^{-1} produce statistically significant amounts of MetHb ($p < 0.05$).



[Semi-log plot showing changes in MetHb levels]

An *in vitro* model is advantageous in that it prevents organ dependent secondary metabolism. We did not expect prilocaine to create MetHb directly and our study confirmed this. On average, only 3% MetHb (0.3 g dl^{-1}) was produced by addition of the highest *o*T concentration (1 mg ml^{-1}) which is associated with prilocaine doses exceeding usual clinical use.

Conclusion: Our *in vitro* data suggests that 2-amino-5-hydroxytoluene is responsible for MetHb formation following prilocaine use whereas *o*T produces insignificant amounts at levels found clinically.

References:

1) Hjelm M, Holmdahl MH. Clinical chemistry of prilocaine and clinical evaluation of methaemoglobinaemia induced by this agent. Acta Anaesthiol Scand Suppl 1965;16:175-82

9AP3-2

Sugammadex and morbid obesity; dosage according to total or ideal body weight? A preliminary study

González Techera L., Cervantes O., Avecilla A., Brunelli A., Bertrán C., Vila P.
Hospital Germans Trias i Pujol, Department of Anaesthesiology and Pain Medicine, Badalona, Spain

Background and Goal of Study: Sugammadex reverses neuromuscular block (NMB) induced by steroidal neuromuscular blocking agents rocuronium and vecuronium. Required dose is usually adjusted according to weight and level of NMB [(1)]. There are currently no studies in morbidly obese (MO) patients that clearly define criteria for dosage, total vs ideal body weight (TBW vs IBW). These patients could present an increased cardiorespiratory-morbidity due to residual curarization. The goal of this study was to evaluate the efficacy of sugammadex given according to IBW dosage [Body Mass Index, BMI: kg/height^2 (women=25.height^2; men=27.height^2)] for the reversion of a moderate NMB after rocuronium block in morbidly obese patients.

Materials and Methods: After ethics committee approval and written informed consent, fourteen MO patients with BMI>40 kg/m^2, ASA I-III, scheduled for laparoscopic bariatric surgery were included. General balanced anaesthesia with propofol, fentanyl, desflurane and rocuronium (0.6 mg/Kg IBW) was performed. NMB was monitored using TOF-Watch SX®. An iv dose of 2 mg/kg (IBW) of sugammadex was given after reappearance of the second response (T2) of TOF; then, recovery time until TOF ratio 0.9 was recorded. Data are presented as median and ranges.

Results and Discussion: 6 men and 8 women were included with a median age of 49 years (36-65), TBW of 129.8 kg (95-184), BMI 49.2 kg/m^2 (40.1-67.7) and calculated IBW 68.6 kg. Sugammadex mean dose was 137 mg. The dose difference between ideal (given) and total weight was 123 mg. Median recovery time to reach TOF ratio 0.9 was 148 seconds (70-360 s). There were two patients with problems during NMB monitoring that had recovery times greater than 6 minutes, but neither had clinical signs of residual curarization.

Conclusion: Despite using lower doses than those recommended by the product information sheet, the median recovery times were similar to other studies in non-obese patients [(1,2)]. Since drug's solubility affects its dosage in MO, sugammadex (a very hidrophylic drug) should be adjusted according to IBW. More studies with large sample sizes are necessary to confirm this hypothesis.

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9AP3-3

Comparison of antagonisation with Sugammadex in Rocuronium blockade maintained by continuous infusion versus bolus regime

Georgiev S., Vylcheva D., Mladenov B.
Medical University Sofia Bulgaria, Department of Anaesthesiology and Intensive Care, Sofia, Bulgaria

Background and Goal of Study: The aim of the study was to compare the efficacy of Sugammadex in antagonising a rocuronium block maintained either by boluses or continuous infusion.

Materials and Methods: 80 ASA I - II patients scheduled for gynaecologycal surgery lasting 2-5 h were randomised. Exclusion criteria were hepatic, renal or neuromuscular disorders, stigmata of difficult intubation as well as known allergies to NMB's.

Patients were intubated after a dose of 0.6 mg/kg Rocuronium. Following that the bolus group received boluses targeting to maintain zero responses to TOF and a posttetanic count of no more than 10 responses. In the other group the initial bolus was followed by continuous infusion of 0.3-0.6 mg/kg/h rocuronium, with the same end target of muscle relaxation.

General anesthesia in both groups was maintained with Sevoflurane and Sufentanyl, and neuromuscular monitoring was done using a TOF Watch placed on the hand.

At the end patients received a single bolus dose of 4 mg/kg sugammadex at a target NMB of T_1 of 3-10%.The mean time for recovery of the train-of-four ratio to 0.9 was noted.

Results and Discussion: The bolus group showed a mean time of 1.12 minutes, whereas the continuous infusion group 1.31 minutes.

Conclusion(s): We conclude that there is no clinically significant differnce in the antagonisation efficiency of Sugammadex of a Rocuronium blockade maintained in a continuous or fractioned manner.

9AP3-4

Dialysability of sugammadex and its complex with rocuronium in subjects with severe renal impairment

Cammu G., van Vlem B., van den Heuvel M., Stet L.
Onze-Lieve-Vrouw Ziekenhuis, Department of Anaesthesiology and Intensive Care, Aalst, Belgium

Background and Goal of Study: Sugammadex reverses rocuronium-induced neuromuscular block. Renal excretion is the primary route for elimination of sugammadex and clearance of the sugammadex-rocuronium complex is reduced in patients with severe to end-stage renal failure.[1] This trial evaluated the dialysability of sugammadex and the sugammadex-rocuronium complex among patients with severe renal impairment in the intensive care.

Materials and Methods: Six subjects with creatinine clearances < 30 mL min^{-1}, clinical indications for dialysis and who were scheduled for a (surgical) procedure received a single i.v. bolus dose of 0.6 mg kg^{-1} rocuronium. Fifteen min later, 4.0 mg kg^{-1} sugammadex was administered. Rocuronium and sugammadex concentrations were measured in plasma and dialysate at several time points before, during, and after high-flux dialysis. Clearance in plasma and dialysate, in addition to reduction ratio (extent of the plasma concentration reduction at the end of a dialysis episode as compared to before dialysis), were calculated for each dialysis episode. Times from initiation of sugammadex treatment to recovery of the T_4/T_1 ratio to 0.9 were measured.

Results and Discussion: Sugammadex and rocuronium concentrations in plasma that entered and left the dialyser decreased with time. The observed reduction ratios indicate a mean reduction of about 70% for sugammadex and 75% for rocuronium in the plasma concentrations of these compounds during the first episode. Furthermore, reductions were typically greater than 50% during sequential episodes. On average, blood clearance of sugammadex was 78 mL min^{-1} and dialysate clearance was 65 mL min^{-1}. The average values for blood and dialysate clearance of rocuronium were 89 mL min^{-1} and 94 mL min^{-1}, respectively. The times from the start of sugammadex administration to recovery of the T_4/T_1 ratio to 0.9 ranged from 3.4 min to 9.8 min (median 4.2 min). These recovery times seem prolonged in comparison to previous deep block study results.[2] This could possibly be explained by longer circulation times in these acutely ill patients with severe underlying medical conditions, resulting in a slower recovery of the T_4/T_1 ratio to 0.9.

Conclusion: Haemodialysis using a high-flux dialysis method is effective in removing sugammadex and its complex with rocuronium in patients with severe renal impairment.

References:

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9AP3-5

Intraoperative reversal of neuromuscular block with sugammadex during XLIF surgery

Adamus M., Hrabalek L., Wanek T., Konupcikova K.
University Hospital, Department of Anaesthesiology and Intensive Care, Olomouc, Czech Republic

Background and Goal of Study: XLIF (Extreme Lateral Interbody Fusion) is a method for stabilization of the lumbar spine. The surgery is performed retroperitoneally and adequate neuromuscular block (NMB) for good surgical access is mandatory. On the contrary, the surgeon intraoperatively uses nerve root stimulation to record the evoked EMG response from the adductor magnus and brevis (L2), adductor longus (L3), rectus femoris (L4), and tibialis anterior (L5) muscles to minimize the risk of their injury. During this phase of surgery, the NMB must be minimal. The aim of the study was to determine the extent to which the NMB must be reversed for reliable identification of lumbar nerve roots.

Materials and Methods: Following local ethics committee approval and patients' informed consent, 5 males and 6 females, ASA 1 or 2, scheduled for XLIF, were studied. General anaesthesia (midazolam, propofol, sufentanil, O_2/

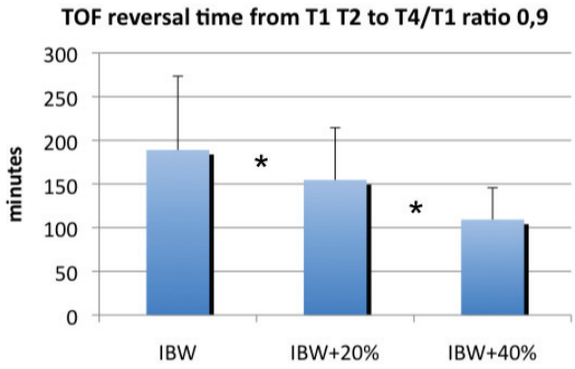
air/sevoflurane, low-flow circuit, controlled ventilation) was administered to all patients. After setting up the NMB monitoring (Datex-Ohmeda S/5 Anaesthesia Monitor with an NMT module, train-of-four [TOF] stimulation of the ulnar nerve at 12-second intervals, EMG response of the adductor pollicis muscle), rocuronium (0.6 mg/kg) was used to facilitate tracheal intubation. When the lumbar spine exposure was sufficient during surgery, the surgeon started the stimulation of lumbar nerve roots (5-10 mA) in 5-second intervals. The NMB was allowed to recover spontaneously to TOF-count 2 and then sugammadex (2 mg/kg) was administered. When the response to nerve root stimulation became detectable as an evoked EMG response of the respective muscles, the TOF-ratio was noted and summarized by descriptive statistics.
Results: Patients' demographics (mean ± SD): age 50.1 ± 8.6 yr, BMI 26.30 ± 4.07 kg/m². Duration of surgery and anaesthesia: 94 ± 28 and 125 ± 24 min, respectively. The mean time for recovery after sugammadex (from TOF-count 2 to TOF-ratio 0.9) was 3.12 ± 0.23 min. When the response to nerve root stimulation (10 mA and 5 mA) became detectable, the mean TOF-ratios were 0.67 ± 0.11 and 0.82 ± 0.09, respectively.
Conclusion: For reliable intraoperative detection of lumbar nerve roots with a stimulating current of 10 mA, the NMB should be reversed to TOF-ratio of at least 0.70. For a current intensity of 5 mA, the respective TOF-ratio should reach 0.85. Intraoperative reversal with sugammadex is effective to rapidly obtain these TOF-ratio values.

9AP3-6

Should dosing of sugammadex in morbidly obese patients be based on ideal or on corrected body weight?

Van Lancker P., Mulier J.P., Bogaert T., Dekock M., Dillemans B.
AZ Sint Jan Brugge-Oostende, Department of Anaesthesiology, Bruges, Belgium

Introduction: Sugammadex is a water-soluble molecule. Overdosing in obese patients is possible when dosed on Total Body Weight.
Methods: Morbidly obese patients scheduled for laparoscopic bariatric surgery under propofol-sufentanil anaesthesia, were randomized into three groups : ideal body weight (IBW), IBW + 20% and IBW + 40%. (1) All patients received Rocuronium 0.6 mg/kg IBW at induction and additional doses in order to keep response ≤ 1 at the adductor policis to a supra-maximal train of four (TOF) stimulation of the ulnar nerve using accelerometry. At the end of surgery and when TOF responses ranged T1-T2, patients received sugammadex 2mg/kg IBW or corrected IBW. Primary endpoint was time from sugammadex injection to a TOF ratio of 0.9. Secondary end-points were the ability of getting into bed by themselves within 5 minutes and Steward recovery score at arrival on PACU and 15, 30 and 45 minutes later. One-way ANOVA statistical analysis was used with $p < 0.05$.
Results: 75 Patients were included after written informed consent and approval of the hospital ethical committee. There was no difference in BMI between the groups (43.7, 43.6, 44.9 kg/m2). All patients were fully reversed after sugammadex administration with a T4/T1 ratio ≥ 0.9. There was a significant difference ($p = 0.000$) in time of decurarisation between the three groups



[Graph]

52% of the patients in IBW group, 56% in IBW+20% and 68% in IBW+40% were able to get into bed by themselves. The Steward recovery scores were not significantly different.
Discussion: Sorgenfrei (2) found at a dose of 2mg/kg a median reversal time of 78 seconds in non-obese patients. We observed longer reversal times, significant different between the groups. The neuromuscular blockade was fully reversed in all 75 patients.
Conclusion: At 2 mg/kg IBW+40% the shortest reversal time was achieved.
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9AP3-7

Dose of sugammadex adjusted to level of neuromuscular blockade in morbid obese patients scheduled for bariatric surgery

Llauradó S., Sabaté A., Camprubí I., Ferreres E., Cabrera A., Martí Valeri C.
Hospital Universitari de Bellvitge, Department of Anaesthesiology, L'Hospitalet de Llobregat, Spain

Background and Goal of Study: Efficacy dose of sugammadex has been defined in lean patients. Our goal was to analyze dose/efficacy of sugammadex adjusted to level of neuromuscular blockade in patients undergoing bariatric surgery.
Materials and Methods: Since introduction of sugammadex, a new protocol of neuromuscular blockade reversal in laparoscopic bariatric surgery has been applied. In summary, rocuronium (0.9 mg/Ideal Body Weight-IBW) was the drug selected for neuromuscular blockade, monitoring using TOF-Watch was implemented in all patients, and once surgery ended, sugammadex administration was guided by Train of Four ratio(TOFr): 1st) From Post-Tetanic Count (PTC) =1 to T1 appearance (Profound Blockade-PB), recommended dose (4 mg/kg) was divided into 4 mg/kg IBW, followed by a new measure of Tofr 3 minutes later with additional dose of 2 mg/kg IBW in case of Tofr was < 0.9. 2nd) From T2 appearance (Moderate Blockade-MB), recommended dose (2mg/kg) was divided into 2 mg/kg IBW, followed by a new measure of Tofr 2 minutes later with additional dose of 2 mg/kg IBW in case of Tofr was < 0.9. Variables measured were: Time from sugammadex administration to Tofr ≥ 0.9 (tS-90) and time from sugammadex administration to tracheal extubation (tS-E). PB and MB groups were compared for demographic, anaesthetic and surgery data. T-student and Chi-square were used for comparison.
Results and Discussion: A total of 79 patients were followed, 23 of them with PB, and 56 with MB.

	PB group n=23	MB group n=56	P-value
Age (years)	46.91±11.77	45.63±9.51	0.618*
BMI (kg/m2)	41.35±5.2	42.84±5.46	0.267*
Male/Female(%)	34.78/65.21	41.07/58.93	0.603**

[Demographic data]

	PB group n=23	MB group n=56	P-value
Cumulative doses of rocuronium (mg)	102.14±20.38	94±41.56	0.677*
Total dose of sugammadex (mg)	330.91±98	170.84±58.88	0.000*
Dose sugammadex per kilo (mg/kg)	2.68±0.88	1.49±0.58	0.000*
Patients with additional dose(%)	52.17	19.64	0.004**
T S-90(sc)	183.05±91.30	183.05±91.30	0.000*
T S-E(sc)	562.45±254.58	278.65±221.19	0.000*

[Doses and time]

BMI=Body Mass Index; sc:seconds. Values are mean ±standard deviation;*t-test; **Chi-Square test

Conclusion(s): Sugammadex doses are related to level of blockade at the end of surgery. Therefore its dose in morbid obese patients should be determined by continuous checking of TOFr. Sugammadex was able to avoid neuromuscular residual blockade in all patients. More studies are necessary to define the minimum efficacy dose of sugammadex in morbid obese patients.

9AP3-8

Reversal of neuromuscular blockade in morbidly obese patients: Sugammadex dosing according to real or ideal body weight?

Vasileiou I., Dre K., Fotopoulou G., Karousos D., Lampadariou A., Tsinari K.
Laiko University Hospital, Department of Anaesthesiology, Athens, Greece

Background and Goal of Study: The adaptation of drug dosages in obese patients is a matter of concern. The purpose of this study was to evaluate

whether suggamadex has to be administered according to the real body weight or ideal body weight in morbidly obese patients.
Materials and Methods: A randomized, double-blind clinical study of 18 morbidly obese (BMI > 40 kg/m²) female patients, aged 25-55 years admitted for laparoscopic gastric banding was performed. Patients with impaired renal or hepatic function were excluded. Anaesthesia was induced with fentanyl, propofol 2mg/kg and rocuronium 0.6 mg/kg based on ideal body weight. Maintenance of anaesthesia was performed with desflurane (MAC 1). Neuromuscular blockade was monitored using acceleromyography. Patients also received supplemental bolus doses of rocuronium (0.15 mg/kg) at the discretion of the anaesthesiologist, in order to achieve zero response to train-of-four (TOF). At the end of surgery, after randomization, patients received sugammadex at a dosage of 2 mg/kg based on either ideal body weight (group I, n=9) or real body weight (group R, n=9) on reappearance of second twitch (T2) of TOF after the last dose of rocuronium. The main endpoint was the recovery time to a T4/T1 ratio of 0.9. Arterial blood pressure and heart rate were recorded just before, 5 and 10 minutes after the administration of sugammadex. Results are reported as mean ± SD. Data were evaluated by *t*-test. Differences were considered significant if $P < 0.05$.
Results and Discussion: Although the time until recovery was shorter for group R (90.28± [50.90]) seconds vs 120.00± [64.00] seconds), the difference was not statistically significant (P=0.135). No difference was recorded between the groups with respect to the values of the systolic blood pressure (149.05 ± [13.00] mmHg for group I and 148.67± [14.82] mmHg for group R, P=0.93), the diastolic blood pressure (85.22± [10.1] mmHg and 116.05± [10.38] respectively, P=0.326) as well as the heart rate (74.22± [9.56] bpm and 78.28± [10.28] bpm respectively, P=0.228). No signs of recurization or treatment-related adverse effects were observed.
Conclusion(s): Taking into account the cost effect, the dosage in morbidly obese patients should be assessed on the basis of ideal body weight rather than on real body weight, as the reversal time of neuromuscular blockade is not affected.

9AP3-9

Sugammadex provides rapid and predictable recovery in patients undergoing surgery with deep neuromuscular blockade: A multicentre phase III study

Rahe-Meyer N., Berger C., Wittmann M., Abels E., Reuter D.A.
Medizinische Hochschule Hannover, Department of Anaesthesiology, Hannover, Germany

Background: In Germany, there tends to be a low rate of pharmacological reversal of neuromuscular blockade (NMB); however, complete and rapid reversal could improve patient safety in surgeries where maintaining deep NMB until wound closure is beneficial. This study compared recovery from deep rocuronium-induced NMB with sugammadex with spontaneous recovery in patients undergoing surgery using deep NMB until end of surgery.
Methods: This was a randomised, safety-assessor-blinded study in adults of ASA Class I-III. Patients received rocuronium 0.6 mg/kg for intubation, with maintenance doses 0.1-0.2 mg/kg as needed to maintain relaxation until end of surgery, followed by sugammadex 4 mg/kg or placebo after last rocuronium dose at 1-2 post-tetanic counts, per randomisation. Induction and maintenance of narcosis and analgesia was given according to routine local practice. Primary efficacy variable was time from start of sugammadex/placebo administration to recovery of the train-of-four (TOF) ratio to 0.9. Secondary efficacy variables included length of stay in operating room (OR).

	Sugammadex (n=69)	Placebo (n=65)
Median (IQR) time to TOF 0.9, min	2.0 (1.6-2.8)	95.8 (58.2-123.3)*
Time for 90% of patients to recover to TOF 0.9, min	4.6	159.8
Median (IQR) time from study drug to patient ready for OR discharge, min	9 (4-15)	103 (74-134)[a]*
Median (IQR) OR length of stay, min	137 (96-209)	217 (169-315)[a]*

IQR=interquartile range; [a]n=61; *P<0.0001 vs sugammadex

[Table]

Results: The intent-to-treat group comprised 134 patients. Factors associated with comorbitidy (eg, old age and ASA Class III) were similar between groups. Time to recovery of the TOF ratio to 0.9 was ~48 times longer ($P < 0.0001$) with placebo vs sugammadex, with a wide variability in recovery times in the placebo group (Table). Median OR length of stay and time from study drug administration to OR discharge were also increased with placebo (Table). Safety was similar between groups, with no recurrence of NMB. Anesthesia was stopped earlier in the sugammadex group due to faster patient recovery; thus blood pressure and heart rate returned to baseline earlier, vs placebo.
Conclusion: Sugammadex allows predictable, complete and rapid recovery from deep NMB and may thus be valuable in surgeries benefiting from maintenance of deep NMB until wound closure. Recovery from deep rocuronium NMB was considerably prolonged in the placebo (median ~96 min) vs sugammadex group (median 2.0 min). Patients were discharged from the OR significantly sooner with sugammadex vs spontaneous recovery from deep NMB.

9AP3-10

Combination of sugammadex and neostigmine for reversal of a rocuronium-induced neuromuscular block

Kramer C., Kretschmer A., Blobner M., Fink H.
Klinik für Anaesthesiologie, Technische Universität München, Department of Anaesthesiology, Munich, Germany

Background and Goal of Study: Sugammadex (SGX) and neostigmine (Neo) both reliably reverse moderate rocuronium-induced neuromuscular blocks though distinct mechanisms of action. A combined, successive use is possible. However, pharmacologic interaction and necessary doses are unclear. In an in-vitro model we investigated the successive dose of SGX or Neo needed to reverse a train-of-four (TOF) ratio from 0.1 to 0.5 and thereafter from 0.5 to 0.9 with SGX or Neo.
Materials and Methods: As previously described an in-vitro rat hemidiaphragm-phrenic nerve system was used[1]. A neuromuscular block of a TOF-ratio 0.1 was induced with rocuronium. The consecutive application of SGX and Neo to reverse the TOF-ratio from 0.1 to 0.5 and thereafter from 0.5 to 0.9 was tested in 4 combinations (group 1: SGX/ SGX; group 2: Neo/ SGX; group 3: SGX/ Neo; group 4: Neo/ Neo; n=6 hemidiaphragms).
Results and Discussion: The dose to reverse a TOF-ratio from 0.1 to 0.5 and from 0.5 to 0.9 with Neo and SGX in either combination (group 2, 3) were similar (Table 1). In contrast to the reversal with SGX/ SGX (group 1) where the dose was equally effective, a ceiling effect for reversal was observed in the Neo/ Neo group (group 4) resulting in an incomplete reversal (Maximum TOF-ratio 0.67 ± 0.08).

Group	Dose to reverse the TOF from 0.1 to 0.5	Dose to reverse the TOF from 0.5 to 0.9
1: SGX SGX (µg/50ml)	298 ± 87	271 ± 97
2: Neo SGX (µg/50ml)	1.16 ± 0.20	267 ± 40
3: SGX Neo (µg/50ml)	325 ± 41	1.21 ± 0.10
4: Neo Neo (µg/50ml)	1.29 ± 0.25	n.a.

[Table 1; n.a. = not applicable]

Conclusion(s): The doses for a consecutive application of SGX and Neo to reverse a rocuronium-induced neuromuscular block are additive. Consistent with previous investigations with pancuronium, complete reversal of a rocuronium-induced neuromuscular block of a TOF-ratio of 0.1 with Neo alone is also not possible[1].
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9AP4-1

Effects of propofol and ketamine on liver regeneration after partial hepatectomy in rats

Yagmurdur H., Astarci H.M., Yagmurdur M.C., Kotanoglu M.S., Dikmen B., Ustun H.
The Ministry of Health Ankara Numune Training and Research Hospital, Department of Anaesthesiology and Intensive Care, Ankara, Turkey

Background and Goal of Study: Liver regeneration is an essential component of the recovery period after partial hepatectomy (1). Although many factors affecting the regeneration activity have been investigated, to our knowledge, there is no data about the effects of intravenous anesthetic agents on liver regeneration. The aim of the present study was to investigate the effects of propofol and ketamine on liver regeneration in rats after 50% hepatectomy.
Materials and Methods: Forty male wistar albino rats were randomly assigned to four groups of 10 rats each. Anesthesia was induced and maintained with propofol in groups 1 and 2 and with ketamine in groups 3 and 4. 50% partial hepatectomy was performed with median laparotomy in groups 1 and 3. Groups 2 and 4 (control groups) underwent an identical surgical procedure without partial hepatectomy. On the 5th postoperative day, animals were sacrificed and regenerated liver was removed, weighed, and sent to the pathology laboratory for immunohistochemical evaluation of endothelial nitric

oxide synthase (eNOS), inducible NOS (iNOS), apoptosis protease-activating factor-1 (APAF-1), and proliferating cell nuclear antigen (PCNA). Blood samples were also obtained for measurement of plasma tumor necrosis factor-α (TNF- α) and interleukin-6 (IL-6) levels. Liver regeneration rate was calculated according to Becker's formula.

Results: The Becker's regeneration index and eNOS expression levels were similar between Group 1 and Group 3. iNOS and APAF-1 expressions were at the mild to moderate levels in Group 1, but these parameters were markedly increased in Group 3 on the 5th postoperative day. Both groups had increased expression of PCNA, but the expression levels were comparable among the groups. Plasma TNF- α and IL-6 levels increased less in the propofol group than in the ketamine group.

Conclusion: Our results demonstrate that the diminution of increase in iNOS expression, TNF- α, and IL-6 levels by propofol produces both an attenuation of cellular apoptosis and increase in the proliferation process, suggesting that the antioxidative effects of propofol has a role in liver regeneration process (2).

References:

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9AP4-2

Comparison of the protective effects of desflurane and propofol anesthesia in rats hepatic ischemia-reperfusion injury model

Tas Tuna A., Demirel C.B., Unal Y., Cavunt A., Yılmazer D., Kavutcu M., Alper M, Kerem M
Gazi University School of Medicine, Department of Anaesthesiology and Intensive Care, Ankara, Turkey

Background and Goal of Study: Interruption of hepatic inflow is a common procedure during trauma surgery, liver transplantation, and resectional surgery. However, the resulting period of hepatic ischemia (I) and subsequent reperfusion (R) can lead to liver injury and dysfunction through the initiation of inflammatory response (1). It has been known that desflurane and propofol protect the liver tissue via different mechanisms (2,3). The aim of this study is to compare the protection effects of desflurane and propofol on hepatic ischemia and reperfusion damage.

Materials and Methods: A number of 30 Wistar rats randomized into 6 groups: the first group is ketamine+I (Group I-K), the second group is ketamine+I+R (Group IR-K), third group is desflurane+ketamine+I (Group I-D), fourth group is desflurane+ketamine+IR (Group IR-D), fifth group is propofol+ketamin+I (Group I-P) and sixth group is propofol+ketamine+IR (Group IR-P). After 30 minutes of hepatic ischemia in group I-K, I-P and I-D and after reperfusion in group IR-K, IR-D, IR-P analysis of tumor necrosis factor (TNF)-α, interleukin (IL)-1β, malondialdehite (MDA) in intra cardiac blood and liver tissue samples performed and degrees of tissues ischemia evaluated.

Results and Discussion: IL-1β levels were significantly higher in Group IR-K and IR-D compared to the ischemic period ($p < 0.05$). TNF-α levels were significantly higher in Grup I-P compared to Group I-D ($p = 0.009$). MDA levels and ischemic degrees were similar in all groups. The number of polymorphoneclear leukocytes (PNL) in Group I-K was significantly lower compared to Group I-D and I-P ($p = 0.009$). The numbers of PNL in IR groups were similar. Although TNF-α levels were statistically higher in Group I-P than Group I-D at the end of ischemia, to determine which agent is more protectible in liver tissue, new researches with higher animals is needed.

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9AP4-3

Comparison of genotoxicity and oxidative stress in patients undergoing non-invasive surgery under isoflurane and propofol anaesthesia

Braz M.G., Pierine D.T., Correa C.R., Ferreira A.L.A., Braz J.R.C., Salvadori D.M.F.
Faculdade de Medicina de Botucatu, UNESP-Univ Estadual Paulista, Pathology, Botucatu, Brazil

Background and Goal of Study: There are positive findings about the genotoxicity of isoflurane (ISO) in patients classified as physical status ASA I-II undergoing invasive surgeries[1], but few studies have evaluated the genotoxic potential of propofol (PROP)[2]. Little is known about the antioxidant capacity in patients submitted to ISO or PROP. As an antioxidant compound, PROP could protect against oxidative stress in patients submitted to surgical procedure. This study aimed to compare the effects of ISO and PROP anaesthesia on DNA of lymphocytes and on the total antioxidant performance (TAP) in patients submitted to non-invasive surgery.

Materials and Methods: The Ethical Committee of the Institution approved the protocol of the study. Patients suffering from any disease (other than surgical abnormality), smokers, alcoholics and those who were under medication or received radiation were excluded. The study included 30 adult ASA physical status I patients submitted to othorhinological surgery. Patients were randomised to receive intravenous anaesthesia with PROP (n=15) or inhaled anaesthesia with ISO (n=15). Blood samples were drawn at: baseline, 120 min of surgery, and the following day of surgery. DNA damage (strand breaks, alkali-labile sites and oxidative lesions) was evaluated in lymphocytes by comet assay and tail intensity was calculated by software to estimate the extent of damage. TAP measured antioxidant capacity in hydrophilic compartment in plasma and oxidation kinetics were monitored by measuring the fluorescence using a multiwell plate reader. Data were compared between groups and in the same group by ANOVA followed by Tukey test to investigate differences at different time points.

Results and Discussion: Patients enrolled in the study were young adults (25±7 years ISO x 28±10 years PROP) with normal body mass index (24±4 kg/m² ISO x 23±3 kg/m² PROP). No differences in DNA damage were observed in the same group or between groups ($P > 0.05$). TAP did not differ between groups ($P > 0.05$); however, TAP increased during surgery in relation to baseline with PROP anaesthesia ($P < 0.05$), but not with ISO.

Conclusion(s): Both ISO and PROP anaesthesia do not induce DNA damage, but PROP increases antioxidant capacity during non-invasive surgery in ASA I patients.

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9AP4-5

Calpain regulates RANKL-induced osteoclastogenesis in murine RAW264.7 cells

Xu J.Y., Liu W., Huang Y.G.
Peking Union Medical College Hospital, Department of Anaesthesiology, Beijing, China

Background and Goal of Study: Metastatic cancer-induced bone pain (CIBP) is the result of increased osteoclastogenesis activity within cancer bone microenvironment. Calpain, a calcium-dependent cysteine protease, has been demonstrated to regulate Receptor Activator of NFκB Ligand (RANKL)-induced osteoclastogenesis. In the present study, Calpain inhibitor was applied in murine RAW264.7 cells to determine whether its inhibition could successfully block osteoclastogenesis process and its possible mechanism.

Materials and Methods: Different dosages of RANKL (0-100ng/ml) and RANKL(50ng/ml) plus Calpastatin (50nM) were applied in RAW264.7 cells respectively for continuous 6 days to induce complete osteoclastogenesis. Calpain activity of each group was measured on day 2 using a fluorometric assay kit. On day 6, we applied two approaches in all groups to determine the maturity of osteoclast. One was Tartrate-resistant acid phosphatase (TRAP) stain, whose positively stained multinucleated cells with three or more nuclei were defined as mature, and the other was pit formation assay, which used artificial substrate of osteoclasts to quantitatively measure their bone resorbing function. Furthermore, Western Blot analysis of NFκB and c-Fos were examined in Calpastatin (50nM) inhibition group and RANKL (50ng/ml) induction alone group.

Results and Discussion: Calpain activity positively correlated with both TRAP positive cell count ($p < 0.05$) and pit formation area ($p < 0.05$) in RANKL-induced RAW264.7 cells. Calpastatin inhibition significantly inhibited TRAP positive cell count ($p < 0.05$) and pit formation area ($p < 0.05$).
Additionally, NFκB and c-Fos protein expression were both significantly decreased after Calpastatin inhibition ($p < 0.05$), comparing with RANKL induction alone.

Conclusion(s): Calpain inhibition can effectively block RANKL-induced osteoclastogenesis in murine RAW264.7 cells. The underlying mechanism could be through upstream activation of both NFκB and c-Fos.

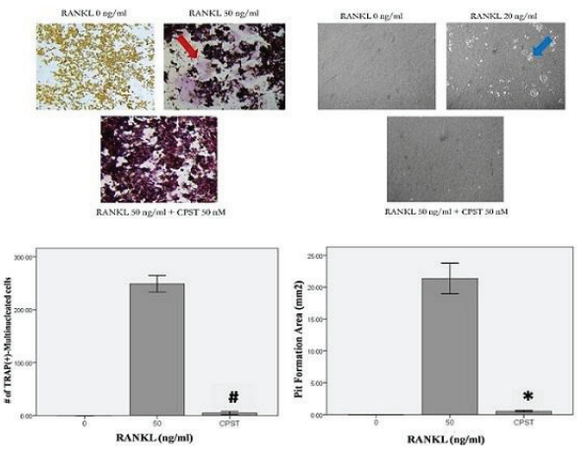

Fig 2. Calpain inhibitor suppresses RANKL-induced osteoclastogenesis in RAW264.7 cells. CPST=Calpastatin. Red arrow indicates TRAP(+) multinucleated cells, blue arrow indicates pit formation. #, * P<0.05 for CPST inhibition vs. RANKL induction only in both TRAP(+) cell count and pit formation area.

[Calpain inhibitor effect]

9AP4-6

The DNA damage and repair of peripheral blood leucocytes (PBL), liver, kidney and brain cells of mice following repeated exposure to isoflurane

Brozovic G., Orsolic N., Rozgaj R., Sakic K.
Clinical Hospital Sveti Duh, Department of Anaesthesiology and Intensive Care, Zagreb, Croatia

Background and Goal of Study: Study was investigated the relationship between DNA damage and repair of PBL, liver, kidney and brain cells of Swiss albino mice induced by repeated exposure to isoflurane. Genetic damage was established by alkaline comet assay.
Materials and Methods: Swiss albino mice were from our own conventional breeding farm. Experimental groups of mice were exposed to isoflurane (1.7 vol%) in oxygen two hours daily, for three consecutive days. Animals were sacrificed by cervical dislocation.The forty mice were divided into eight groups; control group (I), group of mice sacrificed third day of experiment immediately after exposure to isoflurane (II), 2 hours (III), 6 hours (IV), 24 hours (V), 48 hours (VI), 72 hours (VII) and 120 hours later (VIII). Each group comprised of five mice. The alkaline comet assay method was carried out on PBL, brain, liver and kidney cells of Swiss albino mice. A total of 500 cells of the same kind from each group were analysed under a Leitz Orthoplan epifluorescence microscope at 250 x magnifications, equipped with an excitation filter of 515-560 nm and barrier filter of 590 nm. Microscope was connected through camera to a computer-based image analysis system (Comet Assay IV software, Perspective Instruments). As a measure of the DNA damage was the tail length (TL, the distance of DNA migration from the centre of the body of the nuclear core presented in micrometers).
Results and Discussion:

	Control	Isoflurane 0h	Isoflurane 2h	Isoflurane 6h	Isoflurane 24h	Isoflurane 48h	Isoflurane 72h	Isoflurane 120h
PBL	14.38 ±2.75	17.58 ±3.39	19.05 ±4.38	21.01 ±5.24	18.90 ±4.46	17.94 ±2.79	17.47 ±2.78	15.19 ±2.74
Liver cells	16.00 ±4.6	17.71 ±4.39	22.67 ±6.67	21.80 ±5	18.81 ±5.84	17.26 ±3.78	15.98 ±3.09	15.19 ±2.96
Kidney cells	16.99 ±3.49	19.73 ±4.61	29.43 ±8.56	21.81 ±5.61	20.47 ±5.33	16.82 ±3.80	17.40 ±4.35	16.23 ±3.53
Brain cells	13.76 ±2.41	15.26 ±3.9	18.52 ±4.75	20.34 ±4.99	17.64 ±4.29	17.34 ±3.93	17.62 ±4.72a	14.07 ±2.79

[Table 1. Results (mean±SD)]

The results of comet assay performed on PBL, liver, kidney and brain cells are presented in Table 1. The extent of DNA damage at the specific time after repeated exposure to isoflurane was different for each examined organ. The highest DNA damage was observed on liver and kidney cells 2 hours after the last exposure but on PBL and brain cells 4 hours later; 6 hours after the last treatment. Significant repair of broken DNA of PBL was observed after 24 hours, but even 5 days after the exposure, DNA of PBL and brain cells didn't completely repair. DNA of liver cells and kidney cells started to repair 48 hours after the treatment.
Conclusion(s): Even 5 days after the repeated exposure to isoflurane PBL and brain cells didn't restore their damaged DNA.

9AP4-7

Midazolam induce apoptosis in mouse leydig cells and MA-10 tumor cells through caspase-3,caspase-8 and caspase-9

So E.C., Lin Y.X., Huang B.M., Wang Y.K., Wong K.L., Poon P.W.-F.
Chi Mei Medical Center/ Chia Nan University of Pharmacology and Science/ National Cheng Kung University, Department of Anaesthesiology, Tainan, Taiwan, Republic of China

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 try to investigate the possible mechanism for Midazolam induced MA-10 Leydig tumor cell apoptosis.
Materials and Methods: Midazolam (6, 30, 150 μM) (5 mg/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. Flow cytometry was used to test the effect of Midazolam on cell cycle progression. Caspase cascade interaction was investigated by Western blotting. Results were presented as Mean ± SEM. Differences between treatments and controls were determined by two-way ANOVA and statistical significance was set at $p < 0.05$.
Results and Discussion: MA-10 mouse Leydig tumor cells showed membrane blabbing and rounding-up after high dosage (150 μM) Midazolam treatment for 12 hrs. Significantly decrease in cell viability were also found after 12 hr (150 μM, $P<0.001$) and 24 hr (30 μM, $P<0.01$). Flow cytometry showed hypodiploid DNA content (sub-G1 population) gradually increased after 12 hr treatment with 150 μM Midazolam. Caspase-9 and caspase-3 increased significantly after 12 hrs (150 μM) treatment. , Caspase-8 was also seen to be activated by Midazolam at 6 μM after 12 hrs.
Conclusion(s): Our results suggested that Midazolam induced MA-10 mouse Leydig tumor cells apoptosis through the activation of caspase-9, caspase-8 and caspase-3.
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9AP4-8

Oxidative DNA damage in peripheral lymphocytes from patients submitted to non-invasive surgery under sevoflurane anaesthesia

Orosz J.E.B., Braz M.G., Braz L.G., Salvadori D.F., Braz J.R.C.
Faculdade de Medicina de Botucatu, UNESP-Univ Estadual Paulista, Department of Anaesthesiology, Botucatu, Brazil

Background and Goal of Study: In the literature, there is no information about the sevoflurane (sevo) genotoxicity in healthy young patients submitted to non-invasive surgery. The study aimed to evaluate a possible oxidative DNA damage in patients submitted to non-invasive surgey with sevo anaesthesia.
Materials and Methods: The Ethical Committee of the Institution approved the protocol used. This prospective study included 15 ASA I adult patients scheduled for otorhinological surgery and anaesthetized with sevo (1-1.5 MAC). All patients signed the informed consent. Blood samples were drawn at 4 time points: before anaesthesia induction, 15 min after anaesthesia induction and before surgery, 120 min of surgery and on the first postoperative day. Bases oxidations were evaluated by comet assay and % DNA in tail was considered to estimate DNA damage.
Results and Discussion: There were no significant differences in DNA oxidized bases among the four time points evaluated ($P > 0.05$). Differently from our results, the positive findings in DNA damage in ASA I-II patients submitted to invasive surgery under sevo anaesthesia[1,2] might be related to the recruited patients and/or type of surgery.
Conclusion(s): Sevo anaesthesia does not to induce oxidative DNA damage in lymphocytes from ASA I patients submitted to non-invasive surgery.
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Acknowledgements: (optional): FAPESP.

9AP5-1

Remifentanil attenuates the phrenic long term facilitation in rats subjected to acute intermittent hypoxia

Ivancev B., Carev M., Pavlinac I., Pecotic R., Valic M., Dogas Z.
University Hospital Split, Department of Anaesthesiology and Intensive Care, Split, Croatia

Background and Goal of Study: Long term facilitation (LTF) is sustained augmentation of respiratory motor output elicited by acute intermittent hypoxia (AIH), and is considered as a form of the central nervous system plasticity. It has been demonstrated in urethane-anaesthetized rats. Different anesthetics might alter the expression of LTF.
Recent studies point to central inhibitory effect of opioids on the hypoxic ventilatory response in humans. It remains unknown whether opioids modify expression of phrenic LTF. The goal was to investigate whether intravenous infusion of remifentanil would depress phrenic LTF in the model of AIH in urethane-anaesthetized rats.
Materials and Methods: The phrenic nerve activity was recorded in 16 adult, male, Sprague-Dawley rats, bilaterally vagotomised, paralysed and mechanically ventilated. The phrenic nerve recordings monitored central respiratory activity. The animals were divided in 2 groups; urethane-anaesthetized (1.2 g/kg i.p., n=6) and urethane-anaesthetized + remifentanil infusion (0.5 μg/kg/min i.v., n=10). Rats were exposed to five, 3-min hypoxic episodes (FiO_2=0.09), separated by 3 minutes of hyperoxia (FiO_2=0.5). Phrenic nerve amplitude (PNA), burst frequency (f), inspiratory time (Ti), expiratory time (Te) and total respiratory cycle duration (Ttot) were analyzed during 5 hypoxias and 15, 30, and 60 minutes after the final hypoxic episode, and compared to the baseline values prior to the first hypoxic episode. At the end of experiment, infusion of remifentanil was stopped and phrenic nerve activity was compared to baseline values prior to remifentanil infusion. Isocapnia was successfully maintained throughout the protocol.
Results and Discussion: There was a significant increase of PNA (138.8 ± 28.3 %, P< 0.001) in urethane-anaesthetized group 60 minutes after the last hypoxic episode compared to the baseline values, i.e. the LTF was induced. In the remifentanil group no significant changes of PNA were recorded at any time point after the last hypoxic episode, i.e. no LTF was observed. Remifentanil infusion prolonged Ti (0.84 s vs. 0.51 s, P< 0.001), whereas Te and Ttot were not significantly changed. After remifentanil infusion was stopped, PNA was not significantly different compared to baseline values prior to infusion.
Conclusion: Intravenous infusion of remifentanil attenuated phrenic LTF in urethane-anaesthetized rats following AIH protocol.
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9AP5-2

Gabapentin and remifentanil interactions in the sevoflurane minimum alveolar concentration and acute opioid tolerance in the rat

Aguado D., Abreu M., Benito J., García-Fernández J., Gómez de Segura I.A.
Complutense University of Madrid, Dept. of Animal Medicine and Surgery, Madrid, Spain

Background and Goal of Study: Gabapentin, commonly used as antiepileptic drug, is now successfully employed in the treatment of neuropathic pain, perioperative pain management, but also opioid induced hyperalgesia. However the interaction of gabapentin with inhalation anaesthetics and opioids has not been determined. Also, gabapentin may prevent or limit the acute tolerance to remifentanil observed during inhalation anaesthesia. The aim of the study was to determine the effect of gabapentin, administered alone or in combination with remifentanil, on the sevoflurane minimum alveolar concentration (MAC) in rats and to determine whether gabapentin may blunt or prevent acute opioid tolerance.
Materials and Methods: After institutional animal care committee approval, the reduction in the sevoflurane MAC in response to gabapentin with or without remifentanil was evaluated in rats. Forty-two adult male Wistar rats were anesthetized with sevoflurane. Rats were administered gabapentin (150 mg/kg, 300 mg/kg or saline, orally; 3 groups, n=6), and the MAC was determined four times afterwards, at 1 hour intervals. In a second experiment (4 groups, n=6), the baseline MAC was determined. Then, two different doses of remifentanil (120 and 240 μg/kg/h), alone or combined with gabapentin (300 mg/kg), were administered and the MAC was determined three further times to determine acute opioid tolerance. MAC was determined from intratracheal gas samples and tail clamping was used as a supramaximal stimulus. End tidal anaesthetic concentrations were assayed using a side stream gas analyzer. Statistical analysis was performed with an ANOVA for repeated measures.
Results and Discussion: In the first experiment, gabapentin, at either dose, reduced the MAC, with a slow onset, by 25-30% (p< 0.01). In the second experiment, remifentanil, given alone, dose-dependently reduced the MAC by 16±5% and 36±6% with the low and high doses, respectively (p≤0.01) and an opioid-induced tolerance was observed by a lower MAC reduction (p< 0.05), approximately 1.5 h later. When gabapentin was pre-administered to the remifentanil infusion, the MAC reduction increased to 39±12% and 62±14% with the low and high remifentanil doses, respectively (p< 0.01 *vs* remifentanil alone) and a tolerance to remifentanil was not determined (p>0.05).
Conclusion(s): Gabapentin reduced the sevoflurane MAC, potentiated remifentanil MAC reduction and blunted opioid induced acute tolerance in rats.

9AP5-3

Comparison of palonosetron with ramosetron in prevention of postoperative nausea and vomiting in patients undergoing gynecological laparoscopic surgery and receiving postoperative intravenous patient-controlled analgesia

Shin Y.S., Kim A.
Chungnam National University Hospital, Department of Anaesthesiology and Pain Medicine, Daejeon, Korea, Republic of

Background and Goal of Study: Postoperative nausea and vomiting (PONV) are common and distressing complications after anesthesia and surgery. The purpose of this study was to compare the effectiveness of a single intravenous dose of palonosetron with a single intravenous dose of ramosetron in preventing PONV in patients undergoing gynecological laparoscopic surgery and receiving postoperative intravenous patient-controlled analgesia (IV-PCA).
Methods: One hundred patients undergoing laparoscopic gynecological surgery under general anesthesia were randomized to receive palonosetron (group P, n= 50) or ramosetron (group R, n= 50) intravenously at 5 minutes before end of surgery. The PCA regimen consisted of nalbuphine 40 mg was programmed to deliver 2 ml/hr as background infusion and 2 ml per demand with a 15 min lockout. Occurrences of nausea and vomiting, the need for rescue antiemetics and analgesics, pain score, as well as adverse events associated with study medications, were recorded for 48 hours after the operation.
Results: The incidence of PONV showed no significant differences between groups during 48 hours after surgery. There was no significant difference between the groups in the incidences of the need for rescue antiemetics and analgesics, pain score and adverse events associated with study medications.
Conclusions: The effect of palonosetron or ramosetron was similar to each other on its efficacy as a prophylactic antiemetic in patients undergoing laparoscopic gynecological surgery and receiving postoperative IV-PCA.
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9AP5-4

Comparison of norepinephrine and dopamine in kidney transplant recipient on renal graft function

Feng C., Liu B., Piao M.
The First Hospital of Jilin University, Department of Anaesthesiology, Changchun, China

Background and Goal of Study: The use of norepinephrine in kidney transplant donors is associated with delayed graft function (DGF) in recipient patients (1). But the effects of norepinephrine on renal graft function are poorly understood when administered in recipient patients. The authors studied the administration of different vasopressors on kidney transplant recipients including norepinephrine and dopamine to determine which one affords better outcome on renal graft function.
Materials and Methods: After exclusions, sixty-eight patients aged 25-68 yr. undergoing cadaver kidney transplantation with combined spinal-epidural anesthesia infused either norepinephrine (n=35) or dopamine (n=33). Central venous pressure (CVP) was maintained between 10 to 15 mmHg by infusing 6% hydroxyethylstarch 130/0.4 during operation. Infusion of norepinephrine at 0.04 to 0.2 μg/kg/min and dopamine at 3 to 10 μg/kg/min was administered respectively to strictly control systolic blood pressure (SBP) in the range of 145 to 180 mmHg from reperfusion until the end of surgery. The rate of DGF, the levels of beta 2-microglobulin (β_2-MG), alpha 1-microglobulin (α_1-MG), blood urea nitrogen (BUN), serum creatinine (sCr) and urine volume before anesthesia, at the end of surgery, at post-operative day 1, 3, 7 and 14 were analyzed as well as hemodynamic stability peri-operation.
Results and Discussion: The demographic characteristics of donors and recipients were similar in the two groups, including cold and warm ischemia

duration, operation time and volume replacement as well. Hemodynamic indexes including SBP, diastolic blood pressure, mean blood pressure and CVP were stable peri-operation in both groups ($p>0.05$). Heart rate (HR) in recipients treated with dopamine was significantly higher than those treated with norepinephrine during operation ($p< 0.05$). The rate of DGF was 8.6% in recipients treated with norepinephrine compared with 6.1 % in those treated with dopamine ($p>0.05$). There were no statistical differences in serum levels of β_2-MG, BUN, and sCr, urine levels of β_2-MG and α_1-MG and urine volume between two groups peri-operation ($p>0.05$).

Conclusion(s): This clinical trial demonstrates that infusion of norepinephrine and dopamine is of stable hemodynamics and no adverse effect on renal graft function is found with norepinephrine during kidney transplantation.

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9AP5-5

Remifentanil attenuates LPS-induced neutrophil activation via kappa receptor

Kwak S., Jeong C.W., Jeong S.W., Chung S.T., Lee S.H., Chung H.-J.
Chonnam National University, Department of Anaesthesiology and Pain Medicine, Gwangju, Korea, Republic of

Background and Goal of Study: Opioids modulate the immune response via opioid receptors expressed directly on the immune cells themselves. Neutrophils play a pivotal role in the coordination and regulation of immune responses. However, the ability of opioid directly participating in LPS-induced neutrophil activation has not been fully examined. We investigated the influence of various opioids including remifentanil, sufentanil, alfentanil and fentanyl 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, opioids that fentanyl (1, 10, 100)ng/mL, sufentanil (1, 10, 100)ng/mL, alfentanil (10, 100, 1000)ng/mL, remifentanil (1, 10, 100)ng/mL each well; LPS 100ng/mL, opioids combination with LPS 100ng/mL and opioids combination with LPS and opioid receptor antagonists each well

Results and Discussion: Remifentanil only could attenuate activation of neutrophils exposed to LPS. In particular, remifentanil decreased LPS-induced activation of intracellular signaling pathways, including p38 mitogen-activated protein kinase (MAPK) and ERK1/2, and expression of pro-inflammatory cytokines, including TNF-a, IL- 6 and IL- 8. These effects of remifentanil were reversed by kappa receptor antagonist.

Conclusion(s): These results demonstrate that remifentanil can attenuate LPS-induced neutrophil responses via kappa receptor and also suggest that such effects are sufficiently important in vivo to play a major contributory role in neutrophil-mediated inflammatory responses by surgical and anesthetic trauma.

9AP5-6

Inhibition of cannabinoid receptor 1 causes anaesthetic induced excitation in septic rats

Lehmann C., Kuschnereit R., Kuster I., Zhou J., Cerny V., Kelly M.
Dalhousie University, Department of Anaesthesiology, Halifax, Canada

Introduction: In systemic inflammation and sepsis, the endocannabinoid system is upregulated [1]. While it is known that neuronal cannabinoid signalling via cannabinoid receptor 1 (CB1) in the central nervous system represents an intrinsic neuroprotective response [2] and exerts anti-epileptic activity [3], inhibition of CB1 (CB1inh) has been suggested as an experimental target for sepsis therapy [4]. We studied the effects of CB1inh in rats with experimental sepsis during anesthesia induction with pentobarbital.

Methods: 5 groups of Lewis rats were included in the study: Group 1 - sham operated controls treated with CB1inh (AM281, 2.5 mg/kg i.v., n=12), Group 2 - animals with colon ascendens stent peritonitis (CASP-)induced sepsis treated with CB1inh (n=12). As additional control groups we administered in CASP animals the CB1 agonist ACEA (2.5 mg/kg i.v.; Group 3; n=4) or the solvent DMSO (Group 4; n=4). In Group 5 we administered 50 mg/kg ketamine for induction of anesthesia 14 hours following the CASP treated by CB1inh. All other groups received a standard dose of pentobarbital (40 mg/kg i.v.) 14 hours following CASP procedure.

Results: In 5 out of 12 septic animals (42%) with CB1inh (Group 2) we observed tonic-clonic seizures immediately after induction of anesthesia with a standard dose of pentobarbital. In sham-operated animals (Group 1) or CASP animals without CB1inh (Group 4) we did not observe anesthetic-induced excitation. Replacement of the barbiturate by ketamine (Group 5) avoided seizures as well as treatment with the CB1 agonist (Group 3).

Conclusion: CB1 inhibition in sepsis may increase the incidence of anesthetic-induced excitation and reduce CB1-mediated intrinsic neuroprotective response.

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9AP5-7

Comparison of dexamethasone and metoclopramide effect, and the effect of them combined on PONV on urology

Gani H., Ohri I., Kerci M., Cobani E., Naco M., Beqiri V.
UHC ‚Mother Teresa', Department of Anaesthesiology and Intensive Care, Tirana, Albania

Background and Goal of Study: Nausea and vomiting post-operatively(PONV) is one of the complication that is often seen post-operation and post anesthesia.The purpose of this study is to discover the effect of dexamethasone, metoclopramide and the effect of both of them on preventing PONV.

Materials and Methods: On this study are included 680 patients(Pts) that had undergone urology surgery,ASA I-III.Pts are selected randomly and double blinded, placebo, controlled study.Participants are divided in two groups .On the first group 200 participants with endotracheal anesthesia (EA) and 480 participants with spinal anesthesia (SA).Furthermore each group is divided on 4 subgroups with 50 participants each and 220 patients.First Group (G1) received 2ml sol NaCL 0.9% on the beginning of the surgery after initiating of anesthesia or enmidiatly after starting spinal anesthesia. G2 instead of saline received 10mg Metocloporamide on the beginning of surgery and 10mg on the end of the procedure.G3 received 8mg Dexamethason on the beginning of surgery.G4 received 8mg Dexamethason and 10mg Metoclopramide on the beginning and 10mg Metoclopramide on the end of surgery.Study evaluated PONV frequency and pain level, and the request for antyemetic and analgesics.Study also evaluated the side effects of Dexamethason and Metoclopramide on the 24 first hours post-procedure. Data is analyzed by using AVONA and X^2 when $p< 0.05$ to have statistical significant value.

Results and Discussion: On the control group the occurrence of PONV was 65% while after SA and 52% after EA.On the G2 after SA occurrence of PONV 43% and 31% after EA. On G3 occurrence e PONV after AS was 23% and after EA was21%

On G4 occurrence e PONV after SA was 12% and after EA was 11%

One participant did not need antiemetic from the G4 compare with two from the G3 ($p< 0.05$) and 4 participant from the G2 and 7 participant from G1 (after EA)

One participant needed antiemetic (G4) compared with 3 on G3 ($p< 0.05$), 5 from G2 and 10 from G1.Pain level and the need for analgesic immediately post-operatively was smaller on the G4 compared with G3 and G1 ($p< 0.05$)

Conclusion(s): Dexamethason and Metoclopramide combined together ($p< 0.05$) were more effective preventing PONV compared to the use of Dexamethason or Metoclopramide alone or only Saline solution. Use of Dexamethasone was more effective on preventing PONV ($p< 0.05$) compare to Metoclopramide and sol saline.

9AP5-8

Effects of endocannabinioid system modulation on the intestinal microcirculation in experimental sepsis

Lehmann C., Kuschnereit R., Kuster I., Zhou J., Cerny V., Kelly M.
Dalhousie University, Department of Anaesthesiology, Halifax, Canada

Introduction: The endocannabinoid system (ECS) is upregulated during sepsis. However, the functional outcomes of modulating endocannabinoid signaling during sepsis are currently unclear. Sepsis is a disease of the microcirculation. Impairment of the intestinal microcirculation during sepsis may cause a breakdown of gut epithelial barrier function and bacterial translocation into the systemic circulation increasing the systemic inflammatory response. Consequently, the protection of the intestinal microcirculation represents a pivotal therapeutic target in sepsis. The aim of the present study was to examine the effects of CB1 and CB2 receptor modulation on the intestinal microcirculation in a model of poly-bacterial sepsis (colon ascendens stent peritonitis - CASP) using intravital microscopy (IVM).

Methods: We studied six groups of animals (Lewis rats, n=10 per group): sham operated controls (SHAM), septic controls (CASP), CASP animals treated with CB1 agonist, ACEA (2.5 mg/kg IV), CASP animals treated with CB1 antagonist, AM281 (2.5 mg/kg IV), CASP animals treated with CB2 agonist,

HU308 (2.5 mg/kg IV) and CASP animals treated with CB2 antagonist, AM630 (2.5 mg/kg IV). All treatments were performed immediately after sepsis induction. IVM of the intestinal microcirculation was performed 16 hours following sepsis induction. Leukocyte adhesion and functional capillary density (FCD) were measured in a blinded fashion.
Results: Following 16 hours of CASP-induced experimental sepsis, a significant increase of leukocyte adhesion in the intestinal submucosal collecting venules (V1: SHAM 35.7±6.2 n/mm², CASP 214.4±22.6 n/mm², p< 0.05) was observed. Capillary perfusion of the muscular and mucosal layers of the intestinal wall was significantly reduced (e.g., longitudinalis muscular layer: SHAM 143.5±7.6 cm/cm², CASP 77.1±7.2 cm/cm²). Treatment of CASP animals with the CB1 receptor agonist, ACEA, reduced leukocyte adhesion (V1: 107.4±5.1 n/mm²), whereas CB2 receptor stimulation did not affect leukocyte adhesion. However, CB2 receptor inhibition by AM630 reduced leukocyte activation significantly (V1: 60.0±14.1 n/mm²) and restored capillary perfusion (longitudinal muscular layer: 114.1±7.6 cm/cm²).
Conclusion: The data suggest that ECS signaling is involved in the impairment of the intestinal microcirculation during sepsis. Blocking CB2 receptor signaling reduces leukocyte activation and improves capillary perfusion in sepsis in rats.

9AP5-9

Droperidol vs metoclopramide for prophylaxis of postoperative nausea and vomiting after breast cancer surgery

Sansone P., Stumbo R., D'Arienzo S., Coletta F., Zagaria G., Pace M.C., Aurilio C.
Second University of Naples, Dept Anaesthesiological, Surgical and Emergence Sciences, Naples, Italy

Background and Goal of Study: Breast cancer surgery performed (with axillary dissection) in general anesthesia has been associated with a relatively high incidence (60-80%) of postoperative nausea and vomiting (PONV). The aim of this study was to compare the efficacy of two antiemetics, both dopamine antagonists: droperidol versus metoclopramide for the prophylaxis of PONV after breast cancer surgery in patients, from 40 to 62 years old.
Methods: After independent ethical committee approval and written informed consent, 50 women, ASA I-II, with breast cancer underwent breast cancer surgery were recluted .This study is a prospective, randomized study. A standard general anesthetic technique, including propofol, remifentanil, sevoflurane and air mixed to oxygen, was used. Patients were randomized to one of the two groups: group DRO (25pz) received droperidol 20 mcg/kg and group MET (25pz) received metoclopramide 0,2 mg/kg, immediately after surgical suture. All episodes of PONV during the first 24 hours after anesthesia administration were recorded by an investigator, furthermore other extrapyramidal symptoms were reported. There were no significant differences between treatment groups with regard to patient demographics, surgical procedure, or awakening time. Statistical analysis was performed using student t test. All comparisons were two-sided, and a P value less than 0,05 was considered significant.
Results and Discussion: The prevalences of PONV 0 to 24 hours after anesthesia were significantly lower in the group DRO compared with group MET. PONV occurred for 32% in the group DRO treated with droperidol and 60% in the group MET treated with metoclopramide. Extrapyramidal symptoms were not reported in any of the groups.
Conclusion(s): Droperidol is a valid therapeutic option for the treatment of PONV in women who underwent breast cancer surgery.
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9AP6-1

Population pharmacokinetics of dexmedetomidine in intensive care patients: The effect of covariates

Ihmsen H., Iirola T., Aantaa R., Laitio R., Schüttler J., Olkkola K.T.
University of Erlangen-Nuremberg, Department of Anaesthesiology, Erlangen, Germany

Background and Goal of Study: Dexmedetomidine (DEX) is a highly selective and potent alpha2-adrenoreceptor agonist for sedation in intensive care units (ICU). Although the pharmacokinetics of DEX have been studied previously in ICU patients (1), there is no information on the pharmacokinetics after long-lasting (>48 h) infusions. The aim of this study was to investigate the pharmacokinetics of long-lasting DEX infusions in ICU patients with special regard to covariate effects.
Materials and Methods: After IRB approval and written informed consent from the legal representatives, 21 patients (22 - 85 y, 53 - 120 kg, 16 male) requiring postoperative sedation and mechanical ventilation received DEX with a loading dose of 3 - 6 μg/kg/h in 10 min and a maintenance dose of 0.1 - 2.5 μg/kg/h. Cardiac output, laboratory and respiratory parameters were monitored regularly. Plasma concentrations of DEX were measured from arterial blood samples by HPLC with tandem mass spectrometric detection. Pharmacokinetics were determined by population analysis (NONMEM) using linear multicompartment models.
Results and Discussion: The median duration of DEX infusion was 96 h (range: 20 - 571 h) with a total dose of 1.22 ± 0.42 μg/kg/h (mean ± SD). Pharmacokinetics were best described by a two-compartment model. The table shows the typical pharmacokinetic parameters (CL=clearance; V1=volume of the central compartment; Vss=volume at steady-state, T1/2α=distributional half-life; T1/2β=elimination half-life) in the study population. An increase in body mass index, creatinine clearance or cardiac output was associated with an increase in dexmedetomidine CL. Vss was increased in patients with low plasma albumine concentration, high creatinine concentration, and in patients with impaired respiratory function, as assessed by a decreased ratio PaO_2/FiO_2. There were no effects of gender.

CL (L/h)	V1 (L)	Vss (L)	T1/2α (min)	T1/2β (min)
52.3 ± 4.7	11.4 ± 1.2	126 ± 14	1.87 ± 0.18	127 ± 18

[Pharmacokinetic parameters (estimate ± SE)]

Conclusion(s): The typical dexmedetomidine pharmacokinetics after long-lasting infusion in ICU patients were similar to the data in earlier studies (1). In critically ill patients with an impaired general status, dexmedetomidine showed a decreased clearance, an increased volume of distribution and a prolonged elimination half-life.
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Acknowledgements: Concentrations of DEX were determined at Clinical Research Services Turku, University of Turku, Finland

9AP6-2

Diminish of minimum alveolar concentration of sevoflurane due to esmolol; a prospective controlled study in patients undergoing craniotomy

Asouhidou I., Samaras A., Katsaridis V., Ioannou P.
'G.Papanikolaou', Department of Anaesthesiology, Thessaloniki, Greece

Background and Goal of Study: Volatile anesthetics have been shown to affect cerebral autoregulation, even maintaining MAC< 0.4 and there is still a controversy over the best choice of anesthetics for neurosurgical patients. Esmolol, an ultra-short-acting, cardioselective b_1 -adrenergic receptor antagonist that is effective in blunting sympathetic overdrive to several perioperative stimuli, is reported that enhances the analgesic effect of opioids but has no analgesic effect when administered alone. This study aims to study the effect of esmolol on sevoflurane concentration.
Materials and Methods: Fourteen patients undergoing elective craniotomy for tumor resection or aneurysm clipping were randomly divided in two groups of seven patients each; control and esmolol group. General anesthesia was induced with propofol (2mg/Kg), fentanyl (2mcg/Kg) and cis-atracurium (0.15mg/Kg). Anesthesia was maintained with remifentanil and sevoflurane in 50% O_2/N_2O in order to maintain BIS 40-50. Patients in the esmolol group received 500mcg/Kg esmolol followed by continuous infusion of 200mcg/Kg/min.
Results and Discussion: At the esmolol group sevoflurane was started at 0.5 MAC just after the intubation and it was adjusted perioperative according to BIS at 0.2-0.3MAC (0.31±0.13), while at the control group was 1.2-2 MAC and 0.8-1.8 MAC (1.26±3.43). None of the patients presented any hemodynamic instability due to esmolol.
Conclusion(s): Continuous infusion of esmolol not only managed to control the sympathetic overdrive perioperatively, but also diminished MAC of sevoflurane at "subanesthetic" dose and make sevoflurane ideal and safe agent for neuroanesthesia.
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9AP6-3

Effect of dexmedetomidine on erythrocyte deformability during ischemia-reperfusion injury of liver in diabetic rats

Arslan M., Çomu FM., Işık B., Öztürk L., Kesimci E.
Gazi University Faculty of Dentistry, Department of Oral and Maxillofacial Surgery, Ankara, Turkey

Background and Goal of Study: Diabetes mellitus (DM) is a chronic metabolic disorder accompanied by an increased oxidative stres. Ischemia-reperfusion (IR) injury is a cascade of events initiated by tissue ischemia and the cellular damage produced by reperfusion leading to an active inflammatory response. Erythrocyte deformability and plasma viscosity are of crucial importance for the perfusion of tissues and organs. During liver IR there is abundance of the free oxygen radicals in cells further leading to cell damage. Different therapeutic modalities have been used for the prevention of this damage. The aim of this study is to evaluate the effect of dexmedetomidine on erythrocyte deformability during IR injury of liver in diabetic rats.
Materials and Methods: Twenty- eight Wistar Albino rats were included in the study after streptozocin (65 mg/kg) treatment for 4 weeks of observation for diabetes existence. The animals were randomly assigned to one of four experimental groups: Group C (sham-control group): The abdomen was dissected with a median laparotomy and the liver was harvested. Group DC: The abdomen was dissected with a median laparotomy and the liver was harvested. Group DIR: The liver was harvested after IR following abdominal median laparotomy. Group DIRD: The liver was harvested after IR following abdominal median laparotomy and 30 min of infusion of dexmedetomidine 100μg/kg ip The rats were sacrificed after sampling intraabdominal blood. Erythrocyte packages were prepared from heparinized whole blood samples. Deformability measurements were performed in erythrocyte suspensions prepared as containing Htc 5 % in PBS buffer.
Results and Discussion: Deformability index was significantly increased in diabetic rats, however it was similar in Group C and DIRD. It was significantly increased in Group DIR when compared to Group C, DIRD and DC. Relative resistance was increased in IR models.
Conclusion(s): Erythrocyte deformability was damaged in rats having diabetes and IR injury. This injury might lead to further problems in microcirculation. Thus, measurement of erythrocyte deformability might be important in follow-up of IR injury. It was shown that dexmedetomidine may be useful in enhancing the adverse effects of this injury. Further studies in larger series will be addressed in this way.

9AP6-4

Lower surgical stress-induced prolactin release with desflurane versus sevoflurane

Aceto P., Ferraro E., Marusco I., Mecarello M., Privitera G., Sollazzi L.
Catholic University of Sacred Heart, Department of Anaesthesiology and Intensive Care, Rome, Italy

Background and Goal of Study: Stress response to surgery is affected by many factors, including the type of procedure performed and the anesthetic used (1,2). It is unknown whether sevoflurane and desflurane differ in terms of stress response modulation. The aim of this study was to compare their effects on stress response during pneumoperitoneum.
Materials and Methods: This prospective, randomized, double-blind study enrolled 40 patients, aged 18-70, with ASA physical status I-II, scheduled to minor laparoscopic surgery. After approval by the local Ethical Committee, the patients who had provided a written informed consent were randomized to either sevoflurane (SEVO group, n=23) or desflurane (DESF group, n=17) for anesthesia maintenance at 1 MAC. Anesthesia was induced using a standard protocol with propofol 2 mg/kg, cisatracurium 0.15 mg/kg and remifentanil 0.25 mcg/kg/min. Stress response was assessed based on the cortisol and prolactin plasma levels determined by an immunometric assay before anesthesia (T0) and 5 minutes after pneumoperitoneum creation (pressure 12 cmH_2O) (T1). Intraoperative analgesia was assured by remifentanil, at infusion rates ranging from 0.1 mcg/kg/min to 0.3 mcg/kg/min so as to maintain BIS values below 60.
Postoperative analgesia was managed with morphine 0.06 mg/kg. Statistical analysis was performed using the Student's t test and the Wilcoxon Mann Whitney test. A p value < 0.05 was considered statistically significant.
Results and Discussion: Patient demographic characteristics and median remifentanil infusion rates at T1 were comparable in the two treatment groups. Mean arterial pressure and heart rate were constant during anesthesia for all patients, without significant differences between groups. Intraoperative (T1) prolactin levels were significantly increased versus preoperative (T0) values in both groups ($p< 0.000$). In both groups, T1 cortisol levels were significantly reduced compared with levels found at T0 ($p< 0.01$). The prolactin levels at T1 were lower in the DESF group than in the SEVO group (98±66 ng/mL vs 160±54 ng/mL, respectively; $p< 0.01$).
Conclusion(s): Desflurane was associated with a lower prolactin release during surgery as compared to sevoflurane. The choice of the inhalational anesthetic could therefore have an impact on stress response during surgery.
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9AP6-5

Effects of dexmedetomidine and remifentanil as an adjunct of TIVA with propofol

Subasi H., Kol I.O., Duger C., Kaygusuz K., Gursoy S., Mimaroglu C.
Cumhuriyet University, Department of Anaesthesiology, Sivas, Turkey

Background and Goal of Study: In this study, we compared intraoperative hemodynamic responses , recovery times, postoperative analgesic requirements, postoperative hemodynamic parameters and postoperative pain scores of dexmedetomidine and remifentanil as an adjunct of TIVA applications for patients who received laparoscopic cholecystectomy operation.
Materials and Methods: 18 to 60 years old, ASA I-II, 40 patients who will receive laparoscopic cholecystectomy surgery were included in the study and they were randomly divided into two groups. After injecting 2.5 mg kg^{-1} propofol, 0.6 mg kg^{-1} rocuronium, 1μg kg^{-1} fentanyl for induction, endotracheal intubation was performed. Propofol, 150 mg kg^{-1} min^{-1} infusion was started. In dexmedetomidine group, dexmedetomidine infusion was started from 0.5 mg kg^{-1} h^{-1}. In remifentanil group, 0.5 mg kg^{-1} min^{-1} remifentanil infusion was started. 5 min. after incision, dexmedetomidine and remifentanil were reduced to 0.3 mg kg^{-1} h^{-1} and 0.3 mg kg^{-1} min^{-1}, respectively. Before induction, 1 and 5 mins after intubation and skin incision respectively, systolic blood pressure, heart rate, SpO_2, end tidal CO_2 were recorded each 10 min during the surgery. All infusions were terminated at the end of surgery. Adequate spontaneous respiration, extubation, and response to verbal commands; and Aldrete score ≥ 9 times, postoperative pain scores (VAS) and vital parameters in the postoperative period were recorded. Patient-controlled analgesia pump will be installed to all postoperative patients. Total analgesic consumptions, the time of first analgesic need of patients, were recorded.
Results and Discussion: 5 mins after incision, individuals SBP, DBP, HR values in remifentanil group remained significantly lower compared to those in dexmedetomidine group ($P< 0.05$). Recovery was happened earlier for individuals in remifentanil group. However, it was recorded that first postoperative analgesic need time was shorter and hemodynamic parameters were significantly higher ($P < 0.05$). Postoperative recovery of dexmedetomidine group remained more stable in terms of VAS values ($P< 0.05$).
Conclusion(s): It was concluded that dexmedetomidine can be used as a safe and useful adjunct for TIVA procedures.

9AP6-6

Effect of dexmedetomidine on erythrocyte deformability and lipid peroxidation during ischemia-reperfusion injury of liver in rat

Arslan M., Çomu FM., Küçük A., Öztürk L., Yaylak F.
Gazi University Faculty of Dentistry, Department of Oral and Maxillofacial Surgery, Ankara, Turkey

Background and Goal of Study: Ischemia-reperfusion(IR) injury is a cascade of events initiated by tissue ischemia and the cellular damage produced by reperfusion leading to an active inflammatory response. Erythrocyte deformability and plasma viscosity are of crucial importance for the perfusion of tissues and organs. During liver IR there is abundance of the free oxygen radicals in cells further leading to cell damage. The aim of this study is to evaluate the effect of dexmedetomidine on erythrocyte deformability and lipid peroxidation during ischemia-reperfusion injury in rats.
Materials and Methods: Twenty-four Wistar Albino rats were randomly separated into three groups. GroupC: The abdomen was dissected with a median laparotomy and the liver was harvested. GroupIR: The liver was harvested after IR following abdominal median laparotomy. GroupIRD: The liver was harvested after IR following abdominal median laparotomy and 30 min of infusion of dexmedetomidine 100μg/kg ip. All rats were euthanized after sampling intraabdominal blood. Erythrocyte packages were prepared from heparinized whole blood samples. Deformability measurements were performed in erythrocyte suspensions prepared as containing Htc 5% in PBS buffer. . Malondialdehyde(MDA) and superoxide dismutase(SOD) activity were studied by using upper phase obtained by centrifuging.

Results and Discussion: An increase of relative resistance which is the indicator of red blood cell deformability was detected in rats applied to IR. Deformability index was similar in GroupC and GroupIRD (p=0574). It was significantly increased in Group IR when compared to GroupC and IRD (p=0.005,p=0.028). MDA activity was higher in GroupIR when compared to Group C and IRD (p=0.027,p=0.011). . SOD activity was significantly increased in GroupIR when compared to Group C (p=0.029).
Conclusion(s): Erythrocyte deformability was damaged in rats having IR injury and this might be because of increased lipid peroxidation of erythrocyte. MDA accumulation as a result of lipid peroxidation in erythrocytes may cause deterioration of deformability of erythrocytes and rapidly aging in erythrocytes. So measurement of erythrocyte deformability might be useful in follow-up of IR injury as a parameter. It was shown that dexmedetomidine may be useful in decreasing the adverse effects of this injury. However these findings should be supported by detailed clinical and experimental studies.

9AP6-8

Effect of esmolol on propofol consumption in patients undergoing craniotomy

Asouhidou I., Samaras A., Katsaridis V., Ioannou P.
‚G.Papanikolaou', Department of Anaesthesiology, Thessaloniki, Greece

Background and Goal of Study: Propofol is an appropriate component for total intravenous neuroanesthesia but it is not the ideal agent in obese patients because of the risk of delayed awakening. In these cases sevoflurane is preferable, which however provoke vasodilation and impair cerebral autoregulation. Esmolol an ultra-short-acting b_1-adrenergic receptor antagonist that is effective in blunting sympathetic overdrive to several perioperative stimuli, is reported that enhances the analgesic effect of opioids but has no analgesic effect when administered alone. This study aims to reveal the effect of esmolol on propofol consumption in patients undergoing craniotomy.
Materials and Methods: Sixteen patients undergoing elective craniotomy for tumor resection or aneurysm clipping were randomly divided in two groups of eight patients each; control and esmolol group. General anesthesia was induced with propofol (2mg/Kg), fentanyl (2mcg/Kg) and cis-atracurium (0.15mg/Kg). Anesthesia was maintained with remifentanil and propofol in 50% O_2/N_2O in order to maintain BIS 40-50. Patients in the esmolol group received 500mcg/Kg esmolol followed by continuous infusion of 200mcg/Kg/min.
Results and Discussion: At the esmolol group propofol was started at 50mcg/kg/min just after the intubation and it was adjusted perioperative according to BIS at 18-35mcg/kg/min (25.83±9.32), while at the control group was started at 100-150mcg/Kg/min with no significant changes in the anesthetic requirements through the procedure. None of the patients presented any hemodynamic instability due to esmolol.
Conclusion(s): Intraoperatively infusion of esmolol not only managed to control the sympathetic overdrive, but also diminished propofol consumption, resulting in early and smooth emergence. One explanation may be a central antinociceptive effect of b-adrenoceptor block.
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9AP7-1

Effect of sevoflurane on calcium homeostasis during depolarization in human skeletal myotubes

Migita T., Mukaida K., Hamada H., Ichihara Y., Kikuchi H., Kawamoto M.
Hiroshima University Hospital, Department of Anaesthesiology, Hiroshima, Japan

Background and Goal of Study: Volatile anesthetics and depolarizing muscle blocking agents are potential triggers for Malignant Hyperthermia (MH). The goal of this study is clarify the effect of sevoflurane combined with depolarizing muscle blocking agents on calcium homeostasis in human skeletal myotubes.
Materials and Methods: Fourteen subjects whose skeletal muscles were biopsied were classified into MH-prone group (n=8) and non-MH prone group (n=6). Differentiated myotubes were labeled with the calcium-sensitive probe Fura-2 AM, and the changes in the 340/380 nm ratio were used to calculate the changes in intracellular Ca^{2+} concentration ($[Ca^{2+}]_i$) following 1 minute treatment with 1 mM sevoflurane and 60 mM KCl, that was used to depolarize the myotubes. Next, in MH prone group, similar procedure was done by removing extracellular Ca^{2+} or adding 20 μM SKF 96365.
Data are shown as mean ± SD. Unpaired t-test was used for the group comparisons and *P* values less than 0.05 were considered to be statistically significant.
Results and Discussion: Sevoflurane during KCl depolarization increased $[Ca^{2+}]_i$ to 166.5 ± 63.9% of sevoflurane-free condition in MH-prone group and to 103.8 ± 9.9% in non-MH prone group (*P*= 0.028), respectively. In MH-prone group, sevoflurane extended the total response time of the Ca^{2+} transient without any change on the peak amplitude.
By removing extracellular Ca^{2+} or adding SFK 96365 to Ca^{2+} buffer, sevoflurane-induced Ca^{2+} transient during KCl depolarization was reduced to 37.6 ± 14.2% and 41.5 ± 16.2% of the control, respectively. Similarly, sevoflurane-induced Ca^{2+} transient without KCl was reduced to 38.8 ± 18.6% and 43.3 ± 29.3% of the control, respectively.
The prolonged increase in $[Ca^{2+}]_i$ was shown in existence of sevoflurane during KCl depolarization, and the response diminished in the same degree by removing extracellular Ca^{2+} and adding SFK 96365. As SKF 96365 inhibited stromal interaction molecule 1 (STIM1)-mediated Ca^{2+} influx, store-operated calcium entry (SOCE) may contribute the increase of $[Ca^{2+}]_i$.
Conclusion(s): Clinical concentration of sevoflurane during KCl depolarization prolonged increase in $[Ca^{2+}]_i$ of human skeletal muscle. The combination of sevoflurane and depolarizing muscle blocking agents may increase risk of triggering MH.
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9AP7-3

Mutated p.4894 RYR1 function related to malignant hyperthermia and congenital neuromuscular disease with uniform type 1 fiber (CNMDU1)

Haraki T., Yasuda T., Mukaida K., Migita T., Hamada H., Kawamoto M.
Hiroshima University, Department of Anaesthesiology and Intensive Care, Hiroshima, Japan

Background and Goal of Study: Ryanodine receptor 1 (RYR1) is a Ca^{2+}-release channel located in the sarcoplasmic membrane of skeletal muscle. More than 200 mutations in RYR1 have been identified, and shown to be associated with malignant hyperthermia (MH) and congenital myopathies. The A4894T RYR1 mutation was found in a Japanese patient with susceptibility to MH, and the A4894P mutation in a rare case of myopathy: congenital neuromuscular disease with uniform type 1 fiber (CNMDU1). We hypothesized that the different A4894 mutants of RYR1 cause different pathophysiological changes.
Materials and Methods: Mutated RYR1 expression vector corresponding to A4894T or A4894P mutation was transfected into human embryonic kidney (HEK)-293 cells. At 72 hours after transfection, the cells were loaded with Fura-2 AM for 1 hour. Next, the cells were excited alternately at 340 and 380 nm, and the fluorescence emissions of Fura-2 were observed at 510 nm to evaluate the intracellular Ca^{2+} changes. We determined the intracellular Ca^{2+} changes induced by caffeine or 4-chloro-m-cresol (4CmC).
Results and Discussion: Wild type (WT) and A4894T-transfected cells were sensitive to caffeine and 4CmC. The EC50 values of WT and A4894T-transfected cells for caffeine were 1.38 ± 0.10 (mean ± SD) and 0.52 ± 0.04 mM respectively, and for 4CmC were 176.6 ± 9.0 and 77.9 ± 8.6 mM, respectively. The values of A4894T were lower than that of WT (P< 0.001). These results indicate that A4894T mutant is associated with MH.On the other hand, A4894P-transfected cells were insensitive to caffeine and 4CmC. The insensitivity of RYR1 leads to reduction of Ca^{2+} release from SR to cytoplasm and consequently causes muscle weakness, suggesting that the A4894P mutation is associated with CNMDU1. This is the first known functional analysis of the RYR1 mutation in CNMDU1.
Conclusion(s): We concluded that different A4894 mutants of RYR1 lead to different functions of RYR1, and the A4894T mutation in RYR1 is associated with MH and the A4894P with CNMDU1.
Acknowledgements: We appreciate Professor David H. MacLennan for the generous gift of Rabbit-RYR1/pc DNA.

9AP7-4

Mannitol: A survey of its practice in partial and live donor nephrectomy

Sabaté S., Breda A., Vernetta D., Alvarez A., Hernando S.
Fundació Puigvert (IUNA), Department of Anaesthesiology, Barcelona, Spain

Background and Goal of Study: Mannitol is frequently used as a kidney protector during warm ischemia time during partial and live donor nephrectomy

due to diuretic, anti-oxidant and anti-inflammatory properties. Despite this, a prospective study on the effects of Mannitol as a kidney protector has never been performed. The aim of this study is to document the trend in Mannitol use during partial and live donor nephrectomy.
Materials and Methods: A survey on the use of Mannitol during partial and live donor nephrectomy was sent by email to 110 high surgical volume urological centers around the world. Questions specifically related to Mannitol use included: Use of Mannitol in partial and or donor nephrectomy, indications for Mannitol use, physician in charge for Mannitol administration, dosage, timing, and usage of other type of kidney protectors.
Results and Discussion: We obtained a feedback from 47 centers (42.7%). 47/47 (100%) and 17/47 (36%) performed partial and live donor nephrectomy respectively. Mannitol was used in 78.7% and 64.7% of centers performing partial and live donor nephrectomy respectively. The indication for Mannitol use was as anti-Oxidant (20.5%), as diuretic (5.2%) and as a combination of the two (74.3%). Mannitol administration was in charge of the urologist in 53.8% of the cases, anesthesiologist in 30.7% of the cases and both in 12.8%. In case of partial nephrectomy dosages included 12.5 gr in 29.7% of the cases, 25gr in 48.6% and different dosages in 21.7% of the cases. As far as timing for administration Mannitol was administered before clamping in 75.6% of the cases, after clamping in 5.4% and before clamping and at reperfusion in 19% of the cases. In case of live donor nephrectomy it was administered at dosages of 12.5 gr in 36.3% of the cases, and 25 gr in 63.7%. The timing for administration was before clamping in all cases. Overall, 83% (N=39) of the centers utilized Mannitol. Of the centers not using Mannitol, two utilized Furosemide as kidney protector instead of Mannitol.
Conclusion(s): Two important conclusions can be highlighted from this survey. First, the majority of the centers performing high volume partial and live donor nephrectomy prefer to use Mannitol as a kidney protector. Second, it appears that there are neither unified criteria nor standardization for Mannitol indication and usage. The hope is in that this survey will serve as the baseline for a well designed randomized prospective study.

9AP7-5

Effects of dantrolene on calcium homeostasis in cultured myotubes from individuals with predisposition to malignant hyperthermia

Mukaida K., Migita T., Haraki T., Yasuda T., Hamada H., Kawamoto M.
Hiroshima Prefecture Rehabilitation Center, Department of Anaesthesiology, Higashi-Hiroshima, Japan

Background and Goal of Study: Dantrolene (Dan) is effective for treating malignant hyperthermia (MH) caused by increased Ca^{2+} release from the sarcoplasmic reticulum (SR) through ryanodine receptor 1 (RYR1). Dan and its analog are reported to reduce myoplasmic Ca^{2+} concentrations ($[Ca^{2+}]i$)[1)] and inhibit store-operated Ca^{2+} entry (SOCE) [2)]. This study aimed to investigate the effects of Dan in cultured myotubes from MH-predisposed individuals with accelerated Ca-induced Ca release (CICR).
Materials and Methods: In 19 individuals, we measured the CICR rates in skinned fibres and $[Ca^{2+}]i$ in each myotube by using the fluorescent calcium indicator fura-2. We classified them into 3 groups;aCICR/High (accelerated CICR with high resting $[Ca^{2+}]i$), aCICR/Normal (aCICR with normal resting $[Ca^{2+}]i$), and nCICR/Normal (normal CICR with normal resting $[Ca^{2+}]i$) group. The effects of Dan on $[Ca^{2+}]i$, RYR1-dependent (caffeine-induced) $[Ca^{2+}]i$ transients, and extracellular Ca^{2+} entry in myotubes were assessed. An analysis of variance and Tukey's test were used.

CICR rate/resting $[Ca^{2+}]i$	aCICR/High	aCICR/ Normal	nCICR/ Normal	p value
n	6	6	7	
Resting $[Ca^{2+}]i$(nM)	109.1±4.7	76.9±4.7	67.1±1.6	<0.0001
Half maximal effective concentration for caffeine (mM)	2.26±0.19	2.73±0.23	5.23±0.28	<0.0001
Decreased $[Ca^{2+}]i$ (nM)*	28.7±3.1	20.0±1.8	16.7±1.9	0.006
Percent response to 10 mM caffeine*#	160.3±10.69	87.6±3.3	94.2±10.7	<0.0001

[Parameters for [Ca2+]i]

Results and Discussion: After Dan 50 μM treatment for 2 min, the $[Ca^{2+}]i$ in the aCICR/High group significantly reduced, and the percent response to 10 mM caffeine significantly increased (Table 1). However, applying 50 μM Dan for 15 min significantly attenuated the percent response to 10 mM caffeine in all groups. Treatment with 10 mM caffeine in Ca^{2+}-free external buffer depleted SR Ca^{2+} content. Applying 2.5 mM Ca^{2+}-containing external buffer triggered SOCE and increased $[Ca^{2+}]i$. Dan 50 μM reduced the increase in the rate of $[Ca^{2+}]i$ to 51.3% in the aCICR/High group. The inhibitory effect of Dan on SOCE may contribute to reversing an MH crisis involving elevated $[Ca^{2+}]i$ and reduced SR Ca^{2+}content.
Values are mean±SE. * Effects of Dan 50 μM for 2 min., # The control was considered to have 100%.
Conclusion(s): The effects of Dan on myotubes may influence some modes, suppression of the resting $[Ca^{2+}]i$, RYR1-dependent $[Ca^{2+}]i$ elevation and Ca^{2+} entry.
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9AP7-6

Ulinastatin suppresses lipopolysaccharide-induced cyclooxygenase-2 and inducible nitric oxide synthase through the nuclear factor-κB inactivation in mouse BV2 microglial cells

Chung J.-Y., Park S.-W., Yi J.-W.
College of Medicine, Kyung Hee University, Department of Anaesthesiology and Pain Medicine, Seoul, Korea, Republic of

Background and Goal of Study: Ulinastatin is an intrinsic serine-protease urinary trypsin inhibitor that can be extracted and purified from human urine. Urinary trypsin inhibitors are widely used to treat patients with acute inflammatory disorders such as shock and pancreatitis. And it can be used to reduce blood loss during operation. However, although the anti-inflammatory activities of urinary trypsin inhibitors have been studied, their underlying mechanisms are not yet fully understood.
Materials and Methods: In the present study, we evaluated the effect of ulinastatin on lipopolysaccharide (LPS)-induced inflammation using mouse BV2 microglial cells. To accomplish this, we performed a 3-(4,5-dimethylthiazol-2-yl)-2,5-diphenyltetrazolium bromide (MTT) assay, reverse transcription-polymerase chain reaction (RT-PCR), Western blot, an electrophoretic mobility gel shift assay (EMSA), nitric oxide (NO) detection, and a prostaglandin E_2 (PGE_2) immunoassay in mouse BV2 microglial cells.
Results and Discussion: The results of the present study revealed that ulinastatin suppressed PGE_2 synthesis and NO production by inhibiting the LPS-induced expression of cyclooxygenase-2 (COX-2) and inducible nitric oxide synthase (iNOS) mRNA and protein in mouse BV2 microglial cells. Furthermore, ulinastatin suppressed the activation of nuclear factor-κB (NF-κB) levels in the nucleus.
Conclusion(s): These findings demonstrate that ulinastatin has analgesic and anti-inflammatory effects that likely occur via suppression of the expression of COX-2 and iNOS through down-regulation of NF-κB activity.
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9AP7-7

The effects of dexketoprofen trometamol on incisional wound healing in a rat model

Büyükfidan D., Bilimgut B., Tekeli A., Take G., Ceyhan A., Erdoğan D.
Ministry of Health Ankara Training&Research Hospital, Department of Anaesthesiology, Ankara, Turkey

Background and Goal of Study: The drugs used to provide postoperative analgesia are desired to have minimal adverse effects. There are evidences that nonsteroidal anti-inflammatory drugs (NSAIDs) delay both epithelialisation and angiogenesis in the early phases of wound healing due to an antiproliferative effect. We aimed to investigate the effects of dexketoprofen trometamol, a nonselective NSAID, on incisional wound healing in this experimental study.
Materials and Methods: 2-cm subcutaneous incision from lateral side of the distal femur was made and closed in 40 adult female Wistar albino rats. Rats were divided into 4 groups: Group DI was given 8 mg/kg/day dexketoprofen trometamol intraperitoenally (ip) and Group CI was given equivalent volume of saline ip twice a day for 5 days; Group DII was given 8 mg/kg/day dexketoprofen trometamol ip whereas Group CII was given equivalent volume of saline ip twice a day for 10 days. 2 cm^2 of wound tissue was removed from Group DI and Group CI in order to evaluate early phase of wound healing on the 5th postoperative day. To determine the late-term findings, same size of wound tissue was removed from Group DII and Group CII on the 10th postoperative day. Actin, anti-FGF and collagen parameters were assessed histologically. Epidermal thickness were measured in the 4 mm serial sections and counts

were held digitally in Q Leica vin 3 program. Kruskal-Wallis test was used for statistical analysis.
Results and Discussion: Epidermal thickness was significantly higher in Group DI than the other groups (Group CI=55.4, Group DI=130.1, Grup CII=44.5, Group DII=40.7; p< 0.0001; DF=3). Actin (+) cells were found to be more intense and anti-FGF (+) cells were less intense in Group DI and Group DII. Collagen organization was also disrupted in both of these groups. It is desired that the drugs used for postoperative analgesia have no negative impact on wound healing. In this study we showed that epithelialisation, contraction and angiogenesis were more advanced in groups which dexketoprofen was used but collagenation was negatively affected. Although dexketoprofen caused disruption in collagen organization in this study, it improved and accelerated wound healing. These findings are discordant with the results of previous studies investigating the effects of many other NSAIDs on wound healing.
Conclusion(s): Dexketoprofen trometamol can be used safely for postoperative analgesia in surgical patients.

9AP7-9

Sevoflurane administration effect on MAPK pathways activation in a lung- autotransplant model

Sanchez G., González FJ., Simon C., Vara E., Garutti I., Olmedilla L.
Hospital General Universitario Gregorio Marañon, Department of Anaesthesiology and Intensive Care, Madrid, Spain

Background and Goal of Study: Activation of MAPKinase pathways (ERK, JNK and p38), have been postulated to be involved in ischemia-reperfusion induced lung injury (IRLI). Lung injury has been associated with increases in phosphorylated MAPK p38, JNK and ERK levels[1]. On the other hand Sevoflurane has proved to be protective over IRI in myocardial [2]and liver tissue, and in previous research our team has proved that sevoflurane decreases the inflammatory response and oxydative stress mediators like lipid hydroperoxides(LPO) in the IRLI. The aim of this study was to determine whether this protective effect of sevoflurane on lung tissue is associated with an effect on MAPK pathways activation.
Materials and Methods: 20 large-white pigs 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 3% (sevo group n=10) or propofol 10 mg/Kg/h (control group n=10) 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 clamping), 2) 5 min pre-reperfusion and 3) 30 min post-reperfusion, in order to measure levels of LPO and mitogen-activated protein kinases (MAPKs) p38, ERK and JNK using ELISA test. Non-parametric test has been used to find statically significant differences.
Results and Discussion: Data (Mean ± SE) are shown in the table.

	Group	Prepneu-monectomy	Prereperfusion	30min postreper-fusion
LPO mmol/mg	CONTROL	2,61±0,07	3,61±0,05†	3,88±0,06†
LPO mmol/mg	SEVO	2,65±0,11	3,06±0,09*	3,17±0,11*
MAPK-38-P ng/mg	CONTROL	16,52±5,8	95,09±22,6†	104,5±6,82†
MAPK-38-P ng/mg	SEVO	17,49±4,6	94,11±16,11	72,65±11,16*
JNK-P ng/mg	CONTROL	2,388±0,32	2,624±0,23	1,58±0,16‡
JNK-P ng/mg	SEVO	1,97±0,16	1,78±0,29*	1,52±0,21
ERK-P ng/mg	CONTROL	4,114±0,38	4,06±0,34	4,66±0,4
ERK-P ng/mg	SEVO	2,65±0,39*	2,17±0,5*	3,42±0,69

[Table 1]

Table 1: *p< 0.05 vs Control group. † p< 0.05 vs PrePneumonectomy. ‡ p< 0.05 vs 30min PostReperfusion.

Conclusions: Sevoflurane use has demonstrated to diminish oxydative stress mediators and possibly IRLI and this is associated with a decrease in MAPK pathways activation.
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9AP8-1

The evaluation of effects of lornoxicam on blood flow and erythrocythe deformability in comparison with paracetamol in rats

Arslan M., Çomu FM., Işık B., Ataç M.S., Yılmaz D.
Gazi University Faculty of Dentistry, Department of Oral and Maxillofacial Surgery, Ankara, Turkey

Background and Goal of Study: Lornoxicam and paracetamol are preferred for postoperative analgesia with common usage. Although Aspirin is a well known non steroid anti-inflammatory drug that decreases the erythrocyte deformability; a comparative study between lornoxicam and paracetamol regarding to their effects on erythrocyte deformability does not exist in the literature.
The aim of this study was to compare the effects of lornoxicam and paracetamol on blood perfusion and erythrocyte deformability on rats.
Materials and Methods: 20 male Wistar Albino rats were randomly divided in to three groups as lornoxicam group (Group L), paracetamol group (Group P), and control group (Group C). Intraperitoneal administrations were done in all groups except Group C. Liver and renal blood flows were conducted by laser Doppler and the euthanasia via intraabdominal blood uptake was performed. Erythrocyte deformability was measured using a constant flow filtrometer system (MP 30, Biopac Systems Inc, Commat, USA). Erythrocyte packets were prepared from heparinized plasma. Erythrocyte deformability was measured using erythrocyte suspensions at 5% hematocrit in phosphate buffered saline tamponade. The SPSS 12.0 program (Chicago, IL, USA) was used for statistical analyses.
Results and Discussion: Lornoxicam increased the relative resistance which shows the erythrocyte deformability of rats (p< 0.05). Comparison of Group C and Group P revealed no statistically different results (p=0.731) where Group L revealed statistically higher results than Group C. No statistically significant differences were found between groups L and P (p=0.073). Liver and renal blood flow values in Group L was just numerically decreased not statistically whilst no statistically significant difference was found between three groups
Conclusion(s): We believe that lornoxicam may lead functional disorders related to tissue perfusion as a result of both decreased blood flow and erythrocyte deformability. Further studies regarding these issues are thought to be essential.
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9AP8-2

In vitro separation of Intralipid emulsion into lipid rich supernatant and a lipid poor sediment by addition of heparin: A potential method of determining the effect of Intralipid administration on lipophilic free drug concentrations

Willers J., Uncles D.R., Samuels T.L., Papadopoulou A., Short S., WEARSAS (Worthing Education and Research Staff and Associate Specialist) Study Group
Worthing Hospital, Department of Anaesthesiology and Intensive Care, Worthing, United Kingdom

Background and Goal of Study: Intralipid (IL), a fat emulsion in which phospholipid surfactants aid suspension of lipid nanoparticles was originally developed for parenteral nutrition. Recently IL has been proposed as a treatment of lipophilic drug toxicity. Unfortunately the emulsion formulation makes analysis of toxic drug levels difficult without resorting to specialised techniques such as ultrafiltration and equilibrium dialysis or immobilized liposome electrokinetic capillary chromatography. We investigated the simple modification of emulsion characteristics of IL to promote flocculation with separation from the aqueous portion allowing it (and potentially substances contained therein) to be analysed using simple lab-tests.
Materials and Methods: Firstly the dose of heparin required to achieve consistent flocculation of a 2% solution of IL was determined. Thereafter this dose was added to suspensions of 0.5%, 1.5%, 2.5%, 3.5% and 4.5% IL and mixed. After flocculation, the sediment was drained and triglyceride levels (SedTGR) determined in this fraction. Controls were prepared by adding an equal volume of water instead of heparin to burettes containing identical volumes and concentrations of IL. Triglyceride levels (ConTGR) were determined in these controls. Percentage flocculation was calculated by dividing {ConTGR-SedTGR} by ConTGR.

Results and Discussion: Flocculation with a definite lipid supernatant occurred at a heparin conc^{n} threshold >1500 u/ml.
Therefore a heparin conc^{n} of 2000u/ml was used for the remainder of the study. A distinct lipid supernatant occurred in all heparinised tubes at all IL concentrations but not in the controls. This produced a mean IL flocculation value of 50.06% (s.d. 4.67, Kruskal Wallis rank sum test $p > 0.05$). The charged heparin molecule is known to interfere with the electrochemical forces responsible for maintaining IL as an emulsion. Once a threshold heparin conc^{n} is present the degree of IL flocculation appeared consistent and reproducible at a wide range of IL concentrations.
Conclusion: In our model addition of heparin to Intralipid causes significant flocculation resulting in the removal of half the triglyceride load.
This may facilitate analysis of unsequestered lipophilic drug concentrations using conventional lab-tests which can be useful in determining the effectiveness of the deployment of Intralipid in the treatment of lipophilic drug overdose.
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9AP8-3

To dye or not to dye

Tripathy S., Nair P.V.
Walton Centre of Neurosciences, Department of Anaesthesiology and Intensive Care, Liverpool, United Kingdom

Background: Patent blue V dye(PBV) is used at our neurosciences centre to pre mark vertebral levels (under X-ray guidance in the radiology department) prior to microdiscectomy and laminectomy procedures. PBV has received attention recently for causing adverse reactions, when used for lymphangiography, in the NEW START and ALMANAC trials. The aim of this study was to analyse the incidence, severity, outcome and management of adverse events related to the dye in a perianaesthesia setting.
Methods: Data was collected retrospectively from the institutes' radiology adverse events reporting network.Between 2008- 2010 a total of 1247 patients were premarked of whom 11 developed hypersensitivity. Their case notes were analysed and data on the severity of the reaction, time interval from injection to onset of reaction, clinical intervention, anaesthetic implications and follow up of the affected patients collected.
Results: Eleven of the 1247 patients (0.88%) developed an adverse reaction. Six patients had minor grade I reactions (urticaria, blue hives, pruritis,rash) while 4 had grade II reactions (transient hypotension, bronchospasm, laryngospasm). Grade III reaction (hypotension requiring prolonged vasopressor support) was noted in 1 patient. The time of onset ranged from 10-30 minutes. Five of the 11(63.6%) cases were cancelled or postponed (range 6 - 63 days) with three being grade I reactions.
Nine of the reactions manifested in the preoperative ward and 2 (grade I) occurred in theatre, post induction of anaesthesia. These two cases were referred to the anaesthetic anaphylactic clinic. One being elective was cancelled the other an emergency procedure went ahead. Clinical interventions ranged from intravenous fluids only to intravenous adrenaline (2 patients with type 1 reaction receiving intravenous adrenaline).
Nine of the 11 patients received hydrocortisone and chlorpheniramine. Follow up with referral to the regional allergy clinic as per Association of Anaesthesia guidelines were completed in 3 patients.
Conclusion: The incidence and severity of adverse reaction following use of PBV is similar to that seen in larger trials. Greater awareness of the timing and severity of reactions would help in better management, minimising inappropriate interventions and cancellation.
We suggest a time interval of at least 30 minutes from dye injection to induction of anaesthesia to minimise the confusion as to cause of the reaction- anaesthetic drugs versus PBV.

9AP8-4

The effect of site of intramuscular administration of anaesthetic drugs on the course of immobilisation in macaque monkeys (Macaca mulatta): Deltoid versus gluteus muscle

Hess L., Malek J., Kurzova A., Votava M., VG20102015041
Institute for Clinical and Experimental Medicine, Department of Anaesthesiology, Praha, Czech Republic

Background and Goal of Study: Intramuscular administration of drugs is used in anaesthetic practice as well as in pre-hospital treatment of burned patients or disaster victims. In humans a gluteus muscle is the preferred site of injection, but the time to onset and quality of effect may vary substantially (1). The aim of our study was to assess if there is a difference in the course of immobilisation between administration of anaesthetic drugs to a deltoid or a gluteus muscles in macaque monkeys.
Materials and Methods: Behavioural changes, loss of aggressiveness, immobilisation time and cardiorespiratory changes in 20 rhesus monkeys given medetomidine (25 $\mu g.kg^{-1}$) and ketamine (3 $mg.kg^{-1}$) intramuscularly to the deltoid (MD, 10 animals) or gluteus (MG, 10 animals) muscles were recorded. The effect was reversed after 20 min. by atipamezol 250 $\mu g.kg^{-1}$ IM. Data analysis: The cardiorespiratory parameters were evaluated using the two-way repeated measures ANOVA with a post hoc Student-Newman- Keuls t-test. All statistical tests used a two-tailed criterion, with a significance level of $P < 0.05$.
Results: There were highly significant differences between groups MD and MG in onset of effect (71.3 s (SD=11.7) vs. 108.3 s (SD=51.5), $p< 0.001$ and immobilisation time 152.7 s (SD=95.6) vs. 254.4 s (SD=85.0), $p< 0.001$. In the MG group, grasp reflex was still present at the beginning of immobilisation and slowly ceased in 15 - 45 sec. The same was valid for muscle tone. There were no differences in cardiorespiratory parameters. Animals of both groups recovered in average 33 s after atipamezole administration.
Discussion: Studies examining the differences between various sites of injections are rare and their results are conflicting (1-3). Our results demonstrate that the site of intramuscular administration is important for both the onset and quality of effect.
Conclusion(s): Administration of drugs to a deltoid muscle results in more rapid onset and increased effect than administration to a gluteus muscle.
The study was supported by a scientific grant VG20102015041
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9AP8-5

Fenoldopam vs dopamine: "Renal protection" in major urologic surgery

Marra A., Vargas M., Paduano F, Gervasio A., Servillo G.
University of Naples, Department of Anaesthesiology and Intensive Care, Naples, Italy

Introduction: In some urological surgical techniques, associated with a worsening of renal function, particularly nephrectomy, for the period of clamping the renal artery and the resulting ischemia, nephroprotective strategies are needed. Fenoldopam role like renal protector agent, has already been proposed, in different situations in which is possible a kidney injury, like vascular and heart surgery.
Our first endpoint was to evaluate the validity of Fenoldopam like renal protection, in major urologic surgery, versus dopamine and other common used drugs (furosemide, etc.).Second endpoint was to test the onset of side effects.
Methods: We included 60 patients undergoing to nephrectomy.
Patients were randomly assigned to 3 groups. To 20 patients was administred continuous infusion of fenoldopam (0,4 ml/h) during surgery and for the following 48 hours, with an elastomeric pump (0,1 mcg/kg/min) (group F); 20 received continuous intravenous infusion of dopamine (1-5 mcg/kg/min) during surgery (group D);20 didn't received any of the two treatment during surgery (group N).
Results: For none of 20 patients of group F has been necessary to interrupt the infusion of fenoldopam for the onset of side effects. No patients of group F required hemodialysis in the prompt postsurgery period, or in 30 following days. Diuresis remained valid in all patients of group F during the day of surgery and for the following two days. The mean of diuresis of 48 h was 2200 ± 340 for patients of F group, 1650 ± 250 in D group and 1250 ± 170 in N group. The values of creatinine were 1,9 ± 0,4 in F group, 2,1± 0,7 in D group, potassium was 4,3 ± 1,3 in F group, 4,6 ±1,8 in D group. The values of urea were 36± 12 in F group, 37 ± 16 in D group, 37 ± 18 in N group. (Table1).
Conclusion: The use of fenoldopam, in major urological surgery, has proved safe and effective in preventing renal injury. A large multiple-center trial is needed to confirm these findings.

	GROUP F	GROPU D	GROUP F
Creatinine (mg/dl)	1,9 ± 0,4	2,1 ± 0,7	2,0 ± 0,9
Urea (mg/dl)	36 ± 12	37 ± 16	37 ± 18
Potassium (mEq/L)	4,3 ± 1,3	4,6 ± 1,8	4,6 ± 1,9
Diuresis (ml/24 h)	2200 ± 340	1650 ± 250	1250 ± 170
Diuretic	1	7	15
Hemodialysis	1	3	3

[Monitoring of renal function in study participants]

9AP8-6

Pharmacological interaction of anticancer drug cisplatin and inhalation anaesthetics

Brozovic G., Orsolic N., Sakic K.
Clinical Hospital Sveti Duh, Department of Anaesthesiology and Intensive Care, Zagreb, Croatia

Background and Goal of Study: The metabolism of inhalation anaesthetics takes place mainly in liver and to a lesser extends in the kidney and lungs. The liver is expected not only to perform physiological functions but also to protect against the hazards of harmful drugs and chemicals. In this study we investigated the pharmacological interactions of cisplatin and anaesthetics (halotane, sevoflurane or isoflurane). We investigated whether the repeated dose of inhalation anaesthetics and cisplatin might enhance cisplatin genotoxicity/cytotoxicity to kidney and liver cells in mice-bearing Echrlich ascites tumours (EAT).
Materials and Methods: Mice were divided into eight experimental groups comprised of 10 EAT bearing mice. $2{\cdot}10^6$ EAT cells were injected intraperitoneally (ip). Cisplatin was injected ip at dose of 5 mg kg^{-1} started on third day after tumour cell inoculation and mice were immediately exposed to inhalation anaesthetic two hours daily for three consecutive days. Anaesthesia was maintained with sevoflurane (2.4 vol%), halothane (1.5 vol%) or isoflurane (1.7 vol%) in oxygen/air mixture. We analyzed: comet assay of liver and kidney cells and haematological and biochemical parameters in peripheral blood.
Results and Discussion: Genotoxic effects of inhalation anaesthetics on the liver cells of mice - bearing EAT is as follows: halothane>isoflurane>sevoflurane. The combination of cisplatin and halothane caused the strongest DNA damage of liver cells. Sevoflurane and isoflurane had stronger genotoxic effects on kidney cells than the halothane in mice-bearing tumour. The joint effect of cisplatin and inhaled anaesthetics increases genotoxic damage of kidney cells in comparison to the inhaled anaesthetics alone. Most of the liver enzymes were increased in all experimental groups compared with the control group. The biggest changes were observed in lactate dehydrogenase (LDH). LDH activity was twice higher in the experimental groups exposed to inhalation anaesthetic and cisplatin than in the control group or in groups with anaesthetics alone. Increased levels of urea and creatinine in the serum of experimental animals were an indicator of kidney damage.
Conclusion(s): Cisplatin in combination with halotane significantly increased DNA damage of liver while sevoflurane and isoflurane had stronger genotoxic effects on kidney cells. In addition, combined treatments reduce functional capacity of kidney and liver more than inhalation anaesthetics alone.

9AP8-7

The use of a heparin flocculation technique to determine the ability of Intralipid to sequester phenytoin at different concentration ranges of both drugs and the expression of this response by construction of a dose-response surface model

Willers J.W., Uncles D.R., Samuels T.L., Papadopoulou A., Short S., WEARSAS (Worthing Education and Research Staff and Associate Specialist) Study Group
Worthing Hospital, Department of Anaesthesiology and Intensive Care, Worthing, United Kingdom

Background and Goal of Study: Intralipid (IL) is increasingly being used to treat lipophilic drug overdoses by forming a "lipid sink" to sequester these drugs and decrease the amount of free drug available in the intravascular compartment. The determination of the amount of drug sequestered is difficult because of nature of the IL nanoparticle suspension which makes lab tests difficult to do. We have devised a method to separate IL suspensions into two distinct layers, a lipid rich supernatant and a lipid poor sediment. We used this technique to analyse the ability of IL to bind phenytoin in vitro.
Materials and Methods: Each of 5 burettes was primed with 8ml of phenytoin solution (0.5mg/ml). Volumes of 0.3ml, 0.9ml,1.5ml, 2.1ml, 2.7ml 20% IL were added (along with Hartmanns to ensure equal final volumes) to give IL concentrations of 0.5%, 1.5%, 2.5% ,3.5% & 4.5%. All were well mixed. After 20 min 1ml heparin (25000u/ml) was added and the burettes mixed again. Thereafter all specimens were left to flocculate for 4 hours. The sediment was then drained and phenytoin and triglyceride levels measured. This process was repeated with serial phenytoin dilutions until 1/16 th of the original $conc^n$ was reached and repeat drugs measurements obtained. Hence the amount of phenytoin removed by IL was calculated.
Results and Discussion: Space constraints prevent tabulation of the full set of results, however in this model IL consistently sequesters phenytoin with a greater sequestration percentage (in excess of 80%) especially with higher initial phenytion concentrations. This is in accord with other published work on lipid emulsion-drug binding [1]. Choice of IL volumes in this model represent equivalent clinical doses of 100, 300, 500, 700 & 900ml in a 75kg patient. Phenytoin is barely ionized (logP 2.52, logD(7.4) 2.49) and we would expect this model to apply over a wide metabolic range of pH values.
Construction of a dose-response surface model enables prediction of binding of any dose of phenytoin (ranging from clinical to toxicologically significant levels) with any dose of IL.
Conclusion: We have developed an in vitro model to analyse the ability of Intralipid to bind phenytoin which we have used to construct a dose-response surface model. This is the first stage in the development of a new measurement technique to explore the role of Intralipid for the treatment of lipophilic drug overdoses.
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9AP8-9

Iron core/shell nanomagnets as future therapeutic agents: Interactions with the vascular compartment

Herrmann I.K., Urner M., Grass R.N., Stark W.J., Beck-Schimmer B.
University Hospital Zurich, Department of Anaesthesiology, Zurich, Switzerland

Background and Goal of Study: Magnetic nanoparticles have attracted increasing interest as they might revolutionize current drug delivery and make cancer remission therapy more effective [1, 2]. Functionalized nanomagnets carrying different capturing agents (chelators, antibodies) may offer powerful future therapeutic tools in the treatment of sepsis (specific filtering of several cytokines or toxins), severe intoxications (digoxin, barbiturates), metabolic disorders (thyreotoxicosis, hyperfibrinogenemia and hyperlipoproteinemia) and autoimmune diseases (pathogenic autoantibodies or immune-complexes). Successful application strongly relies on a safe implementation that goes along with detailed knowledge of interactions and effects that nanomagnets might impart once entering the body. In this work, we put a particular focus on possible interactions of ultra-strong metal nanomagnets (~ 3 times higher in magnetization compared to oxide nanoparticles) within the vascular compartment.
Materials and Methods: Individual effects are addressed including interactions with the coagulation cascade, the complement system, phagocytes, and toxic or inflammatory reactions both by blood and endothelial cells in response to nanomagnet exposure using state-of-the-art technologies and assays.
Results and Discussion: We show that carbon coated metal nanomagnets (functionalizable to specificially remove small molecules like IL-6 or digoxin from whole blood) are well-tolerated by cells of the vascular compartment and have minor effects on blood coagulation. Additionally, no migration of effector cells was observed when exposing endothelial and blood cells to nanomagnets (chemotaxis).
Conclusion(s): Carbon encapsulated nanomagnets are highly attractive drug carriers for magnetic drug delivery due to strong magnetic properties and high stability. Their capability to selectively remove pathogens from whole blood raises tantalizing future therapeutic possibilities. Early identification of critical material properties helps to avoid costly late stage corrections and ultimately allows a safe implementation of a promising nanomaterial into therapeutic strategies.
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Paediatric Anaesthesia and Intensive Care

10AP1-1

Preoperative anxiety in children: Medical clowns vs oral midazolam

Gozal Y., Koteck A., Mimouni F.
Shaare Zedek Medical Center, Department of Anaesthesiology and Pain Medicine, Jerusalem, Israel

Background and Goal of Study: Preoperative anxiety is very common among children and can result in negative consequences.
The aim of the present study was to evaluate whether medical clowns and parental presence compare favorably with oral midazolam and parental presence in alleviating anxiety prior to surgery.
Methods: Forty children , aged 2 to 12 yr, undergoing a minor surgery under general anesthesia were enrolled in this study. Former premature babies and children with developmental delay were excluded from the study.
Parents were allowed to be with their children in the preoperative holding area and one of the parents was present in the operating room (OR) until after mask induction.
Patients were assigned to one of the two groups: Group C or group M. In group C a medical clown used different techniques aimed to distract the child from 15 min prior to induction. He stayed with the child until induction of anesthesia. In group M, the children were given 0.3 mg/kg of syrup midazolam 15 min prior to induction.
General anesthesia was induced with nitrous oxide in oxygen and sevoflurane. The children's anxiety level was assessed by a psychologist using the modified Yale Preoperative Anxiety Scale (m-YPAS) before intervention (baseline) and in the OR just prior to mask induction. A self-reportable questionnaire, the State-Trait Anxiety Inventory (STAI) was filled in by the parent accompanying the child to the OR before intervention and when he came out of the OR. Serum cortisol level was measured prior to surgery when an IV was put in.
Results: There was a significant increase from baseline in the m-YPAS score after intervention prior to mask induction in both groups: 40 ± 15 prior to intervention vs 59 ± 19 after intervention in group C , and 44 ± 14 vs 53 ± 18 respectively, in group M. However, the increase was larger in group C compared to group M: 48% vs 21%. The parent's anxiety, indicated by the STAI score was similar in both groups: 35 ± 9 and 37 ± 8 before and after inervention in group C, and 36 ± 7 and 41 ± 13 in group M. Serum cortisol levels were similar in the two groups: 11.4 ± 5.2 mcg% and 11.2 ± 5.7 mcg% in groups C and M, respectively. There was a larger proportion of parents (n=14) in group C who were very satisfied with the preoperative process compared to only 6 in group M.
Conclusion(s): Medical clowns and oral midazolam are acceptable interventions for decreasing the anxiety level of children undergoing minor surgery, and their parents.

10AP1-4

Continous quality improvement in a pediatric acute pain service (APS): An experience of 10 years

Rubio P., Notario R., de la Cruz J., Ruiz P.
12 de Octubre University Hospital, Department of Pediatric Anesthesiology, Madrid, Spain

Background and Goal of Study: Clinical guidelines and quality programs are considered as essential tools to enhance postoperative pain management. The aim is to present our quality indicators results for the last 10 years, using the PLAN-DO-CHECK-ACT (PDCA) cycle
Materials and Methods: In 2000, our pediatric APS defined 7 quality indicators and its standards, as a tool to assess outcomes in PDCA cycle framework methodology.
PLAN: To define quality indicators and measure them. To identify the surgeries associated to higher pain level, and the types of patients with higher secondary effects incidence.
DO: Implementation of multimodal analgesia treatments and/or to start new analgesia techniques in the identified surgeries. To start a prophylaxis protocol in patients>9 years. Nursing reeducation
CHECK:Reassessment of quality indicators, search out bias
ACT: To validate analgesia and prophylaxix protocols.
To restart a new PDCA cycle
Results and Discussion: Our APS has realized 4016 analgesic treatments in 10 years. The continous evaluation of outcomes in our patients has provided feedback to the benefits and weaknesses of our model. The use of same tools in every regular audit avoided missing relevant information, such as 2010 higher levels of severe pain. This data could have been lost considering the improved results obtained in the satisfaction quality indicators

	2004	2007	2010
% patients with severe pain	3	1.2	2.2
% patients with moderate pain	26	19	14
% patients with antiemetic treatment	11	4.4	4.5
% patients with pruritus	2.3	1.4	1.2
% patients with urinary retention	2	1.2	0.8
% patients very satisfied	57	57	60.5
% parents very satisfied	62	62	66

[Quality indicators / years]

Conclusion(s): An APS implementation needs a balance between analgesia and secondary effects. Regular audits and quality tools should be introduced in every APS to provide improvement overtime.

10AP1-5

Perioperative anxiety management in paediatric anaesthesia

Sánchez Hernández A., Soliveres J., Hernández M.J., Balaguer J., Estruch M., Solaz C.
Hospital Universitario Doctor Peset, Department of Anaesthesiology and Intensive Care, Valencia, Spain

Background and Goal of Study: Induction of anaesthesia can be distressing for parents and children. Parental presence at anaesthesia induction has been previously investigated but the few studies analyzed show contradictory results in anxiety and children cooperation improvement.
The aim of this randomized controlled trial is to evaluate the impact of parental presence during induction of anaesthesia on parent and children anxiety during the perioperative period, children's behavioral compliance during inhaled induction of anesthesia, and children's postoperative behaviour.
Materials and Methods: After local ethics committee approval, written informed consent was obtained from the parents of 30 ASA I pediatric patients scheduled for tonsillectomy.
Those with previous surgery were excluded. Patients were randomly allocated to two groups: one with the presence of a children's parent during induction of anesthesia (P) or control (C).
The State Trait Anxiety Inventory (STAI) is a parental self-report measuring state and trait anxiety. The form is filled in the waiting area (baseline and moment 1), after separation (C) or just before entering the operating room (P) (moment 2), during induction of anaesthesia (moment 3), and in the postanesthetic care unit.
Modified Yale Preoperative Anxiety Scale (mYPAS) measures children's anxiety in the same moments: preoperative holding area, entering the operating theatre and induction. mYPAS>40 was considered as anxious.
Induction Compliance Checklist (ICC) represents the negative behaviors present during induction; ICC≥4 was considered poor behavioural compliance.
Children's behaviour in the postanesthetic care unit (PACU) was assessed using a 5-point scale: child sleeping, awake and calm, crying, inconsolable crying and disorientation.
Student's t test, Mann Withney U test or Chi square were used as appropiate. A p< 0,05 was considered significant.
Results: See tables. No children was withdrawn. All were ASA I. All surgeries were tonsillectomies. Groups did not differ in demographic characteristics. 87% of children in group P showed good ICC (ICC< 4) (20% in group C, p< 0,05).

Group	mYPAS 1	mYPAS 2 (*)	mYPAS3 (*)	STAI BASELINE	STAI 1	STAI 2 (*)	STAI 3 (*)	ICC < 4 (*)	PACU (*)
P	35.0 (18.8)	37.0 (11.4)	45.3 (29.5)	12.8 (8.9)	11 (4.5)	13.2 (2.5)	13.6 (3.3)	13 (86.6%)	1 (1-2)
C	32.5 (14.2)	79.2 (12.6)	78.6 (5.3)	11.3 (8.9)	11.5 (4.0)	32.5 (6.1)	33.6 (3.8)	3 (20%)	2 (1-2)

[Table 1]

(*) p< 0.05. Data shows mean (SD), median (range) or number (percentage).

Conclusions: Parental presence during anaesthesia induction improves quality of anaesthesia for both, parents and children.

10AP1-6

Effects of dexamethasone on postoperative pain, nausea and vomiting in children undergoing tonsillectomy: A study of 2 doses: 0.15 and 0.5 mg/kg

Hermans V., De Pooter F., De Groote F., De Villé A., Van der Linden P.
CHU Brugmann - HUDERF, Department of Anaesthesiology, Brussels, Belgium

Background and Goal of Study: Anti-emetic properties of dexamethasone (DXM) in children undergoing tonsillectomy are well recognized, but its effects on postoperative pain remains controversial (1). This prospective randomized double-blind study compared two dosages of DXM, 0.15 and 0.5 mg/kg to placebo on postoperative pain, nausea and vomiting (PONV) in children undergoing elective tonsillectomy
Materials and Methods: After local ethics committee approval and parental's written informed consent, 134 ASA I-II children aged 2-8 years were included in this study. They were randomized to receive intravenously (IV) at induction of anaesthesia either a saline solution (group P: N=44), DXM 0.15 mg/kg (group DXM 0.15; N= 46) or DXM 0.5 mg/kg (group DXM 0.5; N= 44). Anaesthetic technique (fentanyl 2 μg/kg - N2O-sevoflurane) and postoperative pain treatment (paracetamol -tramadol) were standardized. Incidence of early and delayed PONV, need for rescue anti emetics, analgesics consumption have been collected in the three groups.
During the first postoperative day (POD1), pain was evaluated using the CHEOPS or the VAS according to the child's age. On postoperative day 2 (POD2), incidence of PONV, and pain was assessed through a phone call. Pain was evaluated using the postoperative pain measure for parents (PPMP) (2). The three groups were compared using non parametric statistical tests or chi-square. A $p < 0.5$ was considered significant. Data are presented as median [interquartiles] or percentages
Results and Discussion: There was no significant difference in demographic and surgical characteristics between the 3 groups.

Variables	Placebo	DXM 0.15	DXM 0.5	p value
Early PONV (≤ POD1) (%)	48	22	25	0.006
Rescue antiemetics (%)	41	11	25	0.005
Early postop pain (≤ POD1(%)	22	20	19	NS
Rescue analgesics (%)	52	43	36	NS
Delayed PONV (POD2) (%)	30	0	0	<0.001
Delayed pain (POD2) (%)	55	20	6	<0.001

[Effects of DXM on postoperative pain and PONV]

Studied variables were not significantly different between the two DXM groups.
Conclusion(s): In the conditions of our study, IV administration of DXM significantly decreased the incidence of early and delayed PONV and reduced pain on POD2. A dose of 0.15 mg/kg of DXM appeared as efficient as a dose of 0.5 mg/kg.
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10AP1-7

Cochlear implant in children: Postoperative pain management

Marandola M., Albante A., Aversano M., Loiacono C., Delogu G.
'Sapienza' University, Department of Cardiovascular Disease, Anesthesia and General Surgery, Rome, Italy

Background and Goal of Study: Neonatal hearing loss is the most frequent sensorial congenital defect in newborns. Early cochlear implantation can be associated with moderate pain and vomiting in the first postoperative period with great discomfort of young patients (1).The aim of this study is to evaluate the efficacy of three different protocols for the treatment of acute postoperative pain and the incidence of vomiting in children undergoing cochlear implantation surgery.
Materials and Methods: Thirty-eight children aged between 1 and 24 months undergoing cochlear implant were enrolled and randomly assigned in three different groups: A (14), B (12) and C (12). General anaesthesia was performed in all patients with the same standardized scheme. After the induction of anesthesia, group A patients received endorectal paracetamol 40 mg/Kg, group B endorectal paracetamol 20 mg/kg plus codeine 0.5 mg/kg and patients of group C were treated with endorectal paracetamol 20 mg/kg plus codeine 0.5 mg/kg and 0.1 mg/Kg of ondansetron i.v. Six hours after the first analgesic dose we repeated the same protocol. Four-items Objective Pain Score (OPS) and vomiting were assessed at the following observation times: 30 (T_0),60 (T_1),120 (T_2) and 240 (T_3) minutes after the end of the surgery, respectively.
Results and Discussion: The patient population was homogeneous. The patients of group B and C demonstrated a good pain control with OPS values less than four at each observation time; in group A, four patients had a value more than four. The incidence of vomiting was similar in group A and B. None of the patients treated with ondansetron (group C) experimented vomiting. Regional anaesthesia alone or combined with intraoperative opioids, non steroidal anti-inflammatory drugs or paracetamol are unable to carry out an effective pain management in the postoperative period.
Conclusions: We demonstrated that an early endorectal administration of paracetamol and codeine is the more effective protocol on the acute postoperative pain control in children undergoing cochlear implant surgery. The i.v. administration of ondansentron reduce the incidence of vomiting. However further studies and a larger population are necessary to confirm the better analgesia protocol in the major ear surgery.
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10AP1-8

A randomized controlled trial to evaluate the incidence of emergence agitation in children: A comparison of intravenous versus inhalational anesthesia

Ahishakiye D., Najafi N., Van de Velde A., Poelaert J.
UZ Brussel - Vrije Universiteit Brussel (VUB), Department of Anaesthesiology, Brussels, Belgium

Background and Goal of Study: Emergence agitation is a frequent postoperative complication in young children. The aim of this study was to compare the incidence of emergence agitation in children undergoing ENT surgery while receiving sevoflurane, desflurane or propofol as maintenance of anesthesia.
Materials and Methods: Children aged between 2 and 7 years, undergoing elective tonsillectomy and adenoidectomy were enrolled in this study. Induction of anesthesia was performed using sevoflurane via face mask in all children.
The patients were then randomly assigned to receive sevoflurane, desflurane or propofol to maintain anesthesia. Analgesic treatment was standardized in all. Following extubation all children were transferred to the PACU. Duration of the surgery, the time to extubation, and the time spent in the PACU were recorded. Agitation and sedation scores were assessed using a five-point scale until discharge home. Agitated children (score >3) were treated with tramadol. The patients' parents were interviewed 24h after surgery to inquire about the occurrence of agitation and combative behavior at home.
Results and Discussion: A total of 93, 88 and 85 children completed the study in the propofol, sevoflurane, and desflurane group respectively. No significant difference could be determined in the demographic characteristics, the duration or the type of the surgery between the 3 groups. The time to extubation was shorter in the desflurane group ($p < 0.001$). The children in the propofol group had significantly higher sedation score and spent more time in the PACU ($p < 0.01$). They also had significantly lower agitation scores during the immediate postoperative period (tab). At home, overall incidence of agitation was 2% and there was no significant difference between the groups.
Table. Agitation scores (mean ± SD) in the study groups

Time of assessment Postoperatively	Propofol Group (n= 93)	Sevoflurane Group (n= 88)	Desflurane Group (n= 85)	P value
1st hour	2.6 ± 0.5	3.8 ± 0.8	3.9 ± 0.5	0.001*, 0.001**
2nd hour	2.8 ± 0.3	3.7 ± 0.5	3.6 ± 0.6	0.004*, 0.006**
3rd hour	2.4 ± 0.6	3.2 ± 0.4	3.0 ± 0.5	0.007*, 0.01**
4th hour	2.2 ± 0.4	2.7 ± 0.6	2.6 ± 0.5	0.01*, 0.03**

[Table]

*Comparison between propofol and sevoflurane groups;
** comparison between propofol and desflurane groups

Conclusion: During the immediate postoperative period, propofol maintenance anesthesia effectively reduced the incidence of emergence agitation in children.

10AP2-1

Comparison of truview EVO2 and macintosh laryngoscopes in infants

Tutuncu C., Kaya G., Meyanci G., Tunali Y., Utku T., Vehid S.
Cerrahpasa Medical Faculty, Department of Anaesthesiology and Intensive Care, Istanbul, Turkey

Background and Goal of study: Truview EVO2 is an indirect laryngoscope with optical accessory and oxygen flow apparatus.
We aimed to compare the Macintosh and Truview laryngoscopes in a group of infant with usual distribution of airway characteristics.
Materials and Methods: Following approval of the hospital ethics committee, written informed consent was obtained from the parents. Eighty, ASA I-II infant scheduled for general anesthesia were included to the study. The exclusion criteria's were abnormalities of head and neck, coagulopathy, and increased intracranial pressure. Eligible children were randomly assigned to one of two study groups: Macintosh laryngoscope and TruviewEVO2 laryngoscope group. Physicians were two staff pediatric anesthesiologists experienced in Macintosh blade at least ten years and in Truview blade at least six months in their routinely practice.
All patients were monitored using electrocardiogram, noninvasive arterial blood pressure, pulse oximetry, capnography. After the inhalation or intravenous induction, neuromuscular blocker was administered routinely. The intubations were performed Macintosh blade or Truview EVO2 blade. Intubation time and Cormack Lehane scores were evaluated during the laryngoscopy. Data were analyzed with Student t test, chi-square, and Pearson correlation test where appropriate. Statistical significance was defined as $P < 0.05$.
Results and Discussion: The mean age was 5.25±4.19 months in Truview group and 4.56±3.17 months in Macintosh group. The mean weight was 6.5±4.38 kg in Truview group, and 5.8±3.36 kg in Macintosh group. There were no statistically significant differences in demographic data. Average time for laryngoscopy was 27±12.46 s in Truview group, and 22.8±10 s in Macintosh group ($p>0.05$). However the Truview laryngoscope provided statistically significant better glottic view ($p< 0.001$) as shown in Table I. The numbers of patients with grade 3-4 Cormack Lehane scores were higher in the Macintosh group than Truview group but there was no intubations failure.
We found that Truview provides superior laryngoscopic view. However the indirect view of glottis and difficulty advancing the tube tip to the vocal cords may be disadvantage of the Truview laryngoscope.
Conclusion: We conclude that Truview laryngoscope appear to offer advantage in terms of better glottic view in a population of normal infants.

10AP2-2

Respiratory protection during paediatric cardiopulmonary resuscitation

Schumacher J., Gray S.A., Michel S., Alcock R., Brinker A.
King's College London, St Thomas' Campus, Department of Anaesthesiology, London, United Kingdom

Background and Goal of Study: Current health care system preparedness for terrorism has been broadened to the so-called all-hazards approach, in which response plans for terrorism are blended with plans for a public health response to unintentional disasters (SARS, pandemic flu, hazmat spill) [1]. Emergency paediatric life support (EPLS) of children infected with serious transmissible respiratory diseases requires adequate respiratory protection for medical first responders. Conventional tight-fitting air-purifying respirators (APR) and loose-fitting powered air-purifying respirator-hoods (PAPR-hood) may exert a different impact during resuscitation and therefore require evaluation.
Materials and Methods: We investigated the influence of tight-fitting full-face APRs and loose-fitting PAPR-hoods during simulated EPLS. Sixteen UK paramedics carried out a standardized EPLS scenario inside an ambulance vehicle, either unprotected or wearing an APR and a PAPR-hood in a randomized crossover design. The scenario consisted of external chest compressions, bag-valve-mask ventilation, endotracheal intubation, intraosseous vascular access and drug administration. Treatment times and wearer comfort were determined and compared.
Results and Discussion: In the questionnaire, volunteers stated that communication, dexterity and mobility were significantly better in the APR group, whereas the heat-build-up was significantly less in the PAPR-hood group. Treatment times of the controls did not differ to the APR group but did with the PAPR-hood group (261 ± 12 seconds for the controls, 275 ± 9 seconds for the conventional APR and 286 ± 13 seconds for the PAPR-hood group, $p< 0.05$ [Mean±SD]). The most time consuming task carried out was the implementation of successful endotracheal intubation (87 to 92 seconds) and the least time consuming task was the identification and application of the drugs (41 to 47 seconds). Endotracheal intubation was carried out successfully during all runs. A tracheal tube bougie was used by 12 of 16 volunteers.
Conclusion: In our study conventional tight-fitting APRs showed significantly better treatment times compared to loose-fitting PAPR-hoods during simulated EPLS in the limited space of an ambulance vehicle. Despite their air-conditioning qualities, PAPR-hoods were rated less favourable in respect of mobility, communication and dexterity during simulated paediatric resuscitation.
References:
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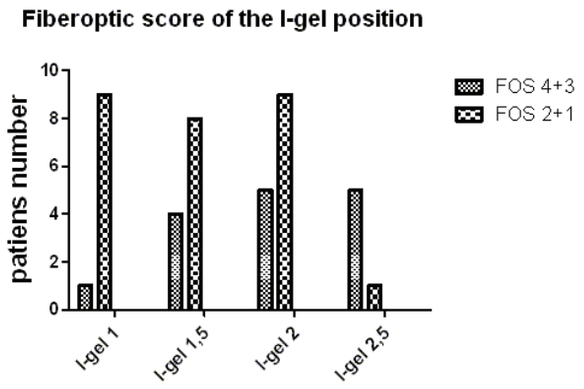
10AP2-4

The newly developed i-gel: An observational study in non paralysed anaesthetized children

Francksen H., Renner J., Duetschke P, Bein B.
UK-SH Schleswig-Holstein, Campus Kiel, Department of Anaesthesiology and Intensive Care, Kiel, Germany

Purpose of the Study: The purpose of the present prospective, observational trial was to assess new disposable devices, a newly developed single use non-inflatable supraglottic, I-gel[å] (Intersergical), for small children in routine clinical practice.
Materials and Methods: After approval of our IRB and written informed consent was obtained, in 42 children (3,9-35 kg) (ASA 1-3), undergoing minor routine surgery. Patients were randomly allocated to controlled ventilation with the I-gel 1 (n=10), I-gel 1,5 (n=12), I-gel 2 (n=14) and I-gel 2,5 (n=6). All devices were inserted by a single experienced anaesthesiologist. After five and 10 minutes of ventilation with the I-gel, SpO_2, $etCO_2$, V_{tex} and P_{aw} were recorded. Time of insertion and airway leak pressure were measured. The position of the I-gel 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 functions adequately; 0=vocal cords not visible and functions inadequately). We evaluated ease in inserting the gastric tube. Occurrence of gastric inflation was assessed with a stethoscope placed on the epigastrium.
Results: 41 devices were inserted at the first attempt, 1 device in second attempt. Time of insertion was median: 10 s; range: 6-20 s. The mean seal pressure was 27±6 cmH_2O and PAW 13±3 cmH_2O. There was no gastric inflation and gastric tube insertion was achieved at first attempt in all cases. Fiberoptic score of the position of the devices was better in the I-gel 1,5 -2,5 compared to I-gel 1 (figure 1).



[Figure 1]

Summary: The disposable J-gel[å] was proven in a clinical trial to effectively ventilate and oxygenate patients with respiratory arrest. In conclusion, this device might be a simple alternative to secure the airway. Higher airway leak pressure suggests that the I-gel[å] may be the first choice in routine clinical practice in this patient population.

10AP2-5

Effects of three different glucose containing maintenance solutions on blood glucose concentrations in infants undergoing major pediatric surgery

Baris S., Karakaya D., Dilek A., Tander B.
Ondokuz Mayis University, Department of Anaesthesiology and Intensive Care, Samsun, Turkey

Background and Goal of Study: Overzealous dextrose replacement can be detrimental because the neonatal kidney easily spills glucose, resulting

osmotic diuresis. In addition, especially in risky pediatric patients, hyperglycemia may cause cerebral ischemia. The aim of this study was to determine ideal glucose containing maintenance solution for maintaining normoglycemia in infants.

Materials and Methods: After obtaining Ethical Committee approval and informed consent from parents, 96 infants aged between 0 to1 years undergoing major pediatric surgery were included into the study. Patients were randomly divided into three groups according to maintenance fluids before anesthesia induction (Group I: 10% Dextrose+ ringer laktate, Group II: 5% Dextrose+ ringer laktate, Group III: 2.5% Dextrose +ringer laktate). Blood glucose levels were determined by glucometer (Optium Xceed, Abbott, UK). If hyperglycemia (blood glucose level > 200 mg/dL) or hypoglycemia (blood glucose level < 40 mg/dL for neonate or < 50 mg/dL for infants) was observed, routine protocols were applied to provide normoglycemia. Hemodynamic parameters were also recorded throughout the study period. Descriptive variables were analyzed using Mann-Whitney U test and chi-square test as appropriate.

Results and Discussion: Groups were comparable with respect to demographic data and duration of anesthesia and surgery. Blood glucose levels were similar between groups. However, hyperglycemia was observed 47 % in Group I, 19% in Group II and 25% in Group III, ($p < 0.05$). Hypoglycemia was observed only in one patient in Group I. Hemodynamic parameters were similar between groups. The risks of hyperglycemia and hypoglycemia during intraoperative period are well known for pediatric patients and have been evaluated in various studies. However, the ideal glucose concentration of maintenance fluid have not been defined yet. Therefore, especially in children at increased risk for intraoperative blood glucose derangements, frequent blood glucose monitoring is recommended.

Conclusion(s): We concluded that maintenance solution with 5 or 2.5 % glucose seems to be an appropriate choice for infants undergoing major pediatric surgery.

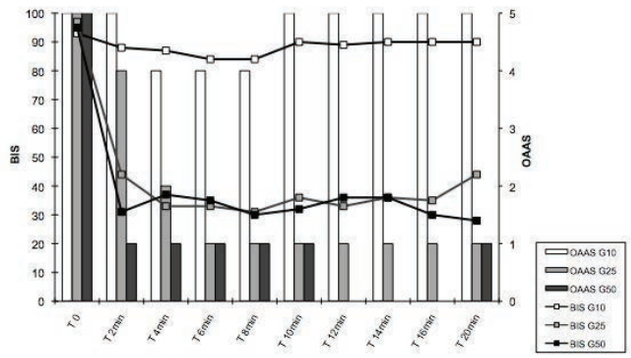
10AP2-6

Clinical sedation and bispectral index in burn children receiving gamma-hydroxybutyrate

Rousseau A.-F., Sabourdin N., Richard P., Ledoux D., Damas P., Constant I.
Armand Trousseau Hospital, Paediatric Burn Centre, Paris, France

Background and Goal of Study: Gamma-hydroxybutyrate(GHB) may be an interesting hypnotic agent in burn patients because of its good respiratory and hemodynamic tolerance. Its clinical and electroencephalographic (EEG) sedative effects are not yet described in children. The aim of this randomized study was to assess clinical and EEG effects (using Bispectral Index(BIS)) of increasing intravenous(IV) doses of GHB in burn children requiring daily sedation for burn wound cares.

Materials and Methods: 36 children were randomly assigned into 3 groups according to the GHB IV dose received before wound care: respectively 10, 25 or 50mg/kg in groups G10, G25 or G50. All children received oral premedication (hydroxyzine 0.5mg/kg and morphine 0.2mg/kg) 30 minutes (min) before. Respiratory rate, pulse oxymetry and BIS were continuously monitored. Depth of sedation was clinically evaluated using OAAS Score every 2 min until recovery (i.e. OAAS=4). Side effects were noted. Comparisons of medians (expressed with interquartile ranged [Q1-Q3]) were performed using Kruskal Wallis test. A p value < 0.05 was considered significant.



[BIS and OAAS values over time]

Results and Discussion: Median age was 17,5 [12-34] months. Whatever the dose, BIS decreased after IV GHB. Nadir value of BIS was significantly lower in G25 and G50 than in G10 (respectively 27[23-29], 22[17-27] versus 72[64-85]), as for OAAS score (respectively 1[0-2], 0[3-5] versus 4[3-4]). Nadir values of BIS and OAAS were reached after similar delays, for BIS 7[5-9,5], 9[5-15] and 8[6-8,5] min respectively for G25, G50 and G10, and for OAAS score 7[5-14], 11[4-12] and 3[1,5-3] min respectively for G25, G50 and G10. Sedation duration was dose dependant :0 min [0-8] in G10, 46 min [35-53] in G25 and 105 min [72-131] in G50. No adverse events were noted.

Conclusion(s): BIS decreased after GHB injection and was correlated with OAAS score. Safe deep sedation can be achieved with IV doses of 25 or 50 mg/kg but the last dose was associated with prolonged duration of sedation.

10AP2-7

Analysis of ESPEN guidelines on lipid and carbohydrate needs estimation in neonates

Tikhova G., Shifman E.
Kulakov Scientific Center of Obstetrics, Gynecology and Perinatology, Department of Anaesthesiology, Moscow, Russian Federation

Background and Goal of Study: Lipids and carbohydrates are the sources of nonprotein energy (NPE) in nutrition therapy. It is extremely important in neonates to coordinate lipid and carbohydrate components of NPE in specified proportion. There are also strict limits on lipid and glucose dosage that should be fulfilled necessarily in order to minimize complications. The goal of the study is to analyze relations between lipid and glucose doses at different values of NPE and to develop practical algorithm taking into account all ESPEN restrictions and guidelines on estimations of NPE, its components and corresponding lipid/glucose doses.

Materials and Methods: The study methods include mathematical analysis of linear equations system and graphical visualization of its solutions. Methods of mathematical modeling were also used to generate a set of real clinical conditions and to test the created algorithm that allows calculating lipid and glucose doses in patient-focused specified proportion.

Results and Discussion: NPE value (kcal/24h), calculated or specified, consists of 2 components provided by lipids and carbohydrates. The NPE value should be constant while doses of lipids and carbohydrates may change during therapy. If NPE value is constant lipid dose (LD) and dry glucose dose (GD) are functionally dependent and this relationship can be expressed with system of 2 linear equations. In these conditions increasing LD by 1 g/kg/24h requires decreasing GD by 2.25 g/kg/24h and if GD rises by 1 g/kg/24h LD should fall down by 0.44 g/kg/24h to preserve specified value of NPE. Each NPE value has its own minimal GD that often exceeds common recommended minimum. This specific minimum may be calculated by formula. The formula shows that minimal GD becomes higher with the increasing of NPE. To control glucose load the other 2 equations were developed. They connect glucose load with daily lipid dose. Using derived calculating schemes it is possible to define the conditions enabling to meet specified balance between 2 NPE components and not to break limits of daily LD and GD.

Conclusion(s): The analysis of ESPEN guidelines on PN in neonate with mathematical methods allowed developing easy practical algorithm for estimating neonate nonprotein energy, its lipid/carbohydrate components in balanced proportion and meet ESPEN restrictions on lipid and glucose dosage.

References:

ESPEN/ESPEGHAN Guidelines on paediatric parenteral nutrition.
Clinical Nutrition 2006;25:177-360

10AP2-8

Preoperative fasting in children: Impact of prior food on gastric emptying after drinking clear fluids - preliminary MRI data

Schmitz A., Liamlahi R., Kellenberger C.J., Frühauf M., Klaghofer R., Weiss M.
Children's Hospital Zurich, Department of Anaesthesiology, Zürich, Switzerland

Background and Goal of Study: Gastric emptying half-life time in children after clear fluid intake was shown to be less than 30 minutes without prior food, i. e. after overnight fasting (1). The impact of prior food on gastric emptying half-life time and residual gastric contents volume at time of induction has to be examined.

Materials and Methods: After overnight fasting, healthy volunteers aged from 6 to 12 years had to drink 7 ml/kg of diluted raspberry syrup without (A) and 4 or 2 hours after breakfast (B / C) on three different days. Breakfast consisted of milk and cereals and was identical for a child on both occasions. Axial images covering the entire stomach were obtained by magnetic resonance imaging (MRI) after overnight fasting, immediately after drinking and then every 30 minutes for 2 hours. Gastric content volumes were determined in a blinded manner, related to body weight (GCV_w) and elimination half-life times ($T_{1/2}$) calculated. Data are presented as median (range). Exact significance p for

inter-group comparison was calculated using Friedman-Test.
Results and Discussion: 3 girls and 4 boys, aged 10.5 (7.6 - 11.8) years and weighing 35.3 (22.4 - 40.7) kg, volunteered in all three groups. GCV_w was 0.49 (0.15 - 0.96) / 0.47 (0.01 - 1.05) / 0.32 (0.20 - 1.13) ml/kg after overnight fasting ($p = 0.77$) and 0.20 (0.05 - 0.84) / 0.31 (0.25 - 0.85) / 0.32 (0.08 - 0.67) ml/kg 2 hours after drinking ($p = 0.49$), and $T_{1/2}$ was 24 (18 - 39) / 25 (19 - 32) / 26 (18 - 32) minutes ($p = 1.0$) in group A, B and C, respectively.
Conclusion: These preliminary data confirm that in healthy children gastric emptying after drinking fluids is rapid. Data do not indicate that a small breakfast, regardless whether 2 or 4 hours before last fluid, alters half-life time or increases residual gastric contents volume at time of anaesthesia induction compared to overnight fasting.
References:
Schmitz et al, Swiss Med Wkly 2010; 140: FM15 (abstract).
Acknowledgements: We would like to thank the children and their parents for volunteering in this study.

10AP3-1

Does a loading dose of intravenous paracetamol affects body temperature in neonates?

Allegaert K., Hopchet L., Kulo A., Smits A., Verbesselt R., de Hoon J.
University Hospitals Leuven, Neonatal Intensive Care and Center for Clinical Pharmacology, Leuven, Belgium

Background and Goal of Study: Intravenous acetaminophen (paracetamol) has recently been registered for use in neonates for treatment of pain but pharmacodynamics, including effect on body temperature following a loading dose (20 $mg.kg^{-1}$) have not been reported.
Materials and Methods: An analysis on body temperature recordings in neonates exposed to iv acetaminophen as included in published pharmacokinetic studies or as recruited in an ongoing PARANEO study were performed [1,2]. Body temperature was recorded by skin probe and registered before and every 2 h following initiation of repeated iv acetaminophen administration up to 48 h. Clinical characteristics (age, weight) were collected and data reported by median and range, or mean and standard deviation. Repeated measures ANOVA and paired analysis were used to quantify differences following acetaminophen exposure.
Results and Discussion: The pooled analysis was based on 99 neonates [median weight 2.7 (range 0.5-5.4) kg, median postmenstrual age 37 (range 27-50) weeks]. Based on observations in 93 normothermic (< 37.8°C) neonates and 6 neonates with fever, is was documented that acetaminophen administration does not affect body temperature in normothermic patients. In neonates with fever, the median decrease (-0.8°C) is most prominent in the first 2 hours ($p < 0.01$) following acetaminophen administration with subsequent further normalisation.
Conclusion(s): Administration of iv acetaminophen does not result in hypothermia in initially normothermic neonates, while in those with fever, maximal temperature reduction is achieved within 2 hours following acetaminophen administration.
References:
1. Allegaert K,et al. Arch Dis Child Fetal Neonat Ed 2004;89:F25-F28.
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10AP3-2

Mechanisms of controlled hypotension during propofol-remifentanil or desflurane-remifentanil anaesthesia for paediatric ENT surgery

Piasecki A., Woloszczuk-Gebicka B., Darowski M., Guc M.
Medical University of Warsaw, Department of Anaesthesiology and Intensive Care, Warsaw, Poland

Background and Goal of Study: Controlled hypotension (CH) with propofol-remifentanil (PRO-REM) or desflurane-remifentanil (DES-REM) is used in selected paediatric ENT procedures to reduce bleeding and improve visibility in surgical field.
To our knowledge, there are no studies showing haemodynamic mechanisms of CH. Therefore, we aimed to compare PRO-REM and DES-REM with regard to cardiovascular changes during CH.
Materials and Methods: After Ethics Comitee approval and parental informed consent, 41 children ASA I-II scheduled for nose, sinus or middle ear surgery were studied. We randomized patients to PRO (n=21, 12±3yrs, 41±11kg) or DES (n=20, 13±3yrs, 45±16kg) groups. In PRO gr anaesthesia was maintained with PRO 3-4 mg $kg^{-1}h^{-1}$, in DES gr with DES/O_2/air, ETconc 3-4%. We used REM 0.75 $\mu g\ kg^{-1}min^{-1}$ for analgesia and CH [1]. IPPV was used ($ETCO_2$35-40 mmHg).
We aimed to maintain controlled hypotension (MAP 50-65 mmHg) and analyse HR, CI, SVI, SVRI during this period. Haemodynamic parameters were measured with non-invasive cardiac output monitor (NICO, Philips-Respironix, USA).
Results and Discussion: Controlled hypotension can be achieved through reduction of CI and/or SVRI: MAP=CIxSVRI.

	PRO-REM	DES-REM
CI	N/↓	N
SVI	N/↑	↑
HR	N/ ↓	N/ ↓
SVRI	N	N/ ↓

[Haemodynamic parameters during CH]

CI was normal [2] (N) in 91% of measurements in DES gr; in PRO gr N in 72% and below N (< 3.5 l $min^{-1}m^{-2}$) in 27%. SVI was above N (>60 ml $beat^{-1}m^{-2}$) in 92% of measurements in DES gr and in 58% in PRO gr. SVRI was N in 84% of measurements in PRO gr; in DES gr N in 63% and below N (< 800 dyn s $cm^{-5}m^2$) in 37%. ↑ SVI in response to ↓ HR and ↓ SVRI was more pronounced in DES gr.
Conclusion(s): Controlled hypotension in DES-REM gr results mainly from SVRI reduction, and in PRO-REM gr from CI reduction. While in both groups HR was decreased due to REM infusion, bradycardia was more pronounced and better compensated by SVI increase in DES group, which allowed for better maintenance of normal CI.
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2. Fuhrman BP. Ped Crit Care Mosby 2006:262

10AP3-3

Age-related PK differences of intravenous paracetamol loading dose administration in neonates

Allegaert K., Smits A., Verbesselt R., de Hoon J., Naulaers G., Kulo A.
University Hospitals Leuven, Neonatal Intensive Care Unit, Leuven, Belgium

Background: Although the target concentration of paracetamol for analgesia in neonates is still undefined, an intravenous (iv) loading dose in an off label approach is routinely used in different neonatal intensive care units (NICU) (1). The aim of this study was to explore if there are the age-related pharmacokinetic (PK) differences in (pre)term neonates following loading dose administration of iv paracetamol.
Materials and Methods: Plasma time-concentration samples collected following loading dose administration of iv paracetamol (20 $mg.kg^{-1}$) of either already reported (2, 3) or still ongoing (PARANEO) PK studies of iv paracetamol in neonates were collected. A naïve pooled approach and an one-compartment linear disposition model (zero order input, first order elimination) were used. Clinical characteristics [gestational age (GA), postnatal age (PNA), postmenstrual age (PMA), current weight (CW)] were registered. Results were reported as median and range. PK estimates between preterm (i.e. < 37 weeks GA) and term neonates were compared (unpaired T test).
Results and Discussion: In 90 neonates [median (range) GA 35.4 (24-41) weeks; PNA 1 (1-76) days; PMA 35.8 (27-43) weeks; CW 2.5 (0.6-4.3) kg], 250 plasma time-concentration samples were available for the naïve pooled PK analysis following loading dose administration. Median (range) C_{max} paracetamol plasma concentration was similar in preterm [18.44 (8.3-31) $mg.L^{-1}$] and term [16.77 (7.77-48.4) $mg.L^{-1}$] neonates while C_{trough} was significantly higher in preterm [9.39 (3.5-14.20) $mg.L^{-1}$] versus term [6.46 (2.17-9.66) $mg.L^{-1}$] cases ($p=0.024$).
Consequently, distribution volume was similar (1.01 vs 1.06 $L.kg^{-1}$) while clearance was lower in preterms (0.15 vs 0.22 $L.kg^{-1}.h^{-1}$) and elimination half life longer (4.8 vs 3.3 h).
Conclusion: Loading dose (20 $mg.kg^{-1}$) of iv paracetamol in neonates results in mean peak concentrations of 18.26 $mg.L^{-1}$ independent of the prematurity while clearance is age-dependent. This suggests that from a pharmacokinetic point of view, the loading dose in neonates is independent of the age, while maintenance dosing regimen has to take the maturational elimination capacity into account.
References:
(1) Allegaert K, et al. Arch Dis Child Fetal Neonat Ed 2004;89:F25-F28;
(2) Allegaert K, et al. Eur J Clin Pharmacol 2004;60:191-197;
(3) Allegaert K, et al. Paediatric Anaesthesia 2007; 17:811-2

10AP3-4

A dose study of remifentanil in combination with propofol during tracheal or bronchial foreign body removal in children

Teksan L., Baris S., Karakaya D., Dilek A.
Ondokuz Mayis University, Department of Anaesthesiology, Samsun, Turkey

Background and Goal of Study: Remifentanil combined with propofol has been used in pediatric patients undergoing bronchoscopy with success (1). However, the optimal dose of remifentanil has not been determined in children. The aim of this study was to assess the effect of two different remifentanil doses on hemodynamic stability, consumption of mivacurium and recovery characteristics during removal of foreign bodies undergoing rigid bronchoscopy in children.
Materials and Methods: After obtaining Ethical Committee approval and informed consent from parents, 70 children, ASA I-II, aged 3 to 12 years, undergoing rigid bronchoscopy for foreign body removal under general anesthesia were studied. Study was conducted in a randomized double-blinded manner. Children were divided equally into two groups. Children received either 0.1 μg/kg/min (Group R1) or 0.2 μg/kg/min (Group R2) remifentanil infusion. Ten minutes after the remifentanil infusion, 3 mg/kg of propofol and 0.02 mg/kg atropine were given. Anesthesia was maintained with 0.1 μg/kg/min remifentanil and 5-13 mg/kg/h propofol in Group R1 and 0.2 μg/kg/min remifentanil and 5-13 mg/kg/h propofol in Group R2. After obtaining baseline measurements with, 0.2 mg/kg of mivacurium was given intravenously. Ventilation was maintained with 100% O2 via a "T" piece connected to the side arm of the bronchoscope. Hemodynamic values and emergence time were recorded. Descriptive variables were analyzed using Mann-Whitney U test and chi-square test as appropriate.
Results and Discussion: Groups were similar with respect to demographic data and duration of bronchoscopy and anesthesia ($p>0.05$). Heart rate, systolic and mean blood pressures increased 1 min after insertion of bronchoscope in group R1 ($p< 0.01$). Propofol consumption was significantly higher in group R1 (94.9±29.8 mg) than group R2 (87.2±28.9 mg), ($p< 0.01$). Spontaneous eye opening time was 8.6±1.3 min in group R1 and 6.3±1.1 min in group R2 ($p< 0.05$). The time to recovery to an Aldrete score of 9 was longer in group R1 (19.8±3.0 min) than group R2 (16.1±3.0 min), ($p< 0.01$). Postprocedural recovery was rapid with 0.2 μg/kg/min remifentanil infusion without any hemodynamic compromise.
Conclusion: Remifentanil 0.2 μg/kg/min infusion with propofol provides hemodynamical stability and early recovery in children undergoing foreign body removal.
Reference:
1. Berkenbosch JW, Graff GR, Stark JM, et al. Ped Anesth 2004; 14: 941-6.

10AP3-5

Sugammadex reversal efficacy and security vs neostigmine in the rocuronium - induced neuromuscular blockade in paediatric patients

Veiga Ruiz G., Carceles Baron M.D., Dominguez Serrano N., Lopez Fuentes L., Orozco Montes J., Alvarez-Gomez J.A.
University Hospital Rosell Cartagena, University Hospital Arrixaca Murcia, Department of Anaesthesiology, Cartagena, Spain

Background and Goal of Study: Sugammadex reverts the neuromuscular blockade, by a novel mechanism of action that remains aside from the complex physiology of the neuromuscular union. The aim of the present study is to compare the efficacy and security of the reversal with sugammadex of a moderate blockade induced with rocuronium in paediatric patients as compared to that of neostigmine.
Materials and Methods: 24 patients aged 2-9 years, scheduled for elective surgery under general anaesthesia were included, with previously signed IC by their parents or tutors. Oral midazolam 0.375% mg.kg^{-1},atropine 0.01mg.kg^{-1}, propofol 2.5 mg.kg^{-1}and remifentanyl 0.2-0.3mcg.kg^{-1}.min^{-1}. After induction the neuromuscular function was monitored by acceleromyography previous a period of stabilization and optimal calibration. 0.45 mg·kg^{-1} rocuronium was administered, followed OIT. TOF values were registered in silico every 15 seconds by means of specific software. O_2/N_2O (30/70%) and 0.15 mg·kg^{-1} boluses of rocuronium as needed. At the end of surgical procedure they were randomized to receive either Sugammadex 2mg·kg^{-1}(n=14) or neostigmine 5 mcg·kg^{-1} and atropine 2.5 mcg·kg^{-1}(n=10) when (T2) reappeared three times consecutively. Main variable was the time after the administration of sugammadex or neostigmine until reaching a 0.9 TOF ratio. Secondary variables were rocuronium onset time, MAP and HR on the 1, 3 and 5 minutes after reversal. Statistical data were processed using t- Student. Data as mean (SD[range]), values were considered as significant under a $p< 0.05$.
Results and Discussion: Age 4.8(2.1[2-8]) vs 4.3(2.3[2-9]) was similar in both groups. The mean time to reach a 0.9 TOF ratio was shorter in sugammadex 1.06 (0.3[0.6-1.6]) vs 11.5(7.4[2.2-23.5]) min ($p=0.017$) neostigmine group (monitoring was interrupted in 4 of this group without reach TOF >0.9). There were no statistically significant differences between groups in surgical time and onset time after rocuronium, all reaching a 94% maximum blockade in less than 80 sec. No significant haemodinamic alterations as compared to their basal values.
Conclusion(s): Sugammadex at 2mg·kg^{-1}reverted in one minute, in an effective and secure way, the neuromuscular blockade induced by rocuronium in paediatric patients older than 2 years old scheduled for elective surgery. We consider it as an adequate, fast and secure alternative to the conventional reversal with neostigmine.
References:
Plaud B et al. Anesthesiology 2009;110:284-94

10AP3-6

Cerebral near-infrared spectroscopy (NIRS) does not correlate with the PediaSat ^{R} continuous central $ScvO_2$ monitoring in pediatric cardiac surgery patients

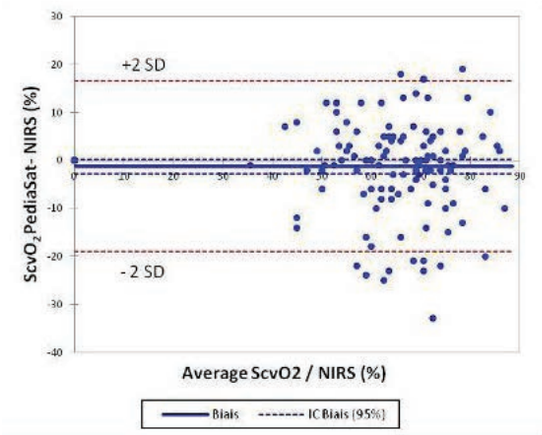
Momeni M., Matta A., Detaille T., Clement de Clety S., Veyckemans F.
Cliniques Universitaires St Luc Université Catholique de Louvain, Department of Anaesthesiology and Intensive Care, Brussels, Belgium

Background and Goal of Study: There are controversial reports regarding the correlation of cerebral NIRS with superior central venous oxygen saturation.[1,2] The PediaSat ^{R} system gives a continuous superior cava oxygen saturation ($ScvO_2$). We evaluated the agreement of both methods in patients < 5 years undergoing congenital heart surgery with cardiopulmonary bypass (CPB).
Materials and Methods: After Ethical approvement and informed parental consent (subgroup of another study), 29 patients were included. The PediaSat was calibrated in vivo. Values with a Signal Quality Index < 2 were not considered. Measurements were performed at: postinduction (T0);after 10(T1),30(T2),45(T3) and 60 minutes (T4) post CPB;then 1(T5),4(T6),12(T7),24 (T8), and 48 hours (T9) after admission in the Pediatric Intensive Care Unit (PICU).Normal distribution was confirmed. Agreement was assessed by Bland-Altman analysis.
Results and Discussion: Median age was 148 days(Range:8-977).A total of 253 matched data were analyzed.Table 1 shows Bland-Altman analysis at each time point except T9.

Time point	N	Pearson correlation	P	Bias(%)	Limits of Agreement(%)
T0	28	0.63	<0.001	-0.01	-17.6;+17.4
T1	27	0.33	0.001	-3.3	-33.7;+27.2
T2	29	0.23	0.008	-1.3	-29.1;+26.6
T3	29	0.19	0.02	1.25	-26.9;+29.4
T4	22	0.21	0.03	-15.6	-67.4;+36.2
T5	23	0.44	<0.001	9.8	-45.2;+64.7
T6	24	0.6	<0.001	-8.7	-55.8;+38.4
T7	24	0.32	0.004	-9.9	-57.9;+38.0
T8	25	0.41	<0.001	2.4	-14.0;+18.7

[Bland Altman analysis at different time points]

Fig 1 shows Bland-Altman plot for all the matched data in PICU.



[Bland-Altman plot post PICU]

These results are not unexpected as NIRS measures tissular and PediaSat [R] venous oxygenation. Both methods are complementary;one cannot replace the other in guiding the therapy.

References:

1.Knirsch et al. Acta Anaesth Scand 2008;52
2.Ranucci et al. Pediatric Anesth 2008;18

10AP3-7

Cerebral and somatic oxygenation monitoring during pediatric aortic coarctation repair using near infrared spectroscopy

Kim H.J., Park J.H.
Asan Medical Center, Department of Anaesthesiology and Pain Medicine, Seoul, Korea, Republic of

Background and Goal of Study: Aortic coarctation repair is usually performed under antegrade selective cerebral perfusion (ASCP) which interrupts whole body perfusion. Therefore, it is important to evaluate both cerebral and lower body perfusion during operation. Near-infrared spectroscopy (NIRS) is noninvasive monitoring for regional tissue oxygen saturation (rSO2). The purpose of this pilot study is to access the usefulness of rSO2 monitoring on pediatric aortic coarctation repair.

Materials and Methods: Without premedication, general anesthesia was induced and maintained using midazolam, fentanyl and rocuronium. ASCP was performed through the innominate artery during aortic arch reconstruction and then full cardiopulmonary bypass (CPB) support was resumed to correct intracardiac defect. We monitored four sites rSO2 using NIRS (INVOS 5100, Somanetics Corporation, Michigan, USA). The sensors were placed over the forehead for right and left cerebral rSO2, right posterior-lateral frank for renal rSO2, and infraumbilical area for abdominal rSO2 monitoring. Variation of rSO2 were analyzed by four period; pre-CPB, during ASCP, during CPB and post-CPB. Records of postoperative complication were collected.

Results and Discussion: In all, 23 patients were enrolled in this study. Both left and right cerebral rSO2 were maintained over the period of operation. Renal rSO2 was decreased during ASCP, whereas abdominal and renal rSO2 were increased during CPB and post-CPB compared with pre-CPB period. Three patients suffered from postoperative acute renal failure (13.0%). All of them died due to heart failure. These patients had lower abdominal rSO2 during ASCP than that of non-complicated patients, 19.5 (17.3, 26.4) versus 48 (36, 57.8) [median (interquartile range)].

Conclusion(s): Cerebral oxygenation was preserved during ASCP and subdiaphragmatic somatic oxygenation was increased after aortic reconstruction. Postoperative mortality was associated with low abdominal rSO2 during ASCP. Special concern and further evaluation will be needed about subdiaphragmatic somatic oxygenation during operation of aorta.

References:

Hoffman GM, Stuth EA, Jaquiss RD, et al. Changes in cerebral and somatic oxygenation during stage 1 palliation of hypoplastic left heart syndrome using continuous regional cerebral perfusion. *J Thorac Cardiovasc Surg* 2004;127(1):223-33.

Acknowledgements: We thank all staff members for their support in performing this study.

10AP3-8

The prognostic value of plasma B-type natriuretic peptide in children with right ventricular overload undergoing congenital heart surgery

Baysal A., Yildirim A., Sasmazel A., Guzelmeric F., Sunar H., Zeybek R.
Kartal Koşuyolu High Speciality Training and Research Hospital, Department of Anaesthesiology and Intensive Care, Istanbul, Turkey

Background and Goal of Study: The brain natriuretic peptide (BNP) levels in plasma were investigated perioperatively and their correlation with prognostic risk factors in children undergoing congenital heart surgery were determined.

Materials and Methods: Fourty six patients were enrolled. The preoperative echocardiographic and cardiac catheterization studies showed right ventricular overload due to pulmonary hypertension. All patients underwent surgical correction of a congenital heart defect. Plasma levels of BNP and lctate were collected preoperatively, 12, 24 and 48 hours postoperatively. A correlation between plasma BNP levels and prognostic risk factors including; aortic cross clamp time, cardiopulmonary bypass time, plasma lactate level,duration of mechanical ventilation, intensive care unit stay, low cardiac output state (LCOS), and 30-day mortality was investigated. The definition of LCOS includes; tachycardia, oliguria, poor perfusion, cardiac arrest, or metabolic acidosis.

Results and Discussion: The 30-day mortality had a significant positive correlation with preoperative, postoperative 12, 24 and 48 hours BNP levels (rho= 0.73, p< 0.001, rho= 0.77, p< 0.001, rho= 0.91, p< 0.001, rho= 0.88, p< 0.001, respectively). The linear regression analysis showed that; the preoperative and the postoperative 12, 24 and 48 hour BNP levels are the independent markers of 30-day mortality (for preoperative BNP; R= 0.87, R2= 0.69, F=12.25, p< 0.001, t=4.61, p< 0.001). The preoperative cut-off value of BNP in patients with pulmonary hypertension is determined as 210 pg/mL for predicting LCOS with a sensitivity of 88.9 and a spesificity of 96.9 %.The preoperative and postoperative BNP levels correlated with duration of mechanical ventilation, cardiopulmonary bypass time (p>0.001).

Conclusion(s): The preoperative and early postoperative BNP values are important in prediction of early prognostic factors such as duration of mechanical ventilation, LOCS and 30-day mortality in children with right ventricular overload.

References:

1.Hsu JH, Oishi PE, Keller RL, et. al. Perioperative B-type natriuretic peptide levels predict outcome after bidirectional cavopulmonary anastamosis and total cavopulmonary connection. J Thorac Cardiovasc Surg 2008; 135: 746-53.2-Shih CY, Sapru A, Oishi P, et. al. Alterations in plasma B-type natriuretic peptide levels after repair of congenital heart defects: a potential perioperative marker. J Thorac. Cardiovasc Surg.2006;131: 632-8.

10AP4-1

ECG alterations in children during intravenous application of three different test solutions for regional anaesthesia

Mauch J.Y., Spielmann N., Dave M.H., Weiss M.
University Children's Hospital, Department of Anaesthesiology, Zurich, Switzerland

Background: Animal studies have shown that ECG alterations caused by intravenous injection of a local anaesthetic (LA) test dose are caused by epinephrine (1). The aim of this study was to elucidate whether these ECG findings in small pigs induced by a test dose of epinephrine, bupivacaine or their combination are reproducible in paediatric patients.

Methods: Paediatric patients from age 1 month to 16 years undergoing general anaesthesia were randomized into three groups. After induction of general anaesthesia using sevoflurane, nitrous oxide, muscle paralysis and tracheal intubation, 0.2 ml/kg of the corresponding test solution was rapidly intravenously administered: group 1 received bupivacaine 0.125%, group 2 bupivacaine 0.125% plus epinephrine 1:200'000, and group 3 plain epinephrine 1:200'000. ECG leads I and II were recorded and analysed later on by a blinded assessor. Non invasive blood pressure was taken before and at 1 and 2 minutes after test dose injection. A T-wave elevation of ≥25%, increase in heart rate of ≥10 bpm, and in systolic blood pressure of ≥15 mmHg above baseline value were considered as a positive result (2).

Results: So far 75 paediatric patients aged 0.2-15.9 yrs (median 5.7 yrs) weighing 4.1-82 kg (19.9 kg) were studied. After intravenous injection of 0.2 ml/kg test solution positive T-elevation was found in 0%, 100% and 96% of patients in group 1, 2 and 3. Increase in heart rate of ≥10 bpm was found in 0% patients of group 1 (n=26), in 59% of group 2 (n=22) and in 77% of group 3 (n=26). Increase in blood pressure at 1 min after injection was found in 0%, 86% and in 93%, at 2 min in 0%, 48% and 65% of patients in group 1, 2 and 3. In children >1 year of age a decrease in heart rate of ≥10 bpm was observed in 0%, 67% and 61% of group 1, 2 and 3.

Discussion and Conclusion: The preliminary findings of this study demonstrate that in children ECG alterations caused by intravascular injection of a LA test dose are caused by epinephrine. The manifestation of elevated T-wave seems to be more sensitive than increase in heart rate and systolic blood pressure to detect intravascular injection of a LA test dose with epinephrine. The intravascular injection of plain bupivacaine cannot be detected by ECG. Based on our study results, an epinephrine containing LA solution and ECG control must be used for the reliable detection of inadvertent LA injection in children.

References:

1) Mauch J et al. Br J Anaesth 2010
2) Tobias JD. Anesth Analg 2001

10AP4-2

Ultrasound assistance for positioning epidural catheters in neonates and infants

Steur R.J., Grapentin M., Wietasch G., Absalom A.
UMCG, Department of Anaesthesiology, Groningen, Netherlands

In young children, especially neonates, it is difficult to detect the epidural space with the loss of resistance (LOR) technique. Ultrasonography may assist epidural cannulation by demonstrating anatomic structures and verifying correct catheter placement. Here we report the results of a comparison of clinical measurement of the depth until LOR with ultrasonic measurement of

the distance between skin and dura.
Methods: Pediatric patients scheduled for major abdominal surgery with planned epidural analgesia were included during a period of 24 months.
After induction of anesthesia, ultrasound was used to identify the midline and the epidural space, and to measure the distance from skin to dura[K1] . Thereafter the epidural catheter was inserted using the standard LOR technique and the depth at which LOR occurred was noted. When the epidural test bolus was administered, ultrasound was used to verify the position of the catheter tip. The two methods of depth measurement were compared using Bland- Altman analysis.
Results: Five lumbosacral and 28 thoracic epidural catheters were placed in 33 patients with median (range) [W2] age 40 days (2 - 335) and weight 3.7 kg (0.95 - 9.9). In all patients the midline and dura were readily identified. The skin - dura distance with ultrasound technique was 6.2 mm (4-8) and[W3] 6.6 mm (5-9) with the LOR technique. The correlation coefficient between the measurements was 0.79. The Bland-Altman analysis of ultrasound vs. LOR showed good agreement with a bias of -0.6 mm and a precision of 1.5 mm.
Conclusions: This investigation shows that ultrasound assistance during placement of epidural catheters in neonates and infants can help to identify the relevant structures and gives a reliable indication of the depth of the epidural space. This helps to improve safety in a normally "blindly" performed procedure.

10AP4-3

Postoperative pain relief using ultrasound guided femoral nerve block versus caudal block following front thigh surgery in infants and young children

Micic S., Komen Usljebrka H., Horvat M., Poldan Grabar N.
KBC, Rijeka Clinical Hospital Centre, Department of Anaesthesiology and Intensive Care, Rijeka, Croatia

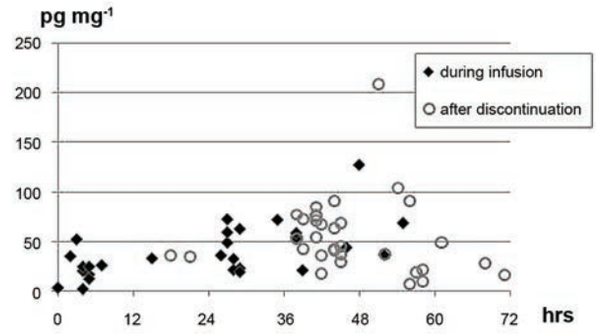
Background and Goal of Study: Common approach to the front thigh surgery in infant end young children was combination of general anesthesia and caudal block. Peripheral ultrasound guided femoral nerve block (UGFNB) might be a good alternative when the caudal block (CB) contraindicated or difficult to perform. Our goal was to compare the efficacy of UGFNB vs. CB for postoperative pain relief, as well as diclofenac-sodium and morphine sulphate consumption in infants and small children undergoing front thigh surgery.
Materials and Methods: The study was approved by the institutional Ethics Committee and written informed consent was obtained .Fifteen patients, ASA I-II, aged from 8 to 18 months were included to the study. Children were prospectively randomized to receive UGFNB (Group I) or CB (Group II). Each child was premedicated with 0.4 mg/kg midazolam syrup. A standardized general anesthesia was induced with sevoflurane and N2O in oxygen (ratio 1:1). Standard anesthesia monitoring was employed. Both groups received 0.1μg/kg sufentanil loading dose prior to orotracheal intubation. After the induction patients in Group I (n=8) received UGFNB with 0.25% levobupivacaine 0.4 ml/kg, and in Group II (n= 7) received CB with 0.25% levobupivacaine 0.5 ml/kg. Anesthesia was maintained with sevoflurane-N2O. Postoperatively, after discharge to the surgery department, Children and Infants postoperative Pain Scale (CHIPPS) in combination with Face Scale were obtained at hours 1-6-12 and 24 by surgery department nurses. If pain score was 3 or more the child received diclofenac-sodium 0.5 mg/kg per rectum, and if 6 or more morphine sulphate 0.05 mg/kg intravenously was added.
Results and Discussion: Between the groups pain score at hour 1 exhibits none clinical difference ($p>0.05$; UGFNB = 0.75; CB = 0.42), as well as pain score at hours 6,12 and 24 that were similar. Total 24 hours morphine consumption was almost equal between groups (0.013 mg/kg for UGFNB and 0.012 mg/kg for CB group), as well as for diclofenac-sodium (1.15 mg/kg for UGFNB and 1.25 mg/kg for CB group).
Conclusion(s): US guided femoral block provides good postoperative pain relief. Postoperative morphine and diclofenac sodium consumption did not differ significantly between groups. Ultrasound guided femoral nerve block could bee a good alternative to the caudal block for postoperative pain relief in infants and small children undergoing front thigh surgery.

10AP4-5

Epidural sufentanil with ropivacaine for postoperative pain relief in infants: Postinfusion pharmacokinetics

Woloszczuk-Gebicka B., Grabowski T., Karas-Trzeciak M.
Medical University of Warsaw, Department of Anaesthesiology and Intensive Care, Warsaw, Poland

Background and Goal of Study: Epidural opioids are combined with diluted local anesthetics to improve analgesia and reduce side effects. Plasma concentrations during continuous epidural postoperative infusion have been reported in children 5-12 y.o. [1], but no data are available with respect to infants. Therefore, we investigated this in infants receiving 0,2% ropivacaine with sufentanil for postoperative pain relief following major abdominal and urological procedures.
Materials and Methods: With consent of local Ethics Committee and with informed parental consent, 13 infants (10.4 ± 9.9 months old, 8.7 ± 2.7 kg, ASA SP groups I and II) were involved in the study. Epidural catheter was placed under general anesthesia in the L3-L4, L4-L5 or L2-L3 space and threaded not further than 4 cm into the epidural space. During surgery, 0.2% ropivacaine, 0.3 mg kg^{-1} h^{-1} with sufentanil 112 ng kg^{-1} h^{-1} was given. For the postoperative period sufentanil dose was reduced to 37 ng kg^{-1} h^{-1}. Epidural infusion was maintained for 42 (up to 56) hours. Blood samples were drawn at the completion of surgery, 24 and 36 - 50 h later, as well as 3, 6 and 18 hours after discontinuation of the infusion.
The analyses were performed on Acquity UPLC system with MS/MS detector (Waters Micromass Quattro micro™) and Waters UPLC Acquity BEH C8 2.1/50mm, 1.7 μm.
Results and Discussion: Vast majority of the measured values exceeded 30 pg ml^{-1}, which suggests that excellent analgesia observed could be attributed in part to the systemic action of the opioid.



[Sufentanil concentration in plasma (pg ml-1)]

In the majority of infants, sufentanil concentration in plasma did not decline immediately after discontinuation of epidural infusion: a distinct redistribution phase was observed.
Conclusion(s): Sufentanil,when administered by epidural infusion, provides excellent postoperative pain relief, acting both on the spinal cord and systemically. Respiratory depression seems possible, and monitoring is compulsory
Reference:
1. Br J Anaesth 2000; 85: 615-7.

10AP4-6

Warm lidocaine/tetracaine patch versus lidocaine/prilocaine cream before intravenous canulation of children: A randomized controlled trial

De Jong C.J., van Wijk A.J., Veerkamp J.S.J.
Academic Centre for Dentistry Amsterdam (ACTA), Department of Social Dentistry and Behavioural Sciences, Amsterdam, Netherlands

Background and Goal of Study: To compare the efficacy of a warm topical lidocaine/tetracaine (LT) patch with lidocaine/prilocaine (LP) cream in preventing pain during intravenous (IV) canulation,testing the hypothesis that application of the warm patch reduces the pain of IV canulation better than lidocaine/prilocaine cream.
Materials and Methods: A randomized, double-blind, controlled trial in a paediatric secondary dental care clinic. Patients aged 3 to 9 years requiring IV canulation for general anaesthesia for extensive dental treatment were eligible for enrolment. All patients were seen during a pre-anaesthesia visit. Patients were randomly assigned to either the LT or LP condition and received written instructions to apply the patch or cream on both hands prior to arriving at the practice. On arrival a nurse not aware of the aim of the study removed the LT or LP prior to presenting the patient to the anaesthetist.
VAS score of pain during canulation was done by anaesthetist (VAS I), anaesthesia nurse (VAS II) and parent (VAS III). Registrations were made of time needed for effective canulation, attempts needed for effective canulation and number of needles used. Registrations concerning reluctant child behaviour (e.g. pulling away hand during needle insertion), or whether insertion was easy

or troublesome according to the anaesthetist and parent were also made. Statistical analysis was done with independent sample T-tests and Mann Whitney tests.
Results and Discussion: 130 children were included in the analysis. Average VAS scores were lower in the LT group, but only VAS I was significantly lower, then LP group. Results indicated a smoother canulation according to the anaesthetist, a shorter procedure (2,42 min LT versus 5,30 min LP group ($p< 0,05$)), less attempts (1,39 versus 1,72 ($p< 0,05$)) needed for effective IV canulation and a reduction in number of needles needed. Behavioural variables, like pulling away arm (25% in LP and 54% in LT group), were significantly lower ($p< 0.05$) when using the lidocaine/tetracaine (LT) patch.
Conclusion(s): The warm lidocaine/tetracaine patch LT was better in reducing pain on IV canulation compared to the lidocaine/prilocaine cream LP. According to both parents, anaesthetist and anaesthesia nurse the use of a (LT) patch improves the quality of the introduction phase of paediatric anaesthesia.

Obstetric Anaesthesia

11AP1-1

How does it hurt after delivery? A propective study intending to assess the intensity of pain after labour at our institution

Santos S.M., Quesada M., Manso F.
Hospital Fernando Fonseca, Department of Anaesthesiology and Pain Medicine, Amadora, Portugal

Background and Goal of Study: This work had the objective of outlining the scores of pain during and after labour, as well as the analgesic technique used since it influences the mother's wellbeing and her ability to efectively take care of the baby.
This sutdy was conducted at a Portuguese hospital with about 4000 birth/year and an average cesarean rate of 27%.
We used the visual analogic scale of pain (0-10) to report patients' degree of pain.
Materials and Methods: After informed consent, and during the period of 6 months, pregnant women were asked about their degree of pain before labour/analgesic technique. After analgesia, they were asked again to report their degree of pain, as well as 24 hours after delivery.
The following items were collected:

- Degree of pain before and after the technique
- Analgesic technique used (spinal, epidural, combined, oral intake)
- Analgesia after delivery
- Type of delivery (eutocic, distocic, Cesarean)
- Exclusion criteria
- Emergent delivery
- Substance dependence
- Smoker
- Preterm birth

Statistical Methods used
Mann-Whitney test was used in assesing nonnormaly distributed variables.
The statistical significance was accepted at the level of $p\leq0,05$
Analyses were performed by using the SPSS version 13.0 (SPSS Inc., Chicago, IL)
Results and Discussion: 153 pregnant women were evaluated. We excluded 21 individuals during the course of the study due to consumption of drugs, alcohol or smoking, and another 3 individuals for preterm delivery.
The median age was 30,9 years (+/- 10 years).
During this period, the incidence of distocia was 10% and cesarean rate of 32,4%
The methods of pain relief used for delivery and after-labour analgesia are summarized on table 1.

Delivery Mode	Analgesia/Anesthesia before labour				Analgesia after labour	
Cesarean	**Epidural**	**Spinal**	**Combined**	**General**	**Epidural**	**Paracetamol+Ketorolac +Tramadol (SOS)**
32,4%	6,25%	56,25%	36,2%	1,3%	37,5%	62,5%
VAS scores (0-10)	3,2±2	1,1±0,5	0		4,5±2,2	5,2±1,4

Vaginal	**Epidural**	**Spinal**	**Combined**	**Nothing**	**Paracetamol**	**Paracetamol +SOS**	**Nothing prescribed**
67,6%	43%	1,2%	22,3%	33,5%	80%	2%	18%
VAS scores (0-10	4,3±1,2	3,7±1,3	3,1±2,1	9,5±0,5	4,1±1,8	2,5±0,3	6,2±2,1

[Pain Scores]

Conclusion(s):
There is a need of improving epidural rates and post-labour analgesia;

- The degree of pain during cesarean was lower with subarachnoid block in comparision with epidural ones ($p< 0,01$);
- The degree of pain relief after cesarean delivery was lower when there was an epidural catheter left in place.

11AP1-2

Combined spinal(morphine)-epidural analgesia does not shorten labor and delivery compared to epidural analgesia: A randomised study

Pascual Ramírez J., Haya J., Pérez López F., Gil Trujillo S., Garrido Esteban R.A., Calatayud L.
Hospital General de Ciudad Real, Department of Anaesthesiology, Miguelturra, Spain

Background and Goal of Study: Intrathecal (IT) opiates combined with epidural local anesthetics provide labor and delivery (L&D) analgesia, sparing epidural local anesthetic use and subsequent motor weakness. Combined spinal-epidural analgesia (CSEA) should decrease the known epidural effect of lengthening delivery, provided less motor weakness is achieved.
Materials and Methods: We randomised 144 women on labor to receive either low-dose epidural analgesia (LEA) or CSEA. The spinal component included bupivacaine 2.5 mg, fentanyl 25 μg and morphine 200 μg; the epidural component of the CSEA was started upon second request with ropivacaine 0.125%. The primary outcome was L&D length since the analgesic procedure was started.
Results and Discussion: The combined group used less amount of ropivacaine ($p< 0.001$) and had lower dermatomal level blockade ($p=0.037$). The length difference LEA-CSEA was 5 minutes for labor ($p=0.82$; 205±109 vs. 210±131; 95% CI 38-48), 2 minutes for delivery ($p=0.60$; 41±32 vs. 43±34; 95% CI 15-9) and 7 minutes for total L&D duration ($p=0.75$; 246±112 vs. 253 ±141; 95% CI 34-39). Women in the CSEA-treated group had higher incidence of pruritus ($p=0.002$) and lightheadness ($p=0.02$) during labor, and higher incidence pruritus ($p=0.002$), nausea-vomiting ($p=0.026$) and drowsiness ($p=0.003$) in the postpartum. The mean Pain Numeric Rating score was lower for the CSEA-treated women during delivery ($p=0.002$), while Satisfaction interview was better for the LEA-treated group during labor ($p=0.005$).
Conclusion(s): Combined spinal opioid analgesia did not shorten L&D lengths as compared to epidural analgesia. The CSEA increased pruritus, nausea and lightheaded-drowsiness rates.

11AP1-3

Type of axial analgesia does not influence time to vaginal delivery in a proportional hazards model

Pascual Ramírez J., Haya J., Pérez López F., Gil Trujillo S., Bernal G.
Hospital General de Ciudad Real, Department of Anaesthesiology, Ciudad Real, Spain

Background and Goal of Study: A recent retrospective study described a biexponential function to fit the progress of labor for nulliparous women [1]. Maternal weight, neuraxial analgesia and Asian ethnicity were associated with slower active labor in that model.
Our study goal was to propectively develop a model of covariates associated to time-to-vaginal-delivery (TTVD) since the placement of a neuraxial analgesia technique.
Materials and Methods: 142 parturients underwent either a levobupivacaine labor epidural (bolus 0.25% or less and perfusion 0.125% or less) or a combined spinal (morphine 0.20mg, fentanyl 25μg and hyperbaric bupivacaine 2.5mg) with epidural (started upon a second analgesia request) procedure. Factors with a $p < 0.25$ or considered clinically important were included in the initial model. A systematic Cox regression was applied to obtain the minor model. Interaction and confusion factors were examined. Covariates with a $p< 0.05$ remained in the final model.
Results and Discussion: The relative risk (RR) for a nulliparous woman to have longer TTVD than a primiparous is 2.5 times higher ($p< 0.001$, confidence interval [CI] 1.76 - 3.80), and 3.4 times ($p=0.015$, CI 1.27 - 9.25) higher

compared to a multiparous. The RR to have longer TTVD for a parturient with oxytocin-augmented labor is 2.05 times (p=0.001, CI 1.31 - 3.22) higher than a patient with spontaneous partum. A parturient with an induced partum has 3.8 times (p< 0.001, CI 2.09 - 6.8) more chances of having longer TTVD compared with a spontaneous partum.
Conclusion: Axial analgesia-related factors do not determine time-to-vaginal-delivery.
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11AP1-4

Neostigmne added to epidural analgesia during labour decreases anesthetic consumption

Payá E., Lopez-Gil J., Sanchez-Garcia E., Idrissi A., Morales E., Jimenez M.
Hospital General Universitario de Alicante, Department of Anaesthesiology and Intensive Care, Alicante, Spain

Background and Goal of Study: Local anesthetic epidural analgesia is the gold standard for labour pain relief. Adjuvant opioids are added to decrease local anesthetic consume and to minimize motor block and adverse effects. Neostigmine inhibits the breakdown of endogenous acetylcholine and stimulates both muscarinic and nicotinic receptors, and can lead spinal analgesia. Our main outcome is to demonstrate neostigmine's sparing anesthetic effect.
Materials and Methods: Written informed consent was obtained from 100 physical status ASA I or II women, in active labour and < 5 cm cervical dilation. A lumbar epidural catheter was inserted. All the parturients received fractionated epidural dose of 0,3% Ropivacaine plus 50mcg of Fentanil in10 ml volume after which were randomly assigned into: Group A: Ropivacaine 0,16 % + Fentanil 1 mcg/ml or Group N: Ropivacaine 0,1 % + Fentanil 1 mcg/ml + Neostigmine 20mcg/ml.Analgesia was maintained via PCEA: basal rate 8mL/h; bolus 5mL; lockout interval 15min.Total and hourly ropivacaine requirements were recorded. Maternal vital signs, Visual Analogue Scale (VAS), level of sensory and degree of motor block (Bromage scale), sedation and nausea were assessed. Foetal heart rate was continuously recorded. Mode of delivery was also reported.
Results and Discussion: There were no significant differences among groups respect to age, weight, height, ASA, cervical dilatation and labour duration. Total and hourly ropivacaine consumption and bolus was significant lower in Neostigmine group, while VAS, Bromage scale and mode of delivery remained similar.
Conclusion: Neostigmine addition to ropivacaine plus fentanil epidural analgesia significant decreased anesthetic consumption while maintaining maternal comfort.
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11AP1-5

The effects of epidural labor analgesia on the incidence of postpartum depression

Wang D.-X., Ding T., Qu Y., Chen Q., Zhu S.-N.
Peking University First Hospital, Department of Anaesthesiology and Intensive Care, Beijing, China

Background and Goal of Study: Postpartum depression is a common and deleterious psychiatric disorder of women who have recently given childbirth. The etiology of postpartum depression remains poorly understood and high circulating cortisol level was found to be associated with the occurrence of depression in non-pregnant patients. The purpose of this study was to investigate the relationships between the use of epidural labor analgesia, the concentration of salivary cortisol and the occurrence of postpartum depression.
Materials and Methods: This was a prospective cohort study. Two hundred and fourteen consecutive parturients who were admitted to the delivery room were enrolled. Baseline characteristics and perinatal variables were collected. Saliva samples were obtained on the first postpartum day and salivary cortisol concentrations were measured. Postpartum depression was assessed using Edinburgh Postnatal Depression Scale on the 3rd and 42nd day after delivery.
Results and Discussion: Postpartum depression occurred in 24.3% of women (52 of 214) at 6 weeks after delivery. There were no significant interrelationship between the use of epidural analgesia and the concentration of salivary cortisol (Spearman correlation coefficient = 0.022, P = 0.783). Multivariate logistic regression analyses revealed that acceptance of prepartum maternal education (OR 0.331, 95% CI 0.123 to 0.889, P = 0.028), use of epidural analgesia during labor (OR 0.301, 95% CI 0.111 to 0.812, P = 0.018) and initiation of breastfeeding after childbirth (OR 0.017, 95% CI 0.004 to 0.080, P < 0.001) were independent protective factors, while high level of salivary cortisol on the first postpartum day (OR 1.245, 95% CI 1.032 to 1.501, P = 0.022) and high score on Edinburgh Postnatal Depression Scale on the third postpartum day (OR 1.187, 95% CI 1.027 to 1.370, P = 0.020) were independent risk factors of postpartum depression.
Conclusions: Postpartum depression was a common psychiatric disorder. High salivary cortisol level was associated with increase risk while epidural labor analgesia was associated with decreased risk of the occurrence of postpartum depression. However, epidural labor analgesia did not decrease the concentration of salivary cortisol.
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11AP1-6

Long-term effects of delivery mode on children's intelligence development: A pilot study

Wang D.-X., Yan T., Qu Y., Chen Q., Zhu S.-N.
Peking University First Hospital, Department of Anaesthesiology and Intensive Care, Beijing, China

Background and Goal of Study: The rate of caesarean section has been increasing worldwidely. However, the effects of delivery mode on children's intelligence development are uncertain. The purpose of this study was to investigate the long-term effects of delivery mode on children's intelligence development.
Materials and Methods: This was a retro-prospective cohort study. Five-year old preschool children who were delivered by primiparae with full-term single pregnancy and head presentation at Peking University First Hospital were enrolled. Baseline characteristics as well as data of pregnant, perinatal, and growing periods were collected. Children were tested with China-Wechsler Young Children Scale of Intelligence to assess intellectual quotient.
Results and Discussion: Two hundred and forty-six children were enrolled. The percentage of children with intellectual quotient of less than 110 was significantly higher in the planned cesarean delivery children than in the planned vaginal delivery ones (33.3% vs. 18.3%, P = 0.014). Multivariate Logistic regression analyses revealed that low education level of parents (OR 4.660, 95% CI 2.180-9.959, P < 0.001), family per capita income of less than 2000 CNY (OR 4.083, 95% CI 1.264-13.189, P = 0.019), planned cesarean delivery (OR 3.424, 95%CI 1.550 to 7.567, P = 0.002), transient neonatal asphyxia (OR 30.842, 95% CI 3.494-272.245, P = 0.002), and admission to neonatal intensive care unit after birth (OR 3.636, 95% CI 1.114-11.866, P = 0.032) were independent risk factors of intellectual quotient of less than 110. In children of planned vaginal delivery, low education level of parents (OR 6.456, 95% CI 2.449-17.021, P < 0.001), family per capita income of less than 2000 CNY (OR 8.249, 95% CI 2.146-31.702, P = 0.002), and transient neonatal asphyxia (OR 101.069, 95% CI 9.351-1092.395, P < 0.001) were independent risk factors, while use of epidural analgesia during labor (OR 0.310, 95% CI 0.104-0.924, P = 0.036) was an independent protective factor of intellectual quotient of less than 110.
Conclusion(s): Planned cesarean delivery was associated with increased risk of intellectual quotient of less than 110. While epidural labor analgesia might be favorable to children's long-term intelligence development.
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11AP1-7

The clinical significance of pain, cognitive activity and epidural analgesia during labor

Balcan A., Cindea I., Nicolae G., Gherghina V.
Emergency Clinical Hospital of Constanta, Department of Anaesthesiology and Intensive Care, Constanta, Romania

Background and Goal of Study: Latent labor is a critical phase in the psychobiology of labor and that pain and cognitive activity during this phase are important contributors to labor efficiency and obstetric outcome. This study

examined the dynamic interplay between subjective pain, pain behavior and cognitive activity during the latent (less than or equal to 3 cm), mid-active (5-7 cm) and transition (greater than or equal to 8 cm) phases of labor in 92 nulliparous women.
Materials and Methods: Patients received no analgesia during the latent phase and either no analgesia(group A; n = 46) or epidural analgesia(group B; n = 46) during the active and/or transition phase. Data were analyzed according to phase and analgesic condition. Patients provided subjective pain ratings and described their thoughts during each of the three phases. Present Pain Intensity (PPI) , Present Behavioral Intensity (PBI) ,Coping/Distress scoreswere recorder for all patients.
Results and Discussion: For subjects with no epidural analgesia, both the Present Pain Intensity (PPI) and the Present Behavioral Intensity (PBI) scores were correlated within and between phases. In contrast, Coping/Distress scores were weakly correlated between the latent and active labor phases and were unrelated between the active and transition phases. PPI and Coping/Distress scores were highly correlated within the latent phase but were independent within the active and transition phases of labor. PBI and Coping/Distress scores were moderately correlated within the latent and active phases and were unrelated during the transition phase. Epidural techniques reduced subjective pain and pain behavior significantly but had no apparent effect on the coping or distress-related cognitive activity characteristic of active labor.
Conclusion(s): We concluded that coping and distress-related cognitive activity in labor may follow a phase-specific pattern which is relatively independent of pain or pain relief after labor has become active.

11AP1-8

Predictors of maternal satisfaction with anaesthesia during labour

Gil-Wey B., Savoldelli G.L., Kern C.G., Haller G.
University Hospitals of Geneva, Department of Anaesthesiology, Geneva, Switzerland

Background and Goal of Study: Assessing maternal satisfaction with anaesthesia provides a valuable insight into patients' perspective on the quality of anaesthetic care provided. It is however largely unknown which factor really contribute to maternal satisfaction. The study purpose was to determine the predictors of maternal satisfaction with anaesthesia management during childbirth.
Materials and Methods: We performed a retrospective cohort study on 15 386 parturients admitted between August 2003 and November 2008 in our labour and delivery units. We used anaesthetic records and retrieved data on patients' demographics, comorbidities, procedures performed and various aspects of their anaesthetic experience including their level of satisfaction measured on a Likert scale from 0-10. We performed a multivariate analysis to identify the different predictors of maternal satisfaction and more specifically those related to pain management, continuity and coordination of care, experience of the anaesthetic procedure and complications.
Results: We found that 761 parturients (7.6%) were dissatisfied with their anaesthetic care. Factors decreasing patient satisfaction were a high risk pregnancy and a dystocic delivery process, OR 95% CI 0.59 (0.34-1.02) and 0.62 (0.52-0.74) respectively. In addition, pain, a negative experience of the anaesthetic procedure performed, delay in analgesia, perceived poor coordination within healthcare teams and the presence of maternal or neonatal complications following delivery were the main factors decreasing patient satisfaction, OR 95% CI 0.07 (0.06-0.09) to 0.71 (0.59-0.85), $P < 0.001$.
Conclusion(s): Maternal satisfaction with anaesthesia care is largely determined by the effectiveness and overall experience of the anaesthetic procedure performed. However, other factors such as a good coordination in patient management and the absence of complications also influence maternal satisfaction. These should be all considered when defining and assessing quality of anaesthesia care during labour and delivery.

11AP2-1

Three different doses of ketamine during general anaesthesia in caesarean section: A double blind, placebo controlled, randomized clinical trial

Bilgen S., Köner Ö., Türe H., Menda F, Fıçıcıoğlu C., Aykaç B.
Yeditepe University, Department of Anaesthesiology and Intensive Care, İstanbul, Turkey

Background and Goal of Study: Ketamine is a NMDA receptor antagonist which is suitable for the induction of anaesthesia during Caesarean section. NMDA receptor antagonists have a preventive effect on perioperative pain and may enhance the efficacy of treatment of both acute and prolonged postsurgical pain (1). In this clinical trial, we examined the optimal analgesic dose of ketamine and its effects on morphine consumption during Caesarean section under general anaesthesia. We also evaluated the effects of ketamine on late postoperative pain.
Materials and Methods: We randomized 160 term pregnant women undergoing elective Caesarean section into four groups (n = 40 each), according to treatment during anaesthesia induction: groups 1 to 3 were given ketamine 0.25, 0.5, or 1 mg/kg iv, respectively, along with propofol and rocuronium, while group 4 (control) was given propofol, rocuronium and placebo. The participants, care givers, and those assessing the outcomes were blinded to group assignment. Apgar scores and haemodynamic variables were recorded during anaesthesia. Groups were compared regarding the cumulative morphine consumption and pain scores assessed with a numerical rating scale at 2, 6, 12, 18, 24, and 48 h postoperatively. Postoperative side effects were recorded. Patients were evaluated for persistent postoperative pain at 2 weeks, 1 and 6 months, and 1 year.
Results and Discussion: Groups were comparable regarding the cumulative morphine consumption and pain scores assessed with a numerical rating scale at 2, 6, 12, 18, 24, and 48 h postoperatively. There was no significant difference in terms of acute, prolonged postoperative pain, morphine consumption, or side effects among the groups. Apgar scores were also similar among the groups. There was no difference in haemodynamic measurements between the groups.
Conclusion(s): Pre-emptive ketamine doses of 0.25, 0. 5, and 1 mg/kg decreased neither early nor late postoperative pain in women undergoing Caesarean section with general anaesthesia, compared with the control group. Ketamine did not decrease the postoperative morphine consumption either.
References:
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11AP2-2

Epidural anesthesia for cesarean delivery in an obese woman with idiopathic intracranial hypertension

Petropoulos G., Karmaniolou I., Chondrogiannis K., Makris A.
Aretaieio Hospital, Medical School, Department of Anaesthesiology and Pain Medicine, Athens, Greece

Background and Goal of Study: Idiopathic intracranial hypertension(IIH) is characterized by increased cerebrospinal fluid pressure(CSF) without any pathology in the brain or in the composition of the CSF. It affects mainly obese women of childbearing age, so it might be encountered in pregnancy. The most frequent symptoms are headache, nausea and vomiting.The cardinal sign is papilledema. The symptoms often worsen during pregnancy and resolve after delivery.Treatment should be focused on preventing visual loss and initially includes control of weight gain,diuretics and corticosteroids. We present a case involving a cesarean section in a woman with IIH.
Materials and Methods: The patient was a 31-year-old woman G3P0, with BMI 43 kg/m^2. The diagnosis of IIH was made a year ago. Her symptoms at that time were headache,nausea and vomiting, while the MRI revealed a partially empty sella turcica (a relatively common finding in these patients) and the lumbar puncture a CSF pressure of 26 cm H_2O with normal composition. She had received acetazolamide until the 25th week of pregnancy.Her neurologic examination at term pregnancy was unremarkable. She was placed in the sitting position and the epidural space was identified on the first attempt at the O3-4 level with a 18G Tuohy needle, using loss of resistence to air. A multi-orifice catheter was introduced 5 cm into the epidural space and since no CSF or blood was aspirated, a test dose(3ml of lidocaine 2%) was given. Subsequently, we administered 18ml ropivacaine 0,75% and 100 γ fentanyl in divided doses over 15 minutes. Left uterine displacement was achieved with a wedge. Surgical anesthesia to a T4 sensory block was followed by delivery of a healthy baby. The patient remained stable throughout the procedure. The epidural catheter was used for postoperative analgesia and was removed 24 hr after delivery. She had an uneventful postoperative course.
Results and Discussion: It is important that the anesthetic technique does not cause a further raise in ICP that could compromise the patient's vision. Lumbar puncture is not contraindicated. Indeed, it is used-as therapeutic modality-to lower ICP.The effect of raised ICP on the spread of local anesthetic injected spinally is unknown.
Epidural anesthesia offers a better control over the spread using incremental doses.
Conclusion: Although IIH is a rare disorder. anesthesiologists must be familiar with its management and the possible complications.

11AP2-3

The comparative of effect of bolus-infusion oxytocine with infusion oxytocine on blood pressure, heart rate, and uterine contraction of women undergoing elective caesarean section with general anesthesia N_2O-sevoflurane

Bisri Y., Redjeki I.S., Himendra A.
Hasan Sadikin Hospital Bandung, Department of Anaesthesiology and Intensive Care, Bandung, Indonesia

Background and Goal of Study: Oxytocin (oxy) is routinely given to stimulate uterine contraction in order to reduce blood loss in caesarean section. This oxy, however, may bring about hypotension, and increase as well as decrease of heart rate. The objective of this study is to evaluate oxy bolus and infusion effects on blood pressure, heart rate, and uterine contraction.
Materials and Methods: A Randomized Controlled Trial, double blind was conducted on 100 patients of elective caesarean sections. Inclusion criteria is aterm pregnant women for elective caesarean section,physical status of ASA I-II, voluntarily join the research and fill out Informed Consent,18-40 years of age,first and second pregnancy. These patients were randomly divided into 2 group, group I (oxy bolus) and group II (oxy infusion). The measurement of systolic, diastolic, mean arterial pressure, and SpO_2, which was conducted every minutes and LAS was measured every 3 minutes within 15 minutes period after the application of oxy. Statistical data for blood pressure, heart rate, and SpO_2 are analyzed with student-t test, whereas LAS is analyzed with Mann-Whitney.
Results and Discussion: This study show that the decrease of Systolic, diastolic, mean arterial pressure in oxy bolus group was greater than that in oxy infusion ($p < 0.001$). The decrease of heart rate in oxy bolus group was greater than that in oxy infusion ($p < 0.05$). The possibility cause is negative inotropic and chronotropic effect as direct effect of oxy to the heart. Uterine contraction with LAS ≥ 6 was reached faster by oxy bolus than oxy infusion ($p < 0.05$). The possibility cause oxcytocin bolus is faster to get therapeutic window than infusion. The addition of methergin occurred more in oxy infusion than oxy bolus ($p < 0.001$). The possibility cause the peak plasma level of oxy bolus faster than oxy infuse and it can made the uterine contraction faster.
Conclusion(s): Group oxy bolus decrease blood pressure and heart rate more than oxy infusion. Adequate uterine contraction is reached faster in the oxy bolus group and the addition of methergin occurs more in the oxy infusion.
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11AP2-4

Differential impacts of anaesthesia modes on risk of surgical site infections in caesarean section patients: A population-based study

Tsai P.-S., Huang C.-J., Fan Y.-C.
Taipei Medical University, College of Nursing, Taipei, Taiwan, Republic of China

Background and Goal of Study: This study compared the risk and hazard ratios (HR) of surgical site infections (SSI) within 30 days of surgery (referred to as 30-day SSI in this study) between patients who received general anaesthesia and those who received neuraxial anaesthesia (i.e., epidural or spinal anaesthesia) for Caesarean section (CS) delivery.
Materials and Methods: This study used 2002-2007 data from the Taiwan National Health Insurance Research Database. A total of 303862 women who underwent CS delivery were included. The Chi-square test was used to compare the differences in 30-day SSI between general and neuraxial anaesthesia patients. The logistic regression test was used to estimate the HR of 30-day SSI for general anaesthesia compared with neuraxial anaesthesia before and after adjustment of the propensity score and possible confounders.
Results and Discussion: Of the 303862 CS patients, 1129 (0.4%) patients had 30-day SSI. Of the 1129 patients who had 30-day SSI, 159 (1.3% of all general anaesthesia patients) patients received general anaesthesia and 970 (0.3% of all neuraxial anaesthesia patients) patients received neuraxial anaesthesia ($p < 0.001$). The unadjusted HR of 30-day SSI for general anaesthesia was 3.85 (95% CI, 3.25 - 4.56; $p < 0.001$). After adjusting for the propensity score and possible confounders, the adjusted HR of 30-day SSI for those who received general anaesthesia remained 3.21 (95% CI, 2.68 - 3.84; $p < 0.001$) times as high compared with those who received neuraxial anaesthesia.
Conclusion(s): General anaesthesia for CS delivery is associated with increased risk of surgical site infections within 30 days of surgery as compared with neuraxial anaesthesia in CS delivery patients.

11AP2-5

Timing of prophylactic antibiotic administration for caesarean section deliveries - are we giving them at the right time?

Wilson S.
University College Hosptial London, Department of Anaesthesiology, London, United Kingdom

Background and Goal of Study: The use of prophylactic antibiotics to prevent post operative infections is commonplace across all surgical specialities. A recent Cochrane review examining 86 studies involving 13,000 women having caesarean sections concluded that the use of prophylactic antibiotics in this population substantially reduced the incidence of febrile morbidity, wound infection, endometritis and serious maternal infectious complications. Ideal blood levels yielding the greatest risk reduction in postoperative infections are achieved if antibiotics are given 30-60 minutes prior to skin incision, with administration outside of these times being associated with increased infection rates.
In the obstetric setting, concerns as to the possibility of masking pre-existing neonatal infections or increasing the risk for developing resistant organisms may influence the timing of prophylactic antibiotic administration, with possible delay in administration until after cord clamping and infant delivery. Recent randomised controlled trials have shown significant maternal benefits from preoperative antibiotic administration through associations with significant reductions in total infectious morbidity and specifically in endomyometritis. In addition, there is no demonstrated evidence for any difference between groups that were given prophylactic antibiotics pre-delivery versus post cord-clamping in terms of neonatal sepsis rates or the need for neonatal intensive care admissions.
The aim of this survey was to collect data as to common practice across obstetric units in the UK regarding timing of prophylactic antibiotic therapy administration for caesarean section deliveries in order to assess whether or not current practice followed the evidence base discussed.
Materials and Methods: An online survey was sent to all obstetric anaesthetists and trainees across the UK containing questions regarding local and personal practice as to timing of administration of prophylactic antibiotics for caesarean sections and the reasons for this.
Results and Discussion: Results of this survey suggest that the vast majority of anaesthetic departments did not have clear guidelines for the timing of administration of prophylactic antibiotics in caesarean sections, with most antibiotics being given after cord clamping.
Conclusion: Current UK-wide practice in timing of administration of prophylactic antibiotics in caesarean section does not appear to follow the evidence base.

11AP2-6

Comparison of 2 versus 5 units of oxytocin in caesarean section

Ayedi M., Zouche I., Smaoui L., Bouaziz I., Smaoui M., Kolsi K.
Hopital Hedi Chaker, Department of Anaesthesiology and Intensive Care, Sfax, Tunisia

Background and Goal of Study: Dose of oxytocin which must be administrated at Caesarean section (CS) is still unclear[1]. Oxytocin may cause adverse cardiovascular effects as tachycardia and hypotension[1], whereas an insufficient dose can cause uterus atony and so increase uterine bleeding[2]. The aim of this study is to compare the effects of two doses of oxytocin in a randomized double-blind trial.
Materials and Methods: After local ethic committee approval and informed consents, 60 healthy pregnant women (term>37 weeks gestation) undergoing CS under spinal anesthesia were randomized to receive either 2 units (G1) or 5 units of oxytocin (G2). After delivery of the baby and cord clamping, the anesthetist gave a 5 ml i.v. bolus of pre-prepared oxytocin solution (containing 2 or 5 units), over 5-10 sec.
Uterus tone (UT) was assessed by a blinded obstetrician as either adequate or inadequate, and using a verbal numerical scale score 1=atonic; 2=partial but inadequate; 3=adequate contraction; 4=well contracted; and 5=very well contracted at 2, 4, 6, 8, 10, 12 and 14 min after oxytocin administration. Oxytocin related side-effects (including tachycardia, hypotension, nausea, and vomiting) were recorded. If UT was assessed as adequate at 2 min, an oxytocin infusion was commenced. If UT was assessed as inadequate, a ‚rescue' bolus of 2.5 units of oxytocin was administered. If UT was assessed as

inadequate after four rescue doses of oxytocin, alternative uterotonic therapy was administered (sulprostone).
Data were entered and analysed using SPSS11.0, Student's t-test was used for parametric data; non-parametric data were analysed with a Khi-2 test.
Results and Discussion: 60 patients were enrolled, all completed the study; demographic characteristics were similar among the 2 groups.
There was no differences in UT at any measurement time and in the number of patients who required rescue doses of oxytocin (15 for each group). Blood loss was similar in the 2 groups (215 ml in G1 and 301ml in G2, P>0.05).
Increase of heart rate 2 min after oxytocin was more frequent in G2 (15 versus 8 in G1, P=0.025), there was no difference in other side effects.
Conclusion: Adequate UT during CS can occur either with 2 or 5 units of oxytocin , but the use of 2 units seems to be more safe as it cause less hemodynamic effects mainly tachycardia.
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11AP2-7

Spinal anaesthesia for Cesarean section in pulmonary hypertension patients: Top goals

Tkachou A.
Belarusian Medical Academy of Post-Graduate Education, Department of Anaesthesiology and Intensive Care, Minsk, Belarus

Background and Goal of Study: Pulmonary arterial hypertension (PAH) due to high maternal and fetal morbidity and mortality rates(1). It is common practice to use general anesthesia in pregnant with severe PAH. After deep clinical investigation we study top goals of different anesthesia technics in PAH pregnant undergoing Cesarean delivery.
Materials and Methods: In total 59 women with congenital heart disease (38-atrial septal defect, 12- ventricular septal defect, 9-patent ductus arteriosus) are surveyed. The PAH (108±34,7 mm Hg) complicated disease flow in all case. All patients had 4 class on ASA, and AAA. 47 pregnant women had III class on NYHA, 12 - IV class on NYHA. 14 patients received normodipine from 2,5 to 5 mg/day, all pregnant women treated by sildenafil 100-150 mg/day and dalteparin 5000 IU/day. Spinal anesthesia was used in 100 % of cases.
Results and Discussion: The main objective - to keep the left-right shunt orientation and not to admit a hypoxia. For this goals, we catheterized radial artery and pulmonary artery by Svan-Gans catheter, then invasive monitoring of two mean arterial pressures began. Preload was not conducted. Spinal anesthesia with Marcaine-spinal 0,5% - 2,2-2,5 ml and sufenta 5-10 μg was performed. Phenylephrine by syringe pump (10-17 μg/kg/h), and fractional introduction in the common dose to 30-35 μg/kg/h at once was prescribed. Mean arterial pressure at operation stages compounded 77±1,3 mmHg, and mean pressure in pulmonary arteries 72±2,4 mmHg. Oxygenation did not decrease below 97 %.
Conclusion(s): Spinal anesthesia with tight control of systemic hemodynamic and pulmonary pressure provides a good analgesia, oxygenation and arterial lactate concentration (1,8±0,2). Development of a subarachnoidal anaesthesia was accompanied by moderate hypotension, which correction coinfusion of crystalloids (to 200 ml during operation) and phenylephine titration.
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11AP2-8

Which is the best method of hypotension prevention in caesarean section (CS) under combined spinal-epidural (CSE) anaesthesia?

Petropoulou O., Tzaneti A., Goulas S., Katsetos C.
General Hospital of Piraeus, "Tzaneio", Department of Anaesthesiology, Piraeus, Greece

Background and Goal of Study: The aim of the study was to assess the most effective prevention of hypotension between different methods of preloading in parturients scheduled for CS under CSE anaesthesia.
Materials and Methods: We studied 60 parturients, ASA I-II, aged 25-35 years old, height > 160cm and < 170 cm with similar demographic data, scheduled for CS under CSE anaesthesia. The study exclusion criteria included : hypertension, cardiovascular disorders or administration of drugs affecting the cardiovascular system. The parturients were divided into four groups, by blinded randomization. Group A (n=15): control group, without preloading. Group B (n=15): preloading with crystalloid solutions 15 ml,kg^{-1}. Group C (n=15): preloading with colloid solutions 5ml,kg^{-1}. Group D (n=15): preloading with combined use of crystalloid 7,5ml,kg^{-1} and colloid 2,5ml,kg^{-1} solutions. After locating the epidural space, O_2-O_3, in all groups of parturients and using the technique needle through needle a cephalid infusion of 1,2ml ropivacaine 0.75% and 15μg fentanyl administered intrathecal. The sensory block did not exceed T4. The assessed parameters, every 1 min until the ligation of umbilical cord and then every 3 min until the end of operation were: blood pressure (BP) and heart rate (HR). The statistical analysis of the results was done by the method Kruskall-Wallis, ANOVA, with Bonferroni control. The comparison between the groups with the smallest decrease of BP and HR was done with the Mann-Whitney trial. Statistical significant (SS) difference was considered when p< 0,05.
Results and Discussion: The statistical analysis of the results showed SS difference between groups for both BP and HR until the ligation of the umbilical cord, p< 0,05. However, the decrease of BP and HR, which was observed between groups, was much less in groups C and D. Comparison between groups C and D showed SS difference in favor of group D, p=0,042. Finally there was no SS difference between groups for all the parameters for the remaining time period, p>0,05.
Conclusion(s): The study showed that the pre-hydration with combined use of crystalloid and colloid solutions for CS under CSE anaesthesia was the best method for hypotension prevention.

11AP2-9

Spinal anaesthesia for caesarean section: Comparison of maternal and neonatal effects of bolus administration of ephedrine and phenylephrine

Balcan A., Cindea I., Gherghina V., Nicolae G.
Emergency Clinical Hospital of Constanta, Department of Anaesthesiology and Intensive Care, Constanta, Romania

Background and Goal of Study: Hypotension is a major concern of the anaesthetists whenever subarachnoid block is performed especially in obstetric patients. Vasopressors have been shown to be more effective at limiting spinal hypotension than other treatment of hypotension like preloading and left uterine displacement. . Some current evidence suggests that phenylephrine may be a better choice for treatment of maternal hypotension than ephedrine. The purpose of this study was to compare the neonatal effects of ephedrine and phenylephrine administered as an intermittent bolus to treat maternal hypotension following subarachnoid block for cesarean section.
Materials and Methods: This was a randomized, double blind, controlled study of sixty 82 healthy parturients American Society of Anesthesiologists' (ASA) status 1 and 2 at term who consented to subarachnoid block . The parturients were preloaded with 10 ml per kg of crystalloid before the induction of spinal anaesthesia with injection of 2.5 ml of 0.5% hyperbaric Bupivacaine at L3/L4 levels. A vasopressor was administered after the block if maternal blood pressure (BP) fell below 80% of baseline. Women received either 100 μg phenylephrine(group A; n = 41) or 6 mg ephedrine(group B; n = 41). Additional doses were administered if needed until BP was at least 80% of baseline.
Results and Discussion: A total of 82 women each were included in the analysis from the phenylephrine and ephedrine groups. The two groups were similar demographically. APGAR scores at 1, 5, and 10 minutes and time to sustained respirations were no different between groups. No umbilical artery pH values were below 7.2 (acidosis). Both umbilical venous and umbilical arterial pH were significantly lower in the Ephedrine group (P = 0.002 and P = 0.01). Umbilical venous and umbilical arterial base deficit were greater in the Ephedrine group as well (P = 0.001 and P < 0.001). Neurobehavioral scores at 2-4 hours, 24 hours, and 48 hours post-delivery were no different in babies born to mothers in the Ephedrine and Phenylephrine groups.
Conclusion(s): Phenylephrine 100 μg was as effective as Ephedrine 6 mg for treatment of maternal hypotension during subarachnoid block. Although there were statistically significant differences in umbilical arterial and venous pH and base deficit between groups, the differences were small and all values were within normal limits.

11AP2-10

Early and delayed antihyperalgesic effects of a low dose of ketamine in elective cesarean delivery according to preoperative quantitative sensory testing

Lavand'homme P., Roelants F.
St Luc Hospital UCL Medical School, Department of Anaesthesiology, Brussels, Belgium

Background and Goal of Study: Perioperative treatments are aimed to decrease acute pain and to prevent pain-related pathologic CNS modulation

which may lead to persistent postsurgical pain. Individual differences in endogenous pain modulation place individuals at risk to develop severe pain (Edwards R. Neurology 2005). Temporal summation (TS) which relies on NMDA receptors activation is an indirect method to evaluate CNS sensitization and nociceptive system hyperexcitability (Granot M, Curr Opin Anaesthesiol 2009; Eide PK, Eur J Pain 2000).
We here assessed the effect of an antihyperalgesic dose of ketamine (KET) after elective cesarean delivery (CD) according the presence of a preoperative TS.
Materials and Methods: All patients underwent preoperative evaluation of TS on volar forearm as following: pricking pain score (VAS, 0-100) was recorded after single application and after the last application of a train of 10 mechanical stimuli (rate 1 Hz) with a 180 g von Frey filament. The difference between the two scores was calculated as mechanical TS. Patients were then randomly allocated to receive either IV KET 0.15 mg/kg or saline before incision. Surgery was realized under spinal anaesthesia and postoperative analgesia provided by PCA morphine and diclofenac. At 24 h, postoperative pain scores were recorded. At 48h, pain scores and area of mechanical hyperalgesia (MH) surrounding the wound was tested. Duration of postoperative pain was questioned at 2 months. For data analysis, patients were classified into 4 groups according to the presence (TS+) or not (TS-) of a preoperative TS. Statistical analysis used ANOVA and Pearson's correlation, $P < 0.05$ was considered significant. (*) $P < 0.05$ with TS+ group and (&) $P < 0.05$ with KET TS+ group.
Results and Discussion: At 24 h, TS+ patients displayed higher pain scores at movement than TS- patients and KET TS+ patients. A positive correlation was found between: preoperative TS value and area of MH (0.47; $p=0.03$), area of MH and postsurgical pain duration (0.50; $p=0.03$).

	TS+ (n=19)	KET TS+ (n=21)	TS- (n=42)	KET TS- (n=45)
Wound MH at 48h	58%	45%	25% *	24% *
Scar Pain at 2 months	25%	26%	0% * &	5% &

[Postoperative data]

Conclusion(s): The use of dynamic QST may help to understand the variability of individual response to perioperative treatments. Patients with preoperative TS+ i.e. more excitable endogenous pain processes benefit from KET administration but are at greater risk of wound MH and persistent pain.

11AP3-1

Vertebral column length and spread of hyperbaric subarachnoid bupivacaine plus fentanyl in the term parturient

Chanimov M., Gershfeld S., Bahar M., Haitov Z.
Assaf Harofeh Medical Center, Department of Anaesthesiology, Zerifin, Israel

Background and Goal of Study: The correlation between the subarachnoid dose of local anesthetic and the cephalad spread of the anesthetic level is not fully understood. Several factors, including height and weight, have been proposed as determinants of the anesthetic dose requirement for spinal anesthesia. Recent evidence suggests no correlation between height and the sensory level of spinal anesthesia.[1-3] Our hypothesis was that vertebral column length (VCL), rather than body height, might be more important in determining local anesthetic spread. The purpose of this study was to evaluate the effect of VCL on sensory blockade spread in the term parturient. Secondary outcomes correlated the block height with patient age, height, weight, and body mass index.
Materials and Methods: This study examined, in 176 parturients at term, the correlation between VCL as measured from cervical vertebra C7 to the level of the iliac crest and the upper sensory level after the subarachnoid administration of 0.04 mg/cm of VCL of hyperbaric bupivacaine with 20 mcg fentanyl. Upper sensory block level, motor block, sedation level and pain were assessed. Systolic and diastolic blood pressures were measured.
Results and Discussion: A significant correlation existed between VCL and the upper sensory anesthesia level. There was no correlation between the spread of sensory block and patient age, height, weight or body mass index. The incidence of hypotension following anesthetic dose adjusted to VCL was lower than traditional results.
Conclusions: Our data show a significant correlation between VCL and subarachnoid local anesthetic spread. There was no correlation between patient age, height, weight or body mass index and the upper sensory level. Spinal anesthesia with a local anesthetic dose adjusted to VCL may help anesthesiologists choose the proper local anesthetic dose to achieve an appropriate upper anesthetic level in spinal anesthesia, with appropriate surgical anesthesia.

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11AP3-2

Distribution of epidural saline upon injection and the epidural volume effect in pregnant women

Fujita N., Higuchi H., Zhang K., Takagi S., Ozaki M.
Tokyo Women's Medical University, Department of Anaesthesiology, Tokyo, Japan

Background: The distribution of injected epidural solution and the epidural volume effect in pregnant women are not known.
Methods: Lumbar epidural catheters were placed using the loss of resistance technique with saline in 8 full-term (39 weeks gestation) parturients for labor and 8 volunteer non-pregnant women. Lumbosacral cerebrospinal fluid volume was measured on thoracic and lumbosacral axial magnetic resonance images. A repeat image series was obtained after injecting 10 ml saline into the epidural space through the catheter to compare the saline distribution (dural sac coating and exit from foramina) and cerebrospinal fluid volume before and after epidural injection. Dural sac coating was based on observation of epidural saline observed in the anterior epidural space after injection in axial magnetic resonance images at the pedicle levels from T12 to L5. Saline leakage from the foramina was determined by the same method at six disk levels from T11-T12 to L4-L5.
Results: Saline injection compressed the dural sac, significantly decreasing in cerebrospinal fluid volume in all subjects ($P < 0.001$). Compared with non-pregnant women, significantly fewer images of pregnant women showed saline surrounding the dural sac (3 vs. 0, median; $P < 0.01$) and saline leakage from the foramina (6 vs. 0, median; $P < 0.01$). The mean reduction in cerebrospinal fluid volume was significantly greater in pregnant (8.4 ± 1.4 ml) than in non-pregnant women (4.6 ± 1.1 ml; $P < 0.001$).
Conclusion: Limited dural sac coating and decreased leakage from the foramina of saline injected into the epidural space may account for the facilitation of longitudinal spread of epidural analgesia in pregnant women. The epidural volume effect is greater in pregnant women than in non-pregnant women.

11AP3-3

Determinants of adverse outcome in obstetric patients admitted to the intensive care units

Garcia T., Rasteiro C., Faria A., Rodrigues T.
Hospital São João, Department of Anesthesiology, Department of Obstetrics and Gynecology, Porto, Portugal

Background and Goal of Study: 0.1 to 0.9% of women develop pregnancy complications requiring ICU admission. Our aim was to evaluate admission variables that can predict adverse outcome (AO) in obstetric patients admitted to the ICU.
Methods: Retrospective study of obstetric patients submitted to anesthesia/analgesia for delivery and admitted to the ICU between Jan 2007 and Sep 2010. The ICUs included general ICU, neurologic ICU and post-anesthetic care unit (PACU). Maternal, delivery, anesthesia and ICU data were collected. Pregnancy induced hypertension (PIH) included pre-eclampsia, eclampsia and HELLP syndrome. Maternal mortality, ICU complications or length of stay in the hospital (LOSH) > 13 days defined AO. ICU complications included pneumonia, cerebral hemorrhage, pleural infusion, disseminated intravascular coagulation, neurological sequel, epilepsy and acute myocardial ischemia.
Results: From 10.490 deliveries, 49 patients (0.47%) were admitted in the ICU and reviewed. AO was reported in 16 cases (32.7%).
Women with AO presented more frequently maternal disease contraindicating vaginal delivery (31.2% vs 3.0%; $p=0.011$), maternal disease as criteria for ICU admission (14.3% vs 8.2%; $p=0.025$), APACHE2 >7 (57.1% vs 21.9%; $p=0.038$) and SAPS2 >16 (66.7% vs 27.3%; $p=0.01$).
No significant differences were reported in patients with AO, concerning maternal and anesthesia characteristics, namely: age $\geq$ 35 years (31.2% vs 27.3%; $p=1$), gestational age $\leq$ 35 weeks (75.0% vs 45.5%; $p=0.051$), previous C-Section (26.7% vs 18.2%; $p=0.703$), maternal co-morbidities (68.8% vs 42.4%; $p=0.084$), ASA physical state III/IV (68.8% vs 57.6%; $p=0.452$) and induction of general anesthesia for c-section (87.5% vs 84.8%; $p=1$).
Relatively to other ICU characteristics, patients with AO showed no different

rates of: anemia (87.5% vs 72.7%; p=0.30), thrombocytopenia (37.5% vs 51.5%; p=0.357), coagulopathy (31.2% vs 27.3%; p=1), acute renal insufficiency (25.0% vs 27.3%; p=1.00), alteration of liver function (50.0% vs 57.6%; p=0.617) and use of blood products (37.5% vs 54.7%; p=0.263).
Conclusions: Maternal disease indicating c-section, admission criteria in the ICU being maternal disease and the studied scores (APACHE2 and SAPS2) are variables capable of predicting adverse outcome in obstetric patients admitted in the ICU.
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11AP3-4

Atypical presentation of post dural puncture headache in the obstetric population: How frequent is it ?

Loures V., Haller G., Savoldelli G.L.
University Hospitals of Geneva, Department of Anaesthesiology, Genève, Switzerland

Background and Goal of Study: Postdural puncture headache (PPDH) is a well known complication of neuraxial techniques in obstetrics. Typical presentation includes frontal/occipital postural headache. However, some patients will have unusual signs and symptoms. This may lead to missed diagnosis and erroneous treatments. Currently, the signs, symptoms and proportion of atypical PDPH is largely unknown . The purpose of this study was to determine the incidence and clinical presentation of patients having atypical PPDH.
Materials and Methods: We performed a retrospective analysis of our quality database on data collected between 2001 and 2010. These include pre, intra and postpartum information collected within 24hrs after delivery of all patients having an anaesthetic procedure. We retrieved information on all patients with a PDPH. Atypical presentation was defined as uncommon symptoms or deterioration/modification of typical symptoms deemed sufficient to require neurological consultation. For all these patients we detailed the following variables: specific signs, symptoms, radiological findings, treatments and clinical course. Descriptive statistics summarise our findings.
Results and Discussion: The database included 25 172 patients. We identified 141 patients (0.6%) with PDPH. Of these 12 (9.3%) had atypical presentation, 11 had received one or two blood patches (BP). All had been examined by a neurologist. The majority had radiological tests (CT scan, MRI). One patient had a diagnostic lumbar puncture. In 10 cases intracranial hypotension was confirmed. In 2 cases (after partially effective BP) an alternative diagnosis was made (sinusitis, migraine). Atypical symptoms included the following: neck pain irradiating to shoulders, arm, spine (42%); cranial nerves symptoms in 25 % (hypoacousia, diplopia, scotoma); in patients with alternative diagnosis the type of headache changed after BP; one patient presented neuropsychiatric symptoms attributed to persistent intracranial hypotension one month after delivery despite having received a blood patch 1 day post-partum.
Conclusion(s): Atypical symptoms of PDPH are not uncommon. It is critical to correctly identify those patients because intracranial hypotension can lead to significant morbidity and differential diagnosis must be excluded. In case of atypical presentation of PDPH, we recommend prompt neurological examination by a specialist, regular clinical monitoring, follow up and systematic MRI examination.

11AP3-5

Risk factors for recurrence of post-dural puncture headache following blood patch in obstetric patients

Haller G., Loures V., Savoldelli G.L.
University Hospitals of Geneva, Department of Anaesthesiology, Geneva, Switzerland

Background and Goal of Study: Postdural puncture headache (PPDH) is a well known complication following neuraxial anaesthesia. In obstetrics, the reported incidence varies greatly, between 0.16 to 5%. It is due to cerebral hypotension caused by the continuous leakage of cerebro-spinal fluid through the dural hole. Usual treatment includes NSAID, paracetamol, caffeine, hyperhydration and strict bed rest. When symptoms persist, a blood-patch (BP) is performed. Despite this treatment some patients have persistent symptoms requiring additional BP. Incidence and risk factors for persistent PDPH following an initial BP are currently unknown. The purpose of this study was to determine the incidence and risk factors for persistent PDPH following an initial BP in obstetric patients.
Materials and Methods: We used our quality database to retrieve obstetric patients having an anaesthetic procedure between 2001 and 2010. Data collected include pre, intra and postpartum patient and procedure-related information. It also includes information on patient satisfaction and possible post-anaesthesia related complications such as PDPH or nerve injuries, collected within 24hrs after delivery by the anaesthetic team in charge. For our study we retrieved all patients who had an identified dural perforation (with a spinal or epidural needle, or a catheter) followed by typical PDPH treated with a BP. For all these patients we determined risk factors for recurrent PDPH by comparing patients and procedures characteristics of patients with or without recurrent symptoms after the BP. We used Chi-square, T-test and OR with 95% CI to compare groups.
Results and Discussion: The database included 25 172 patients. We identified 141 patients (0.6%) with a typical PPDH who had at least one BP. Of these 87 (61.7%) had one BP and 27 (19%) had a failure of the initial BP. Risk factors for recurrence were a low BMI (Mean 27 +/- 4.4 vs. 33 +/- 4.6 P=0.2), a lower blood volume in the epidural catheter (Mean 10 vs. 21 +/- 4.6 P=0.05). Other factors such as size of the needle used, number of punctures performed, platelets count, coagulation tests seemed to have no impact on the likelihood of recurrence.
Conclusion(s): Persistence of PDPH after an initial blood patch is not unusual. Particular attention should be used in patients with low BMI. Furthermore, the volume of the blood injected in the BP should be at least 20 ml, unless the patient complains of pain during injection

11AP3-6

Pneumocephalus with headache after undetected accidental dural puncture

Camgoz Eryilmaz N., Somer M., Kulah B., Honca M., Horasanli E.
Dr. Zekai Tahir Burak Woman Health Training and Research Hospital, Department of Anaesthesiology and Intensive Care, Ankara, Turkey

Background and Goal of Study: The loss of resistance to air technique (LORA) can be associated with pneumocephalus and headache and confused with postdural puncture headache (PDPH). We are reporting a pneumocephalus with headache after undetected accidental dural puncture during epidural analgesia.
Materials and Methods: 25-year-old healthy woman requested epidural analgesia in labour. No contraindication to regional anesthesia was identified. An 18-G Tuohy needle was introduced from L_{3-4} space to identify epidural space with a loss of resistance to 5-6 ml of air technique in the sitting position. The first attempt was unsuccessful. The needle was withdrawn and reinserted uneventfully at L_{2-3} space again using the LORA. A 20-G epidural catheter was inserted into the epidural space. Aspiration from the epidural catheter was negative for blood and cerebrospinal fluid. 30 minutes after the procedure, the patient complained about a severe headache. Neurological examination was normal. There was no fever, but nausea and vomiting. Since there was no evidence of dural puncture and the onset of the headache was immediate, this was not thought to be a PDPH. MRI revealed pneumocephalus in the frontal horn of the left lateral ventricle. The headache was treated with bed rest, oxygen and oral analgesics. The patient was discharged five days later, following the total resolution of headache.
Results and Discussion: The epidural space is commonly identified by using loss of resistance technique to saline or air. According to a meta-analysis the adverse outcomes between different mediums were not different for the obstetric population, but there have been reports criticising LORA. The features of pneumocephalus-related headache (PRH) are similar to PDPH. But, PRH has sudden onset with gradual improvement over 5 days as the air resorbed. Our patient developed severe headache 30 minutes after epidural insertion. Since no evidence of dural puncture, it was not related with the procedure. Pneumocephalus can occur without evidence of dural tap. As in our case, PDPH due to air is possible when air is used to detect loss of resistance with the patient in the sitting position. Resolution of symptoms is usually associated with complete resorbtion of intracranial air. In our patient, the resolution took 5 days.
Conclusion(s): LORA can be related with pneumocephalus. The use of loss of resistance to saline can be suitable and a better alternative to identify the epidural space.

11AP3-7

Obstetric anaesthesia in parturients with heart disease: Review of 72 cases

Rebelo H., Guedes M.L., Sampaio C.
Hospital Sao Joao, Department of Anaesthesiology, Porto, Portugal

Background and Goal of Study: Recent data reveals that the number of pregnant women with heart disease is increasing and cardiac disease represents nowadays the most common cause of maternal death. Maternal heart

disease comprises 0.2 to 3% of pregnancies and is responsible for 10 - 25% of maternal deaths.The authors present a retrospective overview of pregnant women with cardiac disease presenting for delivery in their institution.
Materials and Methods: Retrospective study of patients with cardiac disease admitted for delivery between January 2007 and October 2010. Parturients characteristics, mode of delivery, anaesthetic management, length of stay (LOS) in hospital, complications and newborn outcome were evaluated. We use descriptive statistics to present data.
Results and Discussion: The hospital had approximately 10000 deliveries in the mentioned period. A total of 75 parturients were retrospectively reviewed. The women's mean age was 31 (+-5,2) and 78% were among 18-35 years old. 75% were classified as ASA physical status II and 19,4% as ASA III. The mean gestational age was 37,2 (+-4,6) weeks. Cesarean section was the most prevalent type of delivery (49%) . 86,1% of the parturients received regional anesthesia or analgesia. Only 15% of those who underwent c-section (elective or emergent) received general anaesthesia. There was intraoperative complications (hypotension, severe bleeding, dyspnoea...) in 20% of parturients; hypotension was the most prevalent (14%). The mean LOS was 5 days and the admission rate in ICU after surgery 9,7%. No maternal death was registered. The newborns mean weight was 2893kg (+-723) and mean Apgar at 1st and 5th min, 8 and 9 respectively. 75% were born without complications, 4,2% were pre-term and 2 neonatal deaths were registered.Concerning the cardiac disease, 66,7% were congenital, being Wolf-Parkinson-White Syndrome the most prevalent (19%), followed by atrioventricular septal defects (17%). The most frequent non-congenital cardiac diseases were mitral regurgitation (37,5%) and supraventricular paroxistic tachycardia (29%).
Conclusion(s): Cardiac disease in the obstetric population is quite rare (0,7% in the studied sample) being congenital heart disease more prevalent. Regional anaesthesia seems to be a good anaesthetic choice. It is important that the anaesthesiologist is aware of cardiac disease physiology and management.
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Continuing Education in Anaesthesia, Critical Care & Pain 2010; 10 (3): 81-87;

11AP3-8

The impact of anaesthetic technique on outcome in parturients with cardiac disease

Rebelo H., Guedes M.L., Sampaio C., Castilho J.
Hospital Sao Joao, Department of Anaesthesiology, Porto, Portugal

Background and Goal of Study: The number of pregnant women with heart disease is increasing , representing nowadays the most common cause of maternal death and they are a challenge to the medical team. Regional anaesthesia is recomended for most c-section ,however, general anaesthesia is considered to be safe for the fetus.
The aim of the study was to determine the impact of anaesthetic technique (general vs regional anesthesia) on outcome in parturients with cardiac disease.
Materials and Methods: Retrospective study of all c-section in pregnant women with cardiac disease between January 2007 and October 2010.Patient preoperative characteristics, intra-operative anaesthesia management, complications, length of stay (LOS) in hospital and newborn outcome were evaluated ICU admission, death and LOS>4d were considered to be a complicated outcome (CO). Statistic associations were evaluated using a test analyses
Results and Discussion: Out of 72 parturients with cardiac disease, 35 with c-section were reviewed. 24 had congenital heart disease.(GA) General versus (RA) Regional anesthesia groups revealed non-significant differences, age (p=0,502), ASA (p=0,108), IMC (p=0,595), and others preoperative conditions such cv medications (p=1,0), other comorbidities (p=1,0) NYHA class (p=0,128). There was a statistic association between RA and CO (p=0,008), LOS (p=0,02) and newborn admission in Neonatology Unit (p=0,004). RA group had less cardiovascular (11,1% vs 33,3%) and intra-op complications (6,9%vs 40%). Apgar at 1st min was >8 in 79,3% in RA vs 40,0% in the GA group .The anaesthetic technique was not associated with intraoperative hypotension (p=1,0), blood transfusion required (p=-0,07). Admission in ICU was 13,8% in RA vs 60% in GA group.
Conclusion(s): Better outcomes in newborn and pregnant with cardiac disease was found for caesarean sections under regional anesthesia. Beside that they appear to have less intra-op and cardiac complications.
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11AP4-1

Preventive measures in VTE incidence in obstetrics - our experience

Ilic-Mostic T., Ljubic A., Bozanovic T., Tomanovic-Kokovic J., Arsenijevic L., Mostic D.
University of Belgrade, Department of Anaesthesiology, Belgrade, Serbia

Background and Goal of Study: Venous thromboembolism (VTE) presents a significant cause of morbidity and mortality in surgical patients in whom two or more joined pathophysiological mechanisms often cause thrombosis. Obstetrics surgeries are especially predisposing since the pregnancy additionally represents a hypercoagulable state.
In order to successfully prevent the incidence of VTE, it is necessary to evaluate the risk categories for each and every patient taking into account the type of intervention and patient's clinical condition (age, obesity, accompanying diseases, venous varicosity, previous VTE, thrombophilia etc). According to this, the type and duration of prophylactic therapy are planned.
Goal of the study was to include categorization of patients according to risk factors and mode of pregnancy ending (vaginal or surgical) as well as to determine appropriate actions in preventing VTE (elastic compression or LMW heparin).
Materials and Methods: Retrospective study, conducted at our clinic, included 6,545 deliveries performed in the previous year. Out of this number, 2,100 were pregnancies ended by surgery while 4,445 were vaginal deliveries. All the patients had received preventive measures for VTE according to established protocols.
Results and Discussion: Preventive measures were determined according to number of points calculated by summing up the points related to type of delivery and points related to risk factors: 0.5 points for dehydration, polyglobulia, thrombocytosis, significant limb varicosity, BMI more than 30 and over 35 years of age; 1 point for nephritic syndrome, PIH, preeclampsia, eclampsia, cardiac insufficiency, myeloproliferative disease, family history of DVT and previous thrombophlebitis; 1.5 points for established thrombophylia, presence of antiphospholipid antibodies, previous deep venous thrombosis, active malignancy.
Also, vaginal delivery carries 1 point while cesarean section carries 1.5 points. For the total number of points less than or equal to 1, the patients were not given prophylactic measures. Those with 1.5 points had elastic compression up to mobilization; from 2 to 2.5 points elastic compression and perioperative LMW heparin was applied once a day; the patients with 3 points had elastic compression and perioperative LMW twice a day.
Conclusion(s): During the period of one year, we have applied preventive measures according to established protocol. There were no cases of postpartal or postoperative VTE.

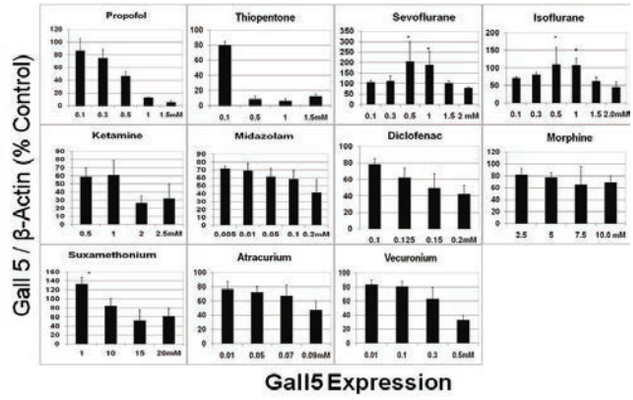
11AP4-2

Cell cycle protein expression as a marker of anaesthetic-induced developmental toxicity

Elsaigh I., Montgomery T., Moriarty D., Buggy D., Gallagher H.
Mater Misericordiae University Hospital & School of Medicine and Medical Science and Conway Institute, University College Dublin, Dublin, Ireland

Background: Widespread concern regarding the toxicity of chemicals in our environment has led to the EU-REACh legislation, and the HPVCC Program in the US. More than 30,000 chemicals, require re-evaluation for toxicity, including developmental toxicity.
Moreover, recent concern over in vivo developmental toxicity of anaesthetics prompted the FDA to establish an Expert Working Group to review this issue and to coordinate safety research.
Reliance on traditional animal testing is neither economically nor ethically feasible. Reliable in vitro screening systems that can predict in vivo developmental toxicity are urgently required. Identifying sensitive reliable molecular markers predictive of developmental toxicity in vivo is a priority.
Goal: Is to screen anaesthetic drugs in a novel developmental toxicity assay that employs the human neuroblastoma cell line SHSY5Y and a cell cycle protein (codenamed Gall5) as a molecular endpoint.
Material and Methods: *MTT Assay:* Effects of drugs on cell viability were first determined. *Immunoblot Assay:* Gall5 expression was then measured.
Results and Discussion: *Propofol, Thiopentone, Ketamine, Midazolam* produced no ectopic Gall5. Their expression followed the pattern seen with non-toxic chemicals.
Halogenated Agents Have been shown to induce neuroapoptosis in the offspring of rodents. Significant induction observed at 0.5 and 1mM. This suggests that, increased expression of Gall5 is somehow associated with their deleterious effects.

Suxamethonium, Atracurium, Vecuronium while they do not cross the placenta significantly, Suxamethonium exhibit increase in Gall5 expression up to1mM (seen in animal studies). Atracurium and Vecuronium show decrease expression.
Morphine, Diclofenac exhibit reduction on Gall5 (consistent with no teratogenicity at therapeutic doses).



[Gall5]

Conclusion: Gall5 expression reliably ranks anaesthetic drugs in terms of their known in vivo developmental toxicity; it may be used to re-assess safety and to predict the toxicity of new drugs.

11AP4-3

Parenteral opioids for obstetric analgesia - a survey among German hospitals with a focus on remifentanil use

Schnabel A., Hahn N., Muellenbach R., Frambach T., Roewer N., Kranke P.
University Hospital of Muenster, Department of Anaesthesiology and Intensive Care, Muenster, Germany

Background and Goal of Study: Although regional anaesthesia techniques are still considered as the gold standard in obstetric analgesia, there is increasing evidence indicating that remifentanil PCIA is a valuable technique, e.g. if central neuraxial blockade (CNB) is contraindicated, not feasible to perform or refused by the patient.
This survey focused on the current use of intravenous opioids in obstetrics in German hospitals.
Materials and Methods: A questionnaire on the use of parenteral opioids with special focus on patient controlled intravenous opioids for labour analgesia, in particular intravenous remifentanil, was sent to 930 anaesthesia units. Data were collected and analysed using SPSS statistical package (SPSS for Windows, version 17). Data were reported as percentage (n/N), median and interquartile range, if not otherwise specified.
Results and Discussion: 343 anaesthetic departments replied (response rate: 37%). 281 clinics had an obstetric department and were included for further analysis (coverage: 60% of 468 clinics providing an obstetric service). The median number of deliveries was 964 (510 - 1200) per year. All included centres provided a 24 hour epidural service and the most common used opioids as alternative to CNB in obstetrics were pethidine (19%), meptazinol (17%) and piritramide (16%) as an intermittent IV/IM administration. 22 (8%) of the responding anaesthetic departments offered a patient controlled intravenous analgesia (PCIA) in case of contraindications for CNB. Remifentanil was the most popular choice as opioid in conjunction with a PCIA (68%) for labour analgesia.
In the majority of these cases (93%), remifentanil is administered as a bolus injection without background infusion. For the latter scenario, most respondents reported to monitor oxygen saturation (91%) and blood pressure (95%), whereas electrocardiography (18%) and the respiratory rate (19%) were less frequently monitored to PCIA, e.g. with remifentanil.
Conclusion(s): This survey showed that pethidine, meptazinol and piritramide are the most common opioids for and opioid-based systemic labour pain relief in Germany. If a PCIA is offered for that reason, remifentanil is the most popular opioid.
A careful monitoring of oxygen saturation seems to be the standard of care. The possibility of oxygen supply and one to one nursing may be recommended for a safe use of remifentanil in daily practice of obstetrics.

11AP4-4

What thromboelastographic values are normal in healthy obstetric patients?

Dogareschi T., Spasiano A., Cecconet T., Buttera S., Galluzzo C., Della Rocca G.
University of Udine, Department of Anaesthesiology and Intensive Care, Udine, Italy

Background and Goal of Study: Pregnant women develop hypercoagulability. Thromboelastograph (TEG) provides an effective and convenient means of monitoring whole blood coagulation. TEG evaluates the elastic properties of whole blood and provides a global assessment of haemostatic function. Previous studies performed TEG on native blood sample, but no data are available with citrated samples in healthy pregnant women at term. The aim of our study is to investigate the effect of pregnancy on coagulation assessed by TEG and establish a normal range of TEG values in pregnant women at term comparing them with healthy not pregnant young women.
Materials and Methods: After Ethic Committee approval we enrolled pregnant women at term undergoing elective cesarean section or labour induction (Group PREG) and healthy non pregnant patients (Group CTRL). Women with fever or inflammatory syndrome, defined as C-reactive protein (PCR) >5 mg/L and with a platelet count < 150.000 mm^{-3} have been excluded. For each patient hemochrome, aPTTr, INR and fibrinogen were assessed. We also performed a thromboelastographic test with Haemoscope TEG® (Haemoscope Corp., Niles, IL, USA) after sample ricalcification with $CaCl_2$ 0.2M within 1 hour from sample collecting. Student t test was used for statistical analysis.
Results and Discussion: 130 patients 32±7 years old were enrolled, 65 for each group. There were no differences between groups regarding demographic data. Blood tests are reported in table 1; TEG values are shown in table 2 as media ± SD.

	PREG	CTRL	p
Hb	12 ± 1.1	13 ± 1.1	<0.001
PLT	230 ± 53	266 ± 54	<0.001
FBN	580 ± 79	347 ± 75	<0.001
INR	0.93 ± 0.04	1 ± 0.1	<0.001
aPTTr	0.99 ± 0.08	1.1 ± 0.1	<0.001

[Table 1- Blood tests evaluated in the 2 groups]

	PREG	CTRL	p
R (min)	6.1 ± 1.8	7.8 ± 2.5	<0.001
K (min)	1.4 ± 0.5	2.7 ± 2.3	<0.001
Alfa (deg)	70.6 ± 6.5	57.7 ± 11.6	<0.001
MA (mm)	71 ± 3.8	61 ± 5.9	<0.001
CI	3.6 ± 0.8	1.8 ± 1.0	<0.001

[Table 2 - TEG values of the 2 groups studied]

Conclusion: The main findings of this study confirm the hypercoagulability status of pregnant women at term. This coagulation pattern is well represented by thromboelastographic trace obtained by recalcificated citrate blood sample.
References:
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11AP4-5

A prospective randomized controlled trial to compare the efficacy and safety of remifentanil IV PCA to epidural PECA in labor analgesia

Stocki D., Matot I., Weiniger C.F.
Tel Aviv Sourasky Medical Center and Hadassah Hebrew University Medical Center in Jerusalem, Department of Anaesthesiology and Intensive Care, Tel Aviv, Israel

Background and Goal of Study: The study aimed to examine both efficacy and safety of IV PCA remifentanil as an alternative to epidural analgesia in labor.
Materials and Methods: Helsinki approval was aquired (0577-08HMO, NCT00801047). Of 144 women approached, 40 were recruited. Two groups were prospectively randomized to receive either IV remifentanil (n=19 and 1

excluded) via PCA, 30-50 mcg/1-2 min, without initial bolus or background infusion, or epidural analgesia (n=20) with initial bolus of 15 cc of 0.1% bupivacaine with 2 mcg/cc of fentanyl and then background infusion of 5 cc/hr plus PCEA optional bolus of 10 cc every 20 min. Crossover was permitted at any time. Exclusion criteria were pre-term pregnancies, blocked nose, non-vertex presentation, non-singleton pregnancy, morbid obesity, pre-eclampsia, contraindications to epidural, medical indication for epidural, previous uterine surgery, narcotics administered within 2 hrs of inclusion. All women received supplementary oxygen via nasal cannula (2 L/min) and we monitored heart rate, respiratory rate (RR), pulse oximetry (SpO_2), end-tidal CO_2 ($EtCO_2$) using the Oridion® Capnostream until delivery (remifentanil) and for 1 hour (epidural). Data were analyzed by intention-to-treat using SPSS v14.0, $p < 0.05$ was significant.

Results and Discussion: VAS pain score was significantly different at 30 min and 2 hrs.

	VAS before analgesia	30 min	1 hour	2 hours	3 hours	4 hours	5 hours	6 hours	VAS post-labor
Remifentanil (n=19)	8.4 ±1.5	3.7 ±2.8	4.0 ±2.5	4.5 ±2.7	4.7 ±1.7	5.6 ±2.9	4.0 ±3.7	6,0 ±2,8	3,6 ±3,3
Epidural (n=20)	8.7 ±1.2	1.5 ±2.2	2.3 ±3.3	1.3 ±1.8	2.9 ±3.2	3.3 ±3.4	4.6 ±4.1	2.3 ±2.9	1.6 ±3.1
P-value	0.521	0.009	0.115	0.002	0.169	0.229	0.822	0.176	0.072

[VAS pain score 0-10]

Maternal satisfaction was high and similar in both groups at initiation of analgesia and post-labor. Average RR was significantly lower, 16.2 bpm (SD 5.4) vs 17.9 bpm (SD 4.0), p=0.006, with higher variability in the remifentanil group. SpO_2 was significantly lower in the remifentanil group, 96.5% (SD 1.2) vs 97.9% (SD 0.9), $p < 0.001$, with more hypoxia events ($SpO_2 < 92\%$). Average $EtCO_2$ was significantly higher in the remifentanil group, 35.1 mm Hg (SD 5.2) vs 32.9 mm Hg (SD 1.9), p=0.01. There was no significant difference in Apgar score at 1 and 5 minutes.

Conclusions: Remifentanil is an effective alternative to epidural analgesia as shown by the comparison of VAS pain score and high maternal satisfaction. Maternal desaturation in the remifentanil group demonstrates the need for continuous respiratory monitoring, although all patients who desaturated were easily aroused without adverse sequelae.

11AP4-6

Does pregnancy affects loading dose pharmacokinetics of intravenous paracetamol?

Allegaert K., van de Velde M., Smits A., de Hoon J., Verbesselt R., Kulo A.
University Hospitals Leuven, Neonatal Intensive Care, Leuven, Belgium

Background and Goal of Study: Higher initial intravenous (iv) analgesic dose of paracetamol is of interest in the immediate postoperative period. Loading dose administration (2 g iv) pharmacokinetics of iv paracetamol in non-pregnant adult patient have been documented (1). The goal of this study was to document paracetamol disposition after loading dose (2 g iv) administration in pregnant women.

Materials and Methods: Pregnant women who underwent a cesarean section, received an initial 2 g loading dose of iv paracetamol were included in this open-label, loading dose PK study. Blood samples were collected at predetermined time points (at 1, 2, 4 and 6 hours after the loading dose). Serum concentrations of paracetamol were determined by high-performance liquid chromatography with UV detection (2). A one-compartmental linear (zero order input, first order elimination) pharmacokinetic model was used. Data on gestational age (GA), body weight (BW) and body surface area (BSA) at delivery were collected and reported as median and range.

Results and Discussion: 128 plasma paracetamol time-concentration points were collected in 35 women [median (range) GA 36.7 (27-41) weeks, BW 80.4 (61-110) kg, BSA 1.92 (1.65-2.35)]. Median (range) C_{max} was 23.12 (7.92-32.32) $mg.L^{-1}$), median C_{trough} was 3.96 (0.55-9.37) $mg.L^{-1}$). Consequently, distribution volume was 86.26 L, clearance was 31.54 $L.h^{-1}$ and elimination half life was 1.9 h.

When compared to data as published in literature in healthy non-pregnant adults (1), both distribution volume (86.26 vs 65.4 L) and clearance (31.54 vs 15.9 $L.h^{-1}$) seem to be higher at delivery compared to the non-pregnant setting.

Conclusions: An iv 2 g loading dose of paracetamol immediately following cesarean section results in relatively lower initial peak concentrations due to a higher distribution volume and even lower paracetamol concentrations afterwards because of higher clearance in pregnancy compared to non-pregnant healthy adults. These pharmacokinetic estimates might be of pharmacodynamic relevance.

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11AP4-7

Effect of tranexamic acid on post partum hemorrhage by uterine atony: A preliminary result of a randomized, placebo-controlled trial

Ayedi M., Jarraya A., Smaoui M., Zouari J., Smaoui L., Kolsi K.
Hopital Hedi Chaker, Department of Anaesthesiology and Intensive Care, Sfax, Tunisia

Background and Goal of Study: Tranexamic acid (TXA) can reduce bleeding in orthopedic, cardiovascular and post trauma [1,2] surgery. Although evidence suggests that this drug reduces postpartum bleeding, the quality of the existing trials is poor. In this trial we assessed the effect of early administration of TXA on post partum hemorrhage caused by uterine atony after cesarean section delivery.

Materials and Methods: After obtaining local ethics committee approval, informed written consent was obtained from 51 patients who agreed to be recruited into this trial. We included ASA1 parturients with correct haemostatic status undergoing cesarean section under spinal anesthesia. Abnormal placentation, severe pre-eclampsia and coagulopathy as well as uterine rupture were excluded. The randomization begins after the inefficacy of oxytocin injections and starting up sulprostone perfusion at the request of the surgeon. Group 1(G1) received 10 mg/kg of TXA as induction dose within 12 minutes and 1mg/Kg/h as maintenance within the 2 following hours. Group 2 (G2) received placebo. Blood analysis containing blood cell count, prothrombine ratio was repeated within the first five days of the post partum. We have also noted the need for blood transfusions, the duration of hospitalization in addition to looking for side effects of TXA.

Results and Discussion: The demographic characteristics and the initial level of hemoglobin and heamatocrit were similar in both groups. The average of bleeding within the first five days calculated according to Gross method [3] was 1090 ml in G1 versus 1670 ml in G2 (p=0.173). The blood transfusion was lower in G1: 1.31 globular sediment versus 3.24 in G2 on the average (p=0.034). The duration of hospitalization was 2.73 day in G1 versus 3.48 day in G2 (p=0.029). In this study, we reported no significant difference in arterial ligations: 2 in G1 versus 8 in G2 and only one hysterectomy in placebo group with no maternal deaths at all. We have noted also no clinical or biological side effect of TXA.

Conclusion(s): TXA safely reduces blood transfusions and duration of hospitalization. It may decrease bleeding, arterial ligation and hysterectomy. A larger number of patients is needed to prove the differences between the 2 groups.

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11AP4-8

Obstetric haemorrhage in a university hospital - transfusion practice and main outcomes in obstetric hysterectomy and massive transfusion

Guasch E., Schiraldi R., Brogly N., García C., Díez J., Gilsanz F.
Hospital Universitario La Paz, Department of Anaesthesiology and Intensive Care, Madrid, Spain

Background and Goal of Study: To describe the main outcomes and complications recorded in obstetric haemorrhages, specially in patients who needed obstetric hysterectomy (OH) and massive transfusion (MT) patients.

Materials and Methods: We collected, during 53 months, every women who had postpartum haemorrhage (PPH) and needed high dependency unit (HDU). We recorded demographic, obstetric variables, mode of delivery, cause of haemorrhage, use and amount of blood products, complications during HDU stay, and duration of stay in HDU. We defined MT as ≥5 red blood pack cells (RBPC) transfusion. For analysis, Anova was employed for parametric data and Chi-2 or Fischer for non-parametric data, where appropriate. $p < 0.05$ was considered significant.

Results and Discussion: 293 patients were collected. Patients data were: age32,72±6 years, height 160,7±6,3 cm, weight 71,7±12 Kg. Mode of delivery: spontaneous vaginal: 29,4% (n=86), forceps 21,2% (n=62), CS 47,1% (n=138). Most frequent causes of haemorrhage were: uterine atony (25,4%), placental retention (21,3%) and vaginal tears (20,1%). RBPC were used in 98,3% of women (n=288), Fresh frozen plasma (FFP) in 49,1%

(n=144) of patients, platelets in 27,3% (n=80), fibrinogen in 53,9% (n=158), rVII factor in 8,2% (n=24), prothrombin complex in 10,5% (n=31) and tranexamic acid in 2 patients. Mean amounts and SD were: RBPC: 5,23±5,2 units, FFP: 5,57±4,6, Platelets pools: 2,35±1,7, and fibrinogen concentrate 4,27±2,4 g. MT was recorded in 102 women (34,8%) and it was correlated to more intra and postoperative complications.APE (acute pulmonary edema). ARF (acute renal failure), MI (myocardial ischemia).

	MT No	*MT Yes*		*MT No*	*MT Yes*		*MT No*	*MT Yes*
APE No	186	5	**ARF No**	184	7	**MI No**	190	3
APE Yes	92	10	**ARF Yes**	85	17	**MI Yes**	90	10
	p=0,01			***p<0,001***			***p=0,004***	

[MT and complications]

	OH No	*OH Yes*		*OH No*	*OH Yes*		*OH No*	*=H Yes*
APE No	224	54	**ARF No**	221	48	**MI No**	228	52
APE Yes	10	5	**ARF Yes**	13	11	**MI Yes**	6	7
	p=0,162			p=0,003			p=0,004	

[OH and complications]

APE is not correlated to OH.Mean time in HDU was 42,73±108h (25-75 percentile was 16-36 h).OH was performed in 20,1% of patients (n=59). HDU is not longer in OH patients (p=0,74). (41, 17±122,5 vs 47,45±46,49 hours). MT was associated to OH (p< 0,001), as is the use of rVIIa factor (p< 0,001)
Conclusion(s): OH is correlated to complications in HDU. OH does not prolong HDU stay in PPH women. MT correlates with complications

11AP4-9

Drug-using parturients in a tertiary referral centre

Robertson J.L., McGrady E., Young S.
Princess Royal Maternity Hospital, Department of Anaesthesiology, Glasgow, United Kingdom

Background and Goal of Study: Drug abusers (DA) are high risk but there is a paucity of relevant data in the anaesthetic literature. We aimed to investigate the demographics and labour ward needs of these patients and to compare it with data from the same unit 12 years previously.
Materials and Methods: Our computerized database (PROTOS) was accessed for all patients who delivered in the first 6 months of 2009. Data was obtained on drug and alcohol use, smoking, deprivation category (Scottish Neighbourhood Statistics, with a 1-6505 decreasing deprivation score) and use of labour analgesia. Data from 1997 was collected (prior to computerization) by accessing the case notes of DA patients over 1 year. Results were analysed using GraphPad Instat.
Results and Discussion: 2949 patients delivered in the 6 months. Details are shown in table 1. For both groups, mean parity was 1 and percentage of primiparous patients and duration of labour were similar. Polydrug use was common (61%) in DA. The most commonly used drugs were heroin (29 patients), cannabis (26) and cocaine (20). Modes of delivery are in table 2. Use of Entonox, diamorphine and epidurals were similar in both groups. The 1997 cohort had 71 DA patients. Again, polydrug use was common but the drugs used were heroin (49 patients), methadone (48) and diazepam (19). Epidural rates were similar in both groups.

	Drug abusers	**Non-drug abusers**	**p value**
Total number of patients	67	2882	
SIMD rank median score	718	1568	p < 0.0001
% patients consuming alcohol in pregnancy	11.9	0.3	p < 0.0001
% patients smoking in pregnancy	79	15.4	p < 0.0001

[Table 1]

Mode of delivery	**No. drug users (%)**	**No. non-drug users (%)**
SVD	37 (55.2)	1627 (56.5)
Instrumental	9 (13.4)	387 (13.4)
C1 C/Section	6 (8.9)	102 (3.5)
C2 C/Section	7 (10.4)	251 (8.7)
C3 C/Section	4 (5.9)	182 (6.3)
C4 C/Section	4 (5.9)	333 (11.6)

[Table 2]

DA live in more deprived areas with higher rates of alcohol and smoking use. The number of DA has doubled since 1997 and while heroin remains the most common drug of abuse, cocaine use is now apparent. Delivery by Category 1 (C1) Caesarian section was higher in the DA group (p = 0.03) and higher in the NDA group for C4 sections.
Conclusion: DA are a potentially challenging group of patients. In particular, the higher C1 rate has safety implications for the patient, baby and healthcare staff.

Intensive Care Medicine

12AP1-1

Prediction of continuous renal replacement therapy after cardiopulmonary bypass surgery

Marcos J.M., Gonzalez R., Soria C., Perez I., Fernandez M.L., Castaño M.
Hospital León, Department of Anaesthesiology and Intensive Care, Leon, Spain

Background and Goal of Study: To study patient related factors and intraoperative variables that can predict the need for continuous renal replacement therapy (CRRT) in the postoperative period of cardiac surgery with cardiopulmonary bypass (CPB) and appraising if they are the same referred to acute renal failure-injury.
Materials and Methods: Retrospective study on 2757 patients undergoing cardiac surgery with CPB, for 6 consecutive years in the same Hospital. We analyzed data from 41 preoperative and intraoperative variables. The indication for CRRT was provided by acute renal failure. There was no internal protocol to determine the indication for CRRT. Preoperative factors were collected by the cardiac surgeon, whereas intraoperative data were recorded by a group of 10 anesthesiologists during the 6 years. Data were collected in FileMaker Database.
Initially, bivariate analyses using χ^2 statistic for categorical variables and *t* test for continuous variables were performed to identify which variables were associated with CRRT, then binary logistic regression was performed.
Results and Discussion: 85 (3.1%) patients required CRRT in CVVH mode. The binary logistic regression analysis identified 7 predictors: history of atrial fibrillation, intra-aortic balloon pump, Euroscore, CPB duration, intraoperative transfusion of fresh frozen plasma, hemoglobin and creatinine preoperative value. The area under the curve of the model using these factors is 84%, IC 95% (79% to 89%).
Mortality in the haemofiltration group was 47.1% for 4.7% of non haemofiltration.
Conclusion(s): In our environment, factors associated with CRRT do not vary to those found for acute renal failure in CPB surgery. In terms of the observed mortality, it would be important to act on the factors described, with particular relevance to optimize preoperative hemoglobin levels and minimize the duration of CPB.

12AP1-2

Fluid therapy in the early perioperative period: Do we need balanced solutions?

Camps A., Tormos P., Pelawski A., Sanchez C., de Miguel M., de Nadal M.
Hospital Universitari Vall d'Hebron, Department of Anaesthesiology, Barcelona, Spain

Background and Goal of Study: In the last few years, postoperative fluid therapy has been topical. Claims against 0.9% saline solutions (SS) (1,2) or hypoosmotic ones (3) have lately favored balanced solutions although substantial debate exists. The aim of our study was to compare two completly opposite unbalanced fluid regimes during the first 24 hrs after elective major surgery.

Materials and Methods: We prospectively studied 110 adult patients who were randomly assigned to two groups. Group I was treated with 2 L of SS (300 mEq Na)+ 0.5 L 30% dextrose (150 gr) and Group II with 2.5 L 0,3 Dextro-Saline (125 mEq Na and 150 gr dextrose), during the first 24 hours after surgery. All patients were monitored with volumetric parameters and if hypovolemic (SVV >10%) they received a fluid bolus (250 mL SS or HES). Patients with renal failure and pneumonectomy were excluded. Blood samples were taken after 24 hours of treatment and electrolytes determined. We also registered total fluid infused (TFI), urine output and weight changes. Student's T test was used for intergroups comparison. Results in mean±SD.
Results and Discussion: No differences were found between groups in terms of sex distribution (males 66%), age (median 66), history of hypertension (48%) or diabetes (28%).
Patients underwent abdominal (36), vascular (28), thoracic (28) and urologic (18) procedures. No differences were found between groups in electrolyte levels and acid-base balance at 24 hours, neither in TFI, urine output or weight changes (Table I). No hyperclorhremic acidosis neither hyponatremia were seen in any patient.

	Group I (n=55)	Group II (n=55)
ph	7.35±0.04	7.35±0.04
Na (mmol/L)	137.7±2.4	137±2,2
Cl (mmol/L)	108±2.9	105±2.6
BE (mmol/L)	-1.1±2.2	-1.9±2.2
AnGap (mmol/L)	9.6±.9	10.3±2.9
TFI (ml)	2927±832	2828±806
Urine output (ml)	1361±700	1210±500
Δweight (gr)	-300±1.5	-179±1.2

[Table I: Values 24 h after surgery]

Conclusion: In the early postoperative period and in patients with normal kidney function, adjusted fluid therapy with saline or hypoosmotic solutions do not show any differences in electrolyte balance, probably suggesting no further role of balanced solutions.
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12AP1-3

Interest of the plasma neutrophil gelatinase associated lipocalin in adult ICU patients starting oliguria

Suball M., Piersoel V., El Mahi T., Stevens E., Roman A.
CHU Saint-Pierre, Department of Anaesthesiology and Intensive Care, Brussels, Belgium

Background and Goal of Study: The plama neutrophil gelatinase associated lipocalin (pNGAL) in an early biomarker of acute kidney injury (AKI)(1).
Methods: Prospective observational study of adult patients with developing in the ICU a first episode of oliguria defined as an urinary output lower than 0.5 ml/kg/h for at least only 2 hours even they received appropriate intravenous fluids and conventional treatment. Plasma NGAL (Triage, Inverness Medical), sodium, creatinine, cystatin C and urinary (diuresis of 1 hour) sodium and creatinine were measured allowing approximation for glomeral filtration rate (GFR) and for the excreted fraction of sodium filtrered (FeNa). SOFA score, RIFLE score (2) were calculated. Hospital mortality was a measured outcome.
Results and Discussion: 93 patients were enrolled: (RIFLE 0: n=52, R: n=15, I : n=13 and F: n=10). Median SOFA score was 3 (min 0, max 17). 38 patients presented sepsis, 27 had received a cardiopulmonary bypass (CPB) and 28 others presented miscellanous situations. The in-hospital mortality of this cohort was 20,2%. Median creatinine was 0.97 mg/dL (P25 : 0.65 mg/dL; P75 1.54 mg/dL), mean cystatin C was 1.43 mg/L (SD: 0.84mg/dL), median pNGAL was 84 ng/mL (P25: 59 ng/mL; p75 :219 ng/mL). Mean GFR was 66 ml/min (SD: 56 ml/min) and 85% of the FeNa were lower than 1%.
Distribution of pNGAL between survivors (median 61 ng/mL, 95%CI 59 to 91 ng/mL) and non survivors (median 182ng/ml 95% CI 86 to 594 ng/ml) was statistically different (p=0.006)(Wilcoxon Rank test).
pNGAL of oliguric patients after CPB (median 59 ng/mL 95%CI 59 -59 ng/mL) was statistically different (Wilcoxon test for unpaired data) of the those with sepsis (median 180ng/mL; 95% CI 92 -276 ng/mL) with a p < 0.0001 and from the other group of patients (median 85 ng/mL; 95%CI 59 - 166 ng/mL) with a p = 0.024 (both p values were corrected by Bonferroni method). There was no correlation between pNGAL values and any of creatinine, cystatin C, GFR, FeNa(Spearman's rho values are respectively 0.59, 0.62, -0.58, 0.31)
Conclusions: pNGAL elevates in early oliguric ICU patients with AKI. This elevation may occur before glomerular function (creatinine, cystatin C, GFR) and tubular function markers (FeNa) confirm kidney dysfunction. Sepsis triggers high value pNGAL in this setting.
References:
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12AP1-4

Low/moderate repeated doses of 6% hydroxyethyl starch could not impair renal function and coagulation in critically ill patients

Vargas M., Marra A., Paduano F, Generali A., Iannuzzi M., Servillo G.
University of Naples, Department of Anaesthesiology and Intensive Care, Naples, Italy

Introduction: 6%hydroxyethyl starch130/0.4 is one of a new class of starch (tetrastarch). A number of studies have investigated the various effects of this HES on renal function, coagulation and platelet function, suggesting its lower tendency to impair these fields because of its rapid degradability. Therefore, we decided to conduct a retrospective clinical trial including septic and trauma patients hospitalized in our ICU in a period of 18 months to evaluate if volume replacement with 6% HES130/0.4 had impaired renal function and coagulation.
Methods: We enrolled 58 patients suffering from sepsis and/or trauma, hospitalized for more than 3weeks. We divided these patients in a group received only crystalloid solution and the other group received 6% HES130/0.4 in a dose ranging from 8 to 30 ml/kg/24h for 21days. For all patients we recorded for a period of 21days urine output, serum creatinine, urea, hemoglobin, hematocrit, platelet amount,INR and SOFA score
Results: Table1 shows the mean values of urine output,creatinine and INR.
All data were analysed as mean and standard deviation,statistical analysis was obtained with ANOVA(p< 0,05). Renal and coagulative parameters of HES group do not differ with statistic significance from those of crystalloid group. In particular the urine output was similar during all the period we have analysed,but by the 15th day onwards the HES-group had a urine output higher than the HES+group. This difference hadn't statistic significance.
Discussion: Our study demonstrates that low/moderate and repeated doses of 6%HES130/0.4 do not impair the renal function and coagulation in septic and trauma patients. There is increasing evidence that 6%HES130/0.4 possesses additional properties that have beneficial effects on organ perfusion,endothelial activation, capillary leakage,tissue edema and decrease erythrocyte aggregation.
Conclusion: The reason for our results could be due to the fact that:medium molecular weight and low molar substitution of 6%HES130/0.4 promote its rapid elimination and its lack of accumulation in the kidney,it improves tissue oxygenation also in the renal tissue,it doesn't modify the vascular endothelium,decrease erythrocyte aggregation and so ameliorate blood viscosity.

	DAY 1 HES+ HES-	DAY 3 HES+ HES-	DAY 7 HES+ HES-	DAY 11 HES+ HES-	DAY 15 HES+ HES-	DAY 19 HES+ HES-	DAY 21 HES+ HES-	P
SOFA	8,5±4,02 7,6±4,04	10±2,7 8,6±3,51	9,75±2,98 10±3,6	9,75±3,3 10,3±2,87	8,75±4,64 8,7±1,52	8,2±4,78 8,3±2,09	7,75±4,64 8±1,9	0,431
URINE OUTPUT	1350±869,8 2930±702,3	2250±1190,2 2830±321,4	2600±707,1 2800±721,1	2025±1129 2600±624	2525±822 3300±519	2100±432 3266±321	2150±404 3000±754	0,299
CREATININE	1,10±0,31 0,86±0,21	1,07±0,32 0,94±0,12	0,93±0,26 0,76±0,11	1,05±0,26 0,86±0,05	1±0,24 0,9±0,1	0,95±0,19 0,93±0,28	0,98±0,09 1±0,26	0,332
INR	1,23±0,13 1,04±0,12	1,42±0,27 1,19±0,06	1,18±0,12 1,20±0,05	1,15±0,11 1,13±0,12	1,17±0,11 1,08±0,06	1,20±0,06 1,10±0,05	1,20±0,08 1,13±0,06	0,117

[Table1: main results of the study]

12AP1-5

Risk factors for contrast induced nephropathy in surgical intensive care unit patients

Araz C., Camkıran A., Ayas H.M., Pirat A., Zeyneloğlu P., Arslan G.
Baskent University, Faculty of Medicine, Department of Anaesthesiology, Ankara, Turkey

Background and Goal of Study: Contrast induced nephropathy (CIN) is an important cause of hospital-acquired acute renal failure and increases mortal-

ity and morbidity. There is little data on the risk factors for CIN in intensive care unit (ICU) patients. The aim of this study was to evaluate the risk factors for the development of CIN in ICU patients.

Materials and Methods: The charts of the patients who were admitted to the ICU between January 2001 and September 2006 were reviewed. Those patients who were exposed to contrast media (CM) during their ICU stay were included. Patients who were receiving renal replacement therapy at the time of CM exposure were excluded.

Patients were divided into two groups based on whether they developed CIN (Group 1) or not (Group 2). CIN was defined as an increase in serum creatinine values of ≥0.5 mg/dl or a ≥25% increase from baseline within 72 hours after administration of contrast agent.

Results and Discussion: Of 42 patients who were included in the study 17 fulfilled the criteria of CIN. There was no statistically significant difference between Groups 1 (n=17) and 2 (n=25) in terms of demographic features, APACHE II scores, and reasons for ICU admission. Patients in Group 1 had a significantly higher rate of congestive heart failure than those in Group 2 (35% *vs* 8%, $p=0.036$).

Compared with Group 2, hemoglobin level before CM exposure as well as PO_2 and diastolic blood pressure after CM exposure were significantly lower in Group 1 (12.7±2.5 *vs* 11.1±1.3 g/dl, 91±21 *vs* 66±11 mmHg, and 59±17 *vs* 72±19 mmHg, respectively)($p\leq0.03$ for all) Multivariate logistic regression revealed that only PO_2 was significantly associated with CIN (p=0.005, OR:0.842).

Conclusion(s): Our results indicate that a low PO_2 is a risk factor for development of CIN in ICU patients. Measures to improve oxygenation may reduce the risk of this complication in ICU patients.

12AP1-6

Prognostic value of glomerular filtrate rate as a predictor of mortality in non cardiovascular surgery

Barreiro Pardal C., Rodríguez Losada M., Pampín Conde M., González Castro A., Raposeiras Roubín S., Carro Roibal M.Á.
Complejo Hospitalario de Pontevedra, Department of Anaesthesiology and Intensive Care, Pontevedra, Spain

Background and Goal of Study: Several studies have shown that the glomerular filtration rate is a strong predictor of mortality following cardiovascular surgery. This study was designed to identify the estimated glomerular filtrate rate (eGFR) using the Cockcroft-Gault and MDRD-4 equations as independent predictive variables of mortality and to determine which of these two formulas is the most powerful.

Materials and Methods: We performed a retrospective study on all patients consecutively undergoing non cardiovascular surgery at our institution from October 2007 to June 2008 (data from 338 patients), with a period of one year of follow up. The SPSS program (version 17.0) was used for all statistical tests. Qualitative variables were compared using the ^{2}-test and quantitative variables using the Student's *t*-test or the Mann-Whitney *U*-test, as appropriate. To determine whether the eGFR was an independent predictor of mortality, a multivariate analysis was performed by binomial linear logistic regression. In the model, we included eGFR as continuous variable. To calculate the discriminatory capacity in terms of operative mortality of the eGFR, ROC curves were constructed.

Results and Discussion: The average of our patients age was 64.5 years. 39.9% were females. The history of diabetes was present in 15.7% and hypertension in 47.9% of total of patients. 53.0% patients were ASA > III. History of dyslipemia was 69.9% patients; history of hypertension was 81.6%. The cumulative incidence of death at one year after surgery was 28.4%. The mean value of creatinine was 1.05±0.68 mg/dL. eGFR using the Cockcroft-Gault equation was found to be an independent predictor of mortality adjusted for age, ASA class, type of surgery, value of haemoglobin and diabetes (OR 1.145, 95% CI 1.053-1.244; p=0.002).

However, in this multivariate analysis using the same variables, eGFR using MDRD-4 did not reach statistical significance as independent predictor of mortality. Area under the ROC curve for eGFR using Cockcroft-Gault equation was 0.685 (0.609-0.761) and using MDRD-4 equation was 0.624 (0.555-0.693).

Conclusion: eGFR using the Cockcroft-Gault equation is an independent predictive factor of 1 year-mortality in non cardiovascular surgery. This can help to identify a group of patients who should be given special attention at the first year post surgery.

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12AP1-7

Is plasmatic N-GAL-un early marker for acute renal injury in cardiac surgery?

Luchian M.M., Paunescu A., Ghenu O., Marinica I., Marin S., Filipescu D.
"Prof. Dr. C.C. Iliescu" Emergency Institute of Cardiovascular Diseases, Department of Anaesthesiology and Intensive Care, Bucharest, Romania

Background and Goal of Study: Early detection of postoperative acute renal injury (AKI) after cardiac surgery is very important. In current practice, AKI is typically diagnosed by measuring serum creatinine concentrations but unfortunately creatinine is very insensitive to even substantial decline in glomerular filtration rate[1]. The purpose of our study is to analyze the utility of plasmatic neutrophil gelatinase associated lipocalin (NGAL) determination for the detection of early AKI in unselected patients admitted in intensive care unit post cardiac surgery with cardiopulmonary bypass.

Materials and Methods: Plasma N-GAL level was determined at baseline, 2 hours and in the first day postoperative in consecutive on pump cardiac surgical patients, during March 2010. Only patients with normal preoperative creatinine value were included. AKI was defined as an increase in serum creatinine >50% from baseline within the first 72 hours post operative. N-GAL was determined with ELISA test kit, with laboratory cutoff value of 106 ng/ml. We analyzed the maximum values of N-GAL in patients with and without AKI using logistic regression. The analysis of ROC curve was utilized for determination of sensitivity, specificity and cutoff value of postoperative N-GAL predicting postoperative AKI.

Results and Discussion: 22 patients (17 men and 5 women) met the inclusion criteria. 6 patients (27. 3%) had AKI. 5 patients (83. 3%) from the group with AKI had N-GAL > 106 ng/ml. N-GAL value was significantly higher in patients with AKI vs. patients without AKI 180.5 (103-218) ng/ml vs. 133 (42-232) ng/ml, p< 0.001. Area ROC curve 0.703 (95% CI 0.471-0.936) presented a very poor correlation between N-GAL value and AKI. The cut off value of post operative N-GAL in our study was 195 ng/ml, with 50% sensitivity and 87.5% specificity.

Conclusion(s): Early raise of post operative N-GAL value is associated with AKI in patients after cardiac surgery. However, in our study sensitivity is poor. This could be due to small group of patients. The utility of early post operative determination of plasma N-GAL is limited in unselected patients.

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12AP1-8

Acute kidney injury after hepatic surgery

Tateda T., Ohji M., Yokozuka M., Masumori Y., Sakamoto M.
St. Marianna University School of Medicine, Department of Anaesthesiology, Kawasaki, Japan

Background and Goal of Study: Restrictive fluids management on hepatic surgery may cause acute kidney injury (AKI) during the perioperative period. We retrospectively evaluated the intraoperative risk factor for AKI during hepatic surgery.

Materials and Methods: Sixty-seven patients who underwent hepatic surgery for liver tumors were analyzed retrospectively. Anesthesia was maintained with sevoflurane and remifentanil. An epidural catheter was inserted before surgery for postoperative analgesia. Central venous pressure (CVP) and stroke volume variation (SVV) by arterial pulse contour analysis were monitored for restrictive fluids management during surgery. Low CVP (< 5cmH2O) and high SVV (>12%) during Pringle's maneuver was achieved by restricting fluids volume. We used the AKI Network definition of AKI. Statistical analysis was performed using the chi-square test, Mann-Whitney U test and logistic regression analysis. P < 0.05 was considered statistically significant.

Results and Discussion: Nine patients developed stage-1 AKI (16%). The duration of anesthesia and surgery were more prolonged in the AKI group than in the non-AKI group (p< 0.05). The blood loss was larger in the AKI group than in the non-AKI group (p< 0.05).

	AKI (n=9)	non-AKI (n=58)
Age (yrs)	70±9	67±8
Gender (male/female)	7/2	39/19
Body weight (kg)	63±10	58±11
Duration of anesthesia (min)	508±105*	375±102
Duration of surgery (min)	356±102*	290±95
Fluids volume (ml/kg/hr)	11±3	10±3
Blood loss	1522±545*	771±837

[Table 1]

Conclusion(s): Prolongation of the duration of hepatic surgery with restrictive fluids management may cause AKI.

12AP1-9

Metabolic acidosis in patients undergoing liver transplantation

González-Suárez S., Camps A., Bosch C., Tesouro A., Sala M.R.
Vall d'Hebron University Hospital, Department of Anaesthesiology, Barcelona, Spain

Background and Goal of Study: An increased plasma chloride ion concentration relative to sodium and potasium concentration, produces a smaller plasma strong ion difference (SID) leading to an Hyperchloremic Metabolic Acidosis (HMA).
The objective of this trial was to determine whether the administration of serum saline 0.9% produced an increase in the clinical complications in patients undergoing liver transplantation compared with patients who received serum saline 0,9% and plasmalyte.
Materials and Methods: For this prospective study we enrolled thirty nine patients who received serum saline 0.9% (A group) and thirty eight patients who received this serum plus plasmalyte (B group). Patients with moderate coagulation disorders (Quick < 40%, platelets < 50.000) and or abnormal renal function (creatinine levels >1.4 mg/dl) were excluded. In the preoperative and postoperative period, we collected the amount of intravenous fluid, analysis of arterial blood gases, electrolytes, serum lactate and SID. A chloride level >110 mmol/L plus a base deficit < -2.0 mmol/L, pH < 7.35 and SID < 40 was defined a priori as HMA. We determined the percentage of patients who presented hyperchloremic acidosis in each group, and the clinical repercussions (transfusion, renal function) in both groups.
Results and Discussion: The incidence of HMA was 33% in group A compared with 18,9% in group B (Chi square; p 0,12). Not significant differences were seen between groups in renal function (urine output and creatinine levels).
The coagulation disorders were greater in group A (Quick 39,07% group A and 45,86% group B; X^2; p-value 0,02;) just as the need of transfusions (Table 1)

Transfusion (mL)	Group A	Group B	p-value
Red blood cell	1836,45	721,95	0,01
Fresh frozen plasma	1628,16	1221,43	0,18
platelets	254,34	328,78	0,39
Estimated blood loss	4884,47	2861,78	0,02

[Need of transfusion]

Conclusion(s): Our results confirmed that large volumes of sodium chloride solutions led to a metabolic acidosis that was associated with a decrease in the SID, coagulation disorders and need of transfusions. The administration of fluids with balanced composition is a better option in patients undergoing liver transplantation.

12AP1-10

N-terminal pro-brain natriuretic peptide identifies patients at risk for occurence of postoperative atrial fibrillation in cardiac surgery with cardiopulmonary bypass

Kallel S., Ben Soltana M.H., Djemal W., Triki Z., Chaari M., Karoui A.
Academic Medical Center Habib Bourguiba of Sfax, Department of Anaesthesiology and Intensive Care, Sfax, Tunisia

Background and Goal of Study: One of the feared complications with the waning of cardiac surgery is atrial fibrillation (AF). The value of Nt-pro BNP in predicting that complication is not well studied. Our objective is to determine its predictive role in the occurrence of postoperative AF after heart surgery with cardiopulmonary bypass (CPB).
Materials and Methods: This is a prospective observational study. It involved patients proposed for programmed or semi-urgent cardiac surgery with normo-thermal CPB. We performed seven blood samples for each patient: the first one immediately after the induction of anesthesia and before CPB. The following samples were made at the end of the CBP (H0), 4 hours later (H4) and every day during the first four days (H24, H48, H72 and H96).NT-proBNP and cTnI were measured in each sample.
Results and Discussion: A total of 42 patients were selected. Two patients were excluded because they died on the first postoperative day. The average age and the sex ratio were respectively 56.1 ± 14.9 years and 1 .3. Our population was divided into 23 coronary artery bypass graft and 17 valve replacements. The most common cardiovascular complication was the AF (17.5%). Rates of Nt-proBNP were significantly increased in patients who developed postoperative AF. The ROC analysis of NT-proBNP at different times studied for the prediction of AF showed that assays at the end of the CPB and those of the 4th postoperative hour (H4) had the best area under the curve (AUC).A threshold value of 353.5 mg / ml of Nt-proBNP at the end of the CPB has a sensitivity of 71% and a specificity of 84% for the prediction of the AF and an area under the curve (AUC) of 0.711. The threshold value (307.5 mg / ml) of Nt-proBNP measured at H4 has the same sensitivity but with a lower specificity (74%) and AUC = 0.709.
Conclusion(s): Our study showed that early assays made at the end of the CPB or four hours later with thresholds of 353 and 307 mg / ml respectively, could predict the occurrence of the AF. In this case, primary prevention would be considered.

12AP1-11

A device for continuous therapeutic blood purification using ultra-strong target-specific nanomagnets

Herrmann I.K., Urner M., Bernabei R.E., Grass R.N., Stark W.J., Beck-Schimmer B.
University Hospital Zurich, Department of Anaesthesiology, Zurich, Switzerland

Background and Goal of Study: The rapid removal of pathogens or noxious compounds (e.g. toxins, metabolites) circulating in the blood stream of a patient is the most direct cure imaginable. Currently, this is possible via dialysis and plasma filtration which remove small molecules such as urea, potassium and creatinine at remarkably high efficacies. The majority of harmful substances, e.g. endo-/exotoxins in sepsis, antibodies and immune-complexes in autoimmune disorders, however, are large (bio-)molecules and have to be removed via more complex chemical and systemic routes [1]. In this work we present the direct removal of harmful substances from human whole blood by the use of magnetic nanoparticles [2, 3].
Materials and Methods: For this purpose, carbon coated metallic nanoparticles were covalently decorated with various functional groups, including heavy metal scavengers, fab-fragments and whole antibodies. An extracorporeal blood purification device was assembled out of FDA-approved transfusion lines in order to investigate the efficiency of magnetic separation-based blood purification in an *ex vivo* setting [4].
Results and Discussion: We present the applicability of the concept utilizing three examples: The removal of a proinflammatory mediator (interleukin-1 beta), of heavy metal (lead), and of a steroid drug (digoxin) was shown by spiking human whole blood with the contaminant and applying appropriately functionalized magnetic beads for the detoxification. The integrity of the blood was not affected by the process as depicted by monitoring a series of clinically important parameters.
Conclusion(s): Successful implementation of magnetic blood purification into a continuously operating extracorporeal device proves the feasibility of using magnetic separation for blood purification. Further steps in the direction of a clinical application of the concept will be discussed.
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12AP2-1

Increased positive end-expiratory pressure reduces but not terminates cyclic alveolar collapse in a porcine lung injury model

Hartmann E.K., Boehme S., Bentley A.H., Klein K.U., David M., Markstaller K.
Medical Center of the Johannes-Gutenberg-University Mainz, Department of Anaesthesiology, Mainz, Germany

Background and Goal of Study: Positive end-expiratory pressure (PEEP) is routinely applied to avoid cyclic recruitment and derecruitment (R/D) and consequently atelectotrauma in acute lung injury (ALI). However, less is known about the persistence of R/D following high PEEP application. In experimental settings R/D can be monitored in real-time by detection of respiratory-dependent oscillations of the arterial partial pressure of oxygen (paO_2) that are attributed to varying shunt fractions during the respiratory cycle [1]. This study aims to characterize the effects of increased PEEP on cyclic R/D in a porcine lung injury model.
Materials and Methods: Following approval of State and Institutional Animal Care Committee ALI was induced in eight anaesthetised, juvenile pigs (25-27 kg) by repetitive bronchoalveolar saline lavage. Respirator settings (peak

pressure 37.8±6.1 mbar, respiratory rate 6.4±1.1/min, zero PEEP, FiO_2 1.0) were applied to provoke maximum R/D and measured by an aortal probe (Foxy AL-300, Ocean Optics, USA) providing ultrafast online-measurement of the paO_2. PEEP was then increased to terminate R/D. For 30 minutes of high PEEP paO_2 oscillations, hemodynamic and respiratory data were acquired. Statistical analysis: MathCAD routine for standardized calculation of paO_2 oscillation amplitudes, Wilcoxon-Rank-Test (significance: $p < 0.05$).

Results and Discussion: Cyclic R/D was detected in every animal (paO_2 oscillation amplitude 83.8±29.6 mmHg, mean paO_2 333.2±92.3 mmHg). Following high PEEP application (13.5±1.6 mbar) as single intervention, the amplitudes decreased to 27.7±15.8 mmHg ($p=0.01$) while the paO_2 increased significantly ($p=0.01$). Though, measureable respiratory-dependent paO_2 oscillations persisted in every animal (8.6-74.38 mmHg). Hemodynamic instability occurred regularly and Epinephrine was administered continuously. These data indicate that despite a high PEEP cyclic R/D may persist. Hence, additive ventilation strategies are necessary to completely avoid an atelectotrauma, especially if PEEP compromises hemodynamic stability.

Conclusion(s): High PEEP alone leads to a reliable reduction, but not elimination, of R/D measured by respiratory-dependent paO_2 oscillations.

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12AP2-2

Platonin mitigates lung injury induced by haemorrhagic shock/resuscitation and endotoxaemia in rats

Huang C.-J., Chen K.-B., Lee J.-J., Tsai P.-S.
Buddhist Tzu Chi General Hospital, Taipei Branch, Department of Anaesthesiology, Sindian City, Taipei County, Taiwan, Republic of China

Background and Goal of Study: Haemorrhagic shock/resuscitation induces inflammatory response and readily causes acute lung injury. In addition, haemorrhagic shock/resuscitation may promote bacterial translocation and cause endotoxaemia, a process that can aggravate the inflammatory response and lung injury. Platonin, a potent antioxidant, possesses potent anti-inflammation capacity. We sought to elucidate whether platonin could mitigate lung injury induced by haemorrhagic shock/resuscitation plus endotoxaemia (HS/E) in rats.

Materials and Methods: Adult male rats were randomized to receive HS/E or HS/E plus platonin (n = 12 in each group). Control groups were run simultaneously. Haemorrhagic shock (mean arterial pressure: 40-45 mmHg) was induced by blood drawing and maintained for 60 minutes. Then, shed blood/saline mixtures were re-infused to achieve resuscitation. Sixty minutes after resuscitation, endotoxin (15 mg/kg, iv) was administered to induce endotoxaemia. Platonin (200μg/kg, iv) was divided into 2 doses and sequentially administered at 2 time points (i.e., immediately after resuscitation and immediately after endotoxin, respectively). At 6 hours after resuscitation, rats were sacrificed.

Results and Discussion: Assays of polymorphonuclear leukocytes/alveoli ratio (leukocyte infiltration index), wet/dry weight ratio (water content index), and inflammatory molecules (e.g., chemokine, cytokine, prostaglandin E_2) confirmed that haemorrhagic shock/resuscitation plus endotoxaemia induced significant inflammation in rat lungs. Functional (arterial blood gas and alveolar-arterial oxygen difference) and histological assays further confirmed that haemorrhagic shock/resuscitation plus endotoxaemia induced significant lung injury in rats. Moreover, our data demonstrated that platonin, at the dosage of 200μg/kg, could mitigate the inflammation and lung injury induced by haemorrhagic shock/resuscitation plus endotoxaemia.

Conclusion(s): Platonin mitigates lung injury induced by haemorrhagic shock/resuscitation plus endotoxaemia in rats.

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12AP2-3

Limb ischemic preconditioning attenuates acute lung injury in haemorrhagic shock/resuscitation rats

Huang C.-J., Tsai P.-S., Jan W.-C., Chen C.-H.
Buddhist Tzu Chi General Hospital, Taipei Branch, Department of Anaesthesiology, Sindian City, Taipei County, Taiwan, Republic of China

Background and Goal of Study: Haemorrhagic shock followed by resuscitation (haemorrhagic shock/resuscitation) readily causes lung injury. We sought to elucidate whether bilateral lower limb ischemic preconditioning (IP) could mitigate lung injury induced by haemorrhagic shock/resuscitation.

Materials and Methods: Adult male rats were randomized to receive haemorrhagic shock/resuscitation (HS) or HS plus IP (n = 10 in each group). Control groups were run simultaneously. Haemorrhagic shock was induced by blood drawing. Mean arterial pressure was lowered to 40-45 mmHg and maintained for 120 minutes. Then, mixtures of shed blood and saline were re-infused for resuscitation. In addition, 3 cycles of IP (10 minutes of ischemia followed by 10 minutes of reperfusion) were performed immediately before HS to achieve preconditioning. After monitoring for another 6 hours, rats were sacrificed and the levels of lung injury were determined.

Results and Discussion: Histo-pathologic analysis revealed moderate lung injury characteristics in rats receiving HS and mild lung injury characteristics in rats receiving HS plus IP. Moreover, the levels of leukocyte infiltration (polymorphonuclear leukocytes/alveoli ratio and myeloperoxidase activity) and lung water content (wet/dry weight ratio) as well as the concentrations of lung inflammatory molecules (chemokine, cytokine, and prostaglandin E_2) in rats receiving HS were significantly higher than those in rats receiving HS plus IP. These data demonstrated the protective effects of limb IP on attenuating lung injury induced by haemorrhagic shock/resuscitation.

Conclusion(s): Bilateral lower limb IP attenuates acute lung injury in haemorrhagic shock/resuscitation rats.

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12AP2-4

Extracorporeal CO_2 removeal in CU

Mattei N., Mocavero P., Corcione A.
A.O.R.N., Department of Anaesthesiology and Intensive Care, Napoli, Italy

Background and Goal of Study: Hypoxemia and hypercapnia both result in a decrease of glomerular filtration rate but acting the first on the increase in renal vascular resistance leading to renal hypoperfusion and the second on systemic vasodilation, stimulation of the renin-angiotensin system, sympathetic activation and renal vasoconstriction.The veno-venous extracorporeal CO2 removal (DECAP) is a minimally invasive technique requiring low blood flows (300-400 ml/min). The advantages its clinical use could be resumed in: the ability to facilitate a “protective” ventilation setting with Pplateau< 25cmH2O [1,2], the reduction of pulmonary and systemic inflammatory response and the reduction of the incidence of acute renal failure (ARF). Possible clinical indications for the CO2 extracorporeal removal are: ARDS of different etiologies; COPD exacerbation, “bridge” lung transplantation

Materials and Methods: In an 8-bed ICU, we conducted a retrospective study analysing two comparable groups of patients diagnosed of ARDS-induced ARF. Group1 included 165 patients treated with protective ventilation and early renal replacement therapy (CRRT) [3,4]. Group2 included 160 patients treated with protective ventilation, CRRT and DECAP. The baseline characteristics of the two groups (Group1 vs Group2) were compared on the basis of SOFA score (14.5+/-3.7 vs 12+/-2.2, NS), APACHE2 score (26.4+/-7.3 vs 24+/-5.6, NS) and mean age (59.7+/-3.15 vs 60+/-12, NS).

Results and Discussion: The duration of CRRT treatment in Group1 and Group2 respectively was 28+/-10 days and 12+/-7 ($p< 0.05$). The significant difference between groups implied lower costs of hospitalization and also reflected in a significant difference ($p< 0.05$) in hospital mortality at 60 days varing from 59% (Group1) to 43 % (Goup2).

Conclusions: Acute kidney injury is a common complication of acute illness, affecting more than 35% of ICU patients. CRRT is the mainstay of supportive treatment of patients with severe ARF; its use is required in 5 to 6% of critical patients but is associated with mortality rates as high as 50-80%. In critically ill patients with ARF supported by hypoxia and/or hypercapnia with different etiology, contemporary and early treatment with extracorporeal CO2 removal reduces mortality and costs in ICU.

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12AP2-5

A multidisciplinary weaning- and extubation regime leads to relevant reduction of weaning and ventilation time

Schandl P., Heil S., Lenhart-Orator A., Gustorff B.
Wilhelminenspital, Department of Anaesthesiology and Intensive Care, Vienna, Austria

Background and Goals: The use of a multidisciplinary weaning protocol and the ensuing assessment corresponding to level A evidence is common practice in North America. A regime such as this was not previously implemented at our department. We hypothesized, that ventilation and weaning time would

be reduced by a respective protocol and that the quality of weaning would be sustainable improved. The objective of this study was to evaluate the implementation of a multidisciplinary (respiratory therapist, physician, nurse) standardized weaning and extubation regime.
Materials and Methods: Setting: 8-bed intensive care unit with intubated surgical, trauma and medical patients. Inclusion criteria: >48h mechanical ventilation by tracheal tube. Exclusion criteria: neuromuscular disease, dysphagia, LTOT and home respiratory care. In this prospective study a historical control group (n=20) was used as the comparison group: physician directed weaned without protocol. Standardized weaning in the intervention group (n=20) was exclusively performed by using the developed protocol: including weaning-criteria, weaning-assessment, weaning-algorithm with a spontaneous breathing trial and extubation criteria.
Results and Discussion: Our regime reduced total time of ventilation (median=169.1h vs. 89.9h) and weaning time (median = 73.35h vs. 20.43h) significantly (p=0.00329 and p=0.0004) in the intervention group.
The standardized weaning procedure reduced the total time of weaning in the medical subgroup significantly (median=176.92h vs. 71.35h). A significant reduction of weaning time was found in the medical subgroup (median=70.51h vs. 8.8h) as well as in the surgical subgroup (median=73.75h vs. 21.68h).
The use of prerequisite extubation criteria in the invention group reduced the rate of recent ventilation by 50%. The reduction of weaning and ventilation time is based on multidisciplinary protocolized weaning. The main difference in weaning algorithm (implementation of a spontaneous breathing trial and the reduced use of a “comfortable ventilation mode”) can be discussed as additional reasons for benefit.
Conclusion: Despite the acknowledgement of methodical limitations of the study and the small sample size it can be assumed that a standardized, multidisciplinary weaning and extubation regime improves the weaning process by reducing weaning and ventilation time. The study results approach to the implementation of a multidisciplinary protocol into European weaning practice.

12AP2-6

Mechanical ventilation for acute respiratory failure in patients with pulmonary fibrosis - yes or no

Feizerfan A., Patel M., Chandan G.
Mid-Staffordshire Foundation Hospital NHS Trust, Department of Anaesthesiology and Intensive Care, Stafford, United Kingdom

Background: Pulmonary fibrosis is a very severe interstitial lung disease; idiopathic pulmonary fibrosis (IPF) is a progressive disease with an inevitable poor prognosis. The outcome after acute respiratory failure (ARF) in patients with IPF and secondary pulmonary fibrosis (SPF) who required mechanical ventilation (MV) is also very poor.
The aim of this retrospective study is to identify the outcome for such patients in our critical care unit (CCU) and compare this to the published case series.
Materials and Methods: We retrospectively collected data for patients with pulmonary fibrosis (Idiopathic and secondary) admitted to CCU needing mechanical ventilation from April 1998 to March 2010. The data was analysed using simple statistics.
Results and Discussion: We had total of ten patients with IPF and SPF with ARF requiring MV; eight were males and two were females with mean age 65 .5 (+/- 9) years. All were ex-smokers and on steroid therapy and three were on home oxygen therapy. Eight were IPF and two were SPF due to Rheumatoid arthritis (RA). All had honeycombing on chest spiral CT and none had lung biopsy.
The main reason for CCU admission in all ten patients was ARF. The mean APACHE II score was 14.2% with mean predicted mortality of 24.1 %. Only three patients had confirmed evidence of chest infection. The mean PaO2/FiO2 before MV at admission was 9.76 Kpa; The mean FEV1 was 69.42 %, FVC was 65.28% and DLCO/Va was 64.5 % of predicted value.
The average length of MV was 9.6 days and the mean length of stay in CCU was 10.8 days. Non-survivors stayed for 6.7 days in CCU and survivor was on MV for 9 days.
Conclusion: In Stern et al‘s case series, one patient who survived had immediate lung transplant. In our case series, the survivor was from recently diagnosed IPF cohort. He had relatively higher PaO2/ FiO2 ratio of 31.3 Kpa before admission with no evidence of chest infection. The MV was for combative/confused behaviour with acute hypoxia rather than typical exacerbation of chronic lung condition. As with other studies, our case series showed that prognosis of ARF in pulmonary fibrosis (IPF and SPF) requiring MV, even with concurrent chest infection, is very poor. There is a general consensus, with limited evidence, to refuse MV for ARF in PF. We conclude, based on the published evidence and our case series, that the pulmonary fibrosis (primary and secondary) with ARF, MV should not be considered.

12AP2-7

The role of curcumin on lipopolysaccharide-induced inflammatory cell activation and acute lung injury

Kwak S., Jeong C.W., Jeong S.W., Chung S.T., Lee S.H., Jeung H.-J.
Chonnam National University, Department of Anaesthesiology and Pain Medicine, Gwangju, Korea, Republic of

Background and Goal of Study: Despite advances in the management of sepsis and acute respiratory distress syndrome, the mortality rate remains high. Over-activation of inflammatory cells involving macrophages and neutrophils are associated with multiple organ failure under those conditions. Thus, nontoxic molecules that regulate inflammatory cells may provide a novel therapeutic strategy. This study was performed to evaluate the effects of curcumin on LPS-induced acute lung injury and the possible mechanism of action in a murine model.
Materials and Methods: To assess the anti-inflammatory effect of curcumin on LPS induced inflammatory cells activation, RAW 264.7 cells were incubated with various concentrations of curcumin (1, 3, 10 uM) for 1 hour and then incubated with or without LPS (100 ng/ml) for 6 hours, and then the amounts of TNF-α and MIP-2 proteins were determined. To elucidate the intracellular signaling pathway, cells were incubated with curcumin (10 uM) for 1 hour and then incubated with or without LPS (100 ng/ml) for 30 min, and the levels of active, phosphorylated forms of MAPKs (p38, ERK1/2, JNK) were determined. We also examined the effect of curcumin (60mg/kg, IP) on acute lung injury and mortality of mouse treated with LPS(20 mg/kg, IP) to determine whether these effects of curcumin also have in vivo significance.
Results and Discussion: Curcumin inhibited the production of TNF-α and attenuated phosphorylation levels of ERK1/2 and JNK, but not p38, in RAW264.7 cells stimulated with LPS. Curcumin also attenuated the production of TNF-α and the phosphorylation of ERK1/2 in the lungs of mice administered intratracheal LPS. Curcumin reduced the wet/dry weight ratio, histological severity, and neutrophil accumulation in the lungs and improved mortality after LPS treatment.
Conclusion(s): Curcumin attenuated LPS-induced lung injury by suppressing TNF-α production as well as ERK1/2 and JNK activation in macrophage stimulated with LPS.

12AP2-8

Efficiency of use surfactant and reception of “opening” of lungs at patients with a virus-bacterial pneumonia and ARDS

Kanus I., Sviatlitskaya V.
Belarusian Medical Academy of Post-Graduate Education, Department of Anaesthesiology and Intensive Care, Minsk, Belarus

Goal of Study: to study clinical efficiency of use surfactant and reception of “opening” of lungs, as way of optimization PEEP at patients with a virus-bacterial pneumonia and ARDS.
Materials and Methods: 41 patients with a virus-bacterial pneumonia and ARDS are surveyed. Middle age of patients has made 43,7±1,4 year. The first group was made by 16 patients whom in the conditions of controllable artificial ventilation of lungs in mode P-CMV twice a day selected optimum PEEP, using reception of “opening” of lungs - by gradual (during 1-2 min) short-term (10-22 hardware respiratory cycles) increase of respiratory volume to 12 ml/kg. The second group was made by 7 patients whom combined twice a day reception of «opening» of lungs and introduction surfactant. Surfactant BL (Russia) entered with use bronchoscope twice a day in a dose of 6 mg/kg on one introduction. The control group was made by 18 patients whom selected optimum PEEP by gradual increase (each 30-40 min on 1-2 sm of w. c.). Optimum considered level PEEP below which deterioration of indicators of biomechanics and gas exchange in lungs was marked.
Results: At patients of the first group level PEEP was above ($p < 0,01$), than at patients of the second and control groups (14,6±1,3 sm of waters of the item, 11,6±1,3см waters of the item and 10,4±1,2 sm of waters ст accordingly). After optimization PEEP at patients of first and second groups PaO2/FiO2 was authentically above (on 27,2%, 34,4% accordingly), and Qs/Qt, Rpik, is authentic more low (on 22,7% and 13,2 % for first group; 21,5% and 14,5% for second group, accordingly), than at patients of control group. At patients of the first group in dynamics faster daily average growth PaO2/FiO2, Cs, and decrease Qs/Qt, an index of damage of lungs in comparison with patients of control group was marked. At patients of second group PaO2/FiO2, Cs were comparable to the first group.Duration of AVL and stay in intensive care unit (ICU) at patients of the first group (12,2±1,3 and 17,1±1,4 days accordingly) were authentically less ($p < 0,01$), than at patients of the second group (20,4±2,1 and 26,3±2,3 days) and at patients of the third group (16,3±1,5 and 22,4±2,1 days).

Conclusion(s): At patients with a virus-bacterial pneumonia and ARDS optimization PEEP by performance of reception of "opening" of lungs, is more effective way in comparison with gradual increase PEEP, and allows reducing duration of artificial ventilation of lungs and staying in ICU.

12AP2-9

Non-invasive positive pressure ventilation via CPAP mask in patients with end stage disease who developed acute respiratory failure

Kiskira O.C., Sakelariadis G., Papaioannou A., Anesidis E., Diamantopoulou A., Grypiotis I.
General Hospital of Molaoi, Department of Anaesthesiology and Pain Medicine, Molaoi, Greece

Background and Goal of Study: Non invasive positive pressure ventilation (NIPPV) is widely accepted as an initial approach to providing ventilatory support to many patients with acute respiratory failure (ARF).
Palliative approaches focused on the quality of life and comfort; represent a challenge for family's physicians and the patients. NIPPV is an attractive option to treat acute respiratory failure in end stage patients when the failure is irreversible and it is a final outcome of the primary disease. The approach to providing ventilatory support to patients with ARF, to relieve them from the sensation of dying suffocate without intubating them because they don't wish it either, is very challenging and sometimes it's the only solution when there no possibility for the admission in the ICU in a hospital that does not have an ICU
Materials and Methods: After institutional approval and patients consent, we conducted a prospective observational study of patients that fulfilled the criteria.6 cases received NIPPV (5 with end stage cancer and 1 with pulmonary fibrosis). When NIPPV was ordered we recorded: respiratory rate, heart rate, arterial blood pressure, neurological status and arterial blood gases, before NIPPV initiation (baseline data) and then 1st, 4th and 8th hour. All patients were alert and cooperative with NIPPV. Analgesia and/or sedation were used when it was necessary.PaO_2, pCO_2 and pH measures were analyzed using statistical methods. Percentage changes from baseline (pre-NIPPV) of these measures were used as dependent variables. Dependent variables (percentage of PaO_2, PCO_2 and pH) were regressed on time, for each patient.
Results and Discussion: In all cases the results were statistically significant, with p-values ranging from a low of 0.0002 to a high of 0.0183. For all patients, the regression coefficient for the percentage change was positive; indicating that the percentage change was increasing with time. We can remark that PaO_2 increases over time, PCO2 and pH p values > 0.05
Conclusion(s): We believe that NIPPV via CPAP mask is a means of potentially ensuring the highest quality of end-of-life care. NIPPV can be applied for palliative care, CPAP mask is a cheap and easy to implement in clinical practice and it might be used to keep patients who developed acute respiratory failure comfortable in their bed before the inevitable.

12AP3-1

C-reactive protein and procalcitonin in early diagnosis of postoperative complications after colon surgery-is there a difference?

Oberhofer D., Rumenjak V.
University Hospital Sveti Duh, Department of Anaesthesiology and Intensive Care, Zagreb, Croatia

Background and Goal of Study: Recent studies show a greater accuracy of procalcitonin (PCT) compared to C-reactive protein (CRP) for differentiation of infectious and noninfectious SIRS in ICU and surgical patients. However, there is a lack of studies comparing CRP and PCT in the early diagnosis of complications after colon surgery which is accompanied by nonspecific SIRS. The aim of the study was to compare diagnostic accuracy of CRP and PCT for the prediction of postoperative complications in patients undergoing elective colon surgery.
Materials and Methods: Prospective observational study of 72 adult patients without infection undergoing elective colon surgery. CRP, PCT and leukocytes were determined preoperatively and on postoperative days 1-3 and 5. Patients were followed for 2 weeks for infectious and other complications. Data were tested for normality and the differences between patients with and without complications were compared using a t-test or Mann-Whitney test as appropriate. CRP and PCT diagnostic accuracy was calculated using a ROC curve.
Results and Discussion: Patients without complications (n=46; comp.-) and with complications (n=26; comp.+) were comparable regarding age, ASA status, diagnosis and the stage of cancer. In comp.+ group there were significantly more men and patients undergoing rectal surgery.

CRP (mg/L) Mean±SD	**Preop. CRP**	**Day 1 CRP**	**Day 2 CRP**	**Day 3 CRP**	**Day 5 CRP**
Comp. - group (n=46)	10,6±14,4	79,8±27,7	125,2±47,7	97,4±48,7	53,4±38,2 (n=30)
Comp. + group (n=26)	8,6±15,4	98,0±34,8	167,8±52,7	150,0±58,6	110,8±51,9
P*	0,596	0,018	0,001	<0,001	<0,001
PCT (mcg/L) Median(Q1-Q3)	**Preop. PCT**	**Day 1 PCT**	**Day 2 PCT**	**Day 3 PCT**	**Day 5 PCT**
Comp.- group (n=43)	0,06 (0,04-0,1)	0,89 (0,6-1,7)	0,75 (0,48-1,3)	0,51 (0,3-0,8)	0,33 (0,25-0,6) (n=21)
Comp. + group (n=26)	0,07 (0,02-0,1)	2,30 (1,1-7,3)	1,63 (0,8-5,1)	1,07 (0,5-2,7)	0,80 (0,44-1,44) (n=20)
P**	0,809	0,003	0,001	0,001	0,003

[CRP and PCT regarding the complications]

* t-test, ** Mann-Whitney test.

Maximal postoperative CRP and PCT had similar and good predictive values for the developement of postoperative complications with the area under the ROC curve of 0,780 for CRP and 0,739 for PCT. The best cut-off level for CRP was 148,5 mg/L and for PCT 1,43 mcg/L. Leukocytes increased significantly postoperatively, but without any differences between the two groups.
Conclusion: In patients undergoing elective colon surgery serial determinations of CRP are as helpful as PCT in the diagnosis of postoperative complications.
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12AP3-3

Variation in prothrombin time and fibrinogen plasma levels in septic shock patients in relation to outcome and the SOFA score

Rodríguez-Varga J.L., Bataller A., de Nadal M., Camps A., Tormos P, de Miguel M.
Hospital Universitari Vall d' Hebron, Department of Anaesthesiology, Barcelona, Spain

Background and Goal of Study: In septic shock patients, initial fibrinogen (Fg) plasma levels have been shown to be related to first week mortality (1). Fg might play a role in the pathogenesis of multiple organ dysfunction syndrome (MODS) by increasing plasma viscosity, reducing microvascular blood flow and worsening tissue perfusion (2).
Prothrombin time (PT) prolongation is independently associated with poor outcome in critically ill patients (3).
The aim of this study was to determine plasma levels of Fg and PT variation in relation to the Sepsis-related Organ Failure Assessment score (SOFA) and outcome in patients with septic shock.
Materials and Methods: Thirty-four surgical patients who developed septic shock were retrospectively studied. Routine hematologic, chemistry and coagulation parameters were obtained at study entry, at 24 and 48 hours. SOFA was calculated at the time of blood sampling for Fg levels and PT values (PT prolongation defined as PT ratio < 75%). Relation between both parameters and the SOFA was evaluated by bivariate correlation analysis. Regression analysis was performed between mesured variables and outcome (in-hospital mortality). A p-value< 0.05 was considered statistically significant.
Results and Discussion: 34 patients (16F, 18M, mean age 65 ± 17 yrs, APACHE II score 30± 6) were studied. Hospital mortality rate was 23,5%. At ICU admission, SOFA was 9,2 ±2,6 and PT and Fg values were 67,1% ± 15,8 and 3,4 g/l ± 1,1 respectively, showing variation through time (p < 0,0001) (Table 1). Only initial Fg levels showed relation to SOFA (p 0.02), whilst PT values showed no relation to SOFA (r2 = 0,128, p = 0.42). Regression analysis showed relation between SOFA at admission and Outcome.

	Admission	**24h**	**48h**	**p**
SOFA	9.15 ± 2.8	8.5 ± 2.5	7.7 ± 3.2	<0.0001
Fibrinogen	3.4 ± 1.1	3.6 ± 1.0	4.2 ± 1.0	<0.0001
Prothrombin time	67.1 ± 15.8	71.2 ± 18.2	82.7 ± 17.3	<0.0001

[Table 1]

Conclusion(s): In patients with septic shock, initial plasma fibrinogen values correlate with SOFA and may thus predict in-hospital mortality in surgical patients who developed septic shock. PT showed no relation to SOFA or outcome in this patients.

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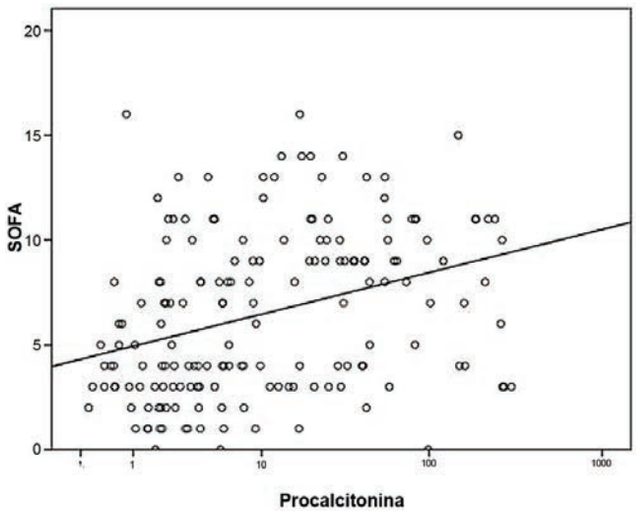
12AP3-4

Correlation between SOFA score and procalcitonin blood levels in peritonitis patients

Miro M., García del Valle S., Agámez G., García Pimentel P.,
Martínez Hurtado E., Olivas E.
University Hospital Fundación Alcorcon, Department of Anaesthesiology and Intensive Care, Madrid, Spain

Background and Goal of Study: Procalcitonin represents a good biological diagnostic marker for sepsis, severe sepsis, or septic shock.
(1). Procalcitonin monitoring is a fast and reliable approach to assessing septic MODS and overall prognosis in secondary peritonitis
(2). The SOFA score is a simple, but effective method to describe organ dysfunction/failure in critically ill patients (3) . We try to find out if there is a correlation between Procalcitonin blood levels and SOFA score in Peritonitis Patients after the surgery.
Materials and Methods: Retrospective study of all patients operated on between January 2009-November 2010 for peritonitis and afterwards admitted in the ICU in our institution. Procalcitonin values and SOFA score were recorded at ICU admission (PCT 0-SOFA 0), and at 24h (PCT 1-SOFA 1) and 48h (PCT 2-SOFA 2) of ICU stay. Correlation between the two variables was studied with the Spearman's Rho test.
Results and Discussion: 64 patients were studied. Lineal correlation was found for PCT 0-SOFA 0 (r=0,299 (p= 0,037)), for PCT 1-SOFA 1 (r= 0,355 (p= 0,024)), and for PCT 2-SOFA 2 (r=0,445 (p= 0,007)).
Global lineal correaltion was found for all PCT values and SOFA score (r= 0,374 (p< 0,001))



[Lineal correlation between PCT values and SOFA sc]

Conclusion: PCT blood levels can predict the severity of sepsis in peritonitis patients measured by SOFA score in the firsts 48 hours after the surgery.

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12AP3-5

Correlation of preoperative baseline CRP values with the development of post-operative atrial fibrillation in patients after CABG surgery in intensive care unit

Kovacevic-Kostic N., Karan R., Markovic D., Soskic L., Velinovic M.,
Radovic M.
Cardiac Surgery Clinic-Clinical Centre of Serbia, Department of Anaesthesiology and Intensive Care, Belgrade, Serbia

Background and Goal of Study: The exact etiology and pathogenesis of post-operative atrial fibrillation still remains unclear. Atrial fibrillation has been associated with Inflammation. Elevated Baseline C-reactive protein (CRP) values might indicate a low grade inflammatory state which, when altered by coronary artery bypass surgery (CABG), may lead to increased incidence of post-operative atrial fibrillation. There are, as well, contradictory results regarding CRP values associated with post-operative onset of atrial fibrillation. The goal of our study was to evaluate correlation between preoperative baseline values of CRP and post-operative atrial fibrillation in patients that underwent CABG.
Materials and Methods: We have evaluated 107 patients that underwent CABG surgery between March 2009 and November 2010 at Cardiac Surgery Clinic,Clinical Center of Serbia. The value of CRP was measured preoperatively and expressed in mg/L. Patients were divided into two groups: Group A with low CRP baseline < 3.0mg/L and Group B with high CRP baseline ≥3.0mg/L. Data were presented as percentage for frequencies and mean value with standard deviation for CRP levels. Comparison between frequencies was done by Chi^2test.
Results and Discussion: The Group A consisted of 34 patients with the Mean value of CRP of 1.8±0.4mg/L. Post-operative atrial fibrillation developed in 7(20.6%) patients, while 27(79.4%) patients remained in sinus rhythm. In the Group B there were 73 patients and the Mean value of CRP was 4.2±0.6mg/L. In this group 38(52%) patients developed post-operative atrial fibrillation, while 35 (48.0%) patients didn't. In the Group A significantly more patients remained in sinus rhythm postoperatively (p=0.0001), while in the Group B more patients developed post-operative atrial fibrillation, but without significance (p=0.583).
Comparing proportion of patients with post-operative atrial fibrillation between Group A and Group B, significantly more patients with high baseline CRP≥3.0mg/L developed atrial fibrillation postoperatively than patients with low baseline CRP< 3.0mg/L (p=0.0001).
Conclusion(s): Baseline CRP is one of possible predictive factors for the development of post-operative atrial fibrillation, particularly in patients with elevated preoperative baseline values, and in these patients adequate prophylactic measures should be undertaken.

12AP3-6

Procalcitonin time course for predicting overall prognosis in secondary peritonitis

Vidal P., Sadurní M., Beltrán S., Pérez A., Sánchez S., García C.A.
Parc de Salut Mar, Department of Anaesthesiology, Barcelona, Spain

Background and Goal of Study: Procalcitonin (PCT) is an accepted sepsis marker to evaluate the evolution of sepsis in secondary peritonitis. Plasma concentrations correlate with severity illness in medical and surgical patients. PCT time course has proven its usefulness in assessing the appropriateness of the empirical antibiotherapy on patients admitted in medical intensive care units (ICU).
The aim of this study was to analyze the PCT time course during the first three days after surgical treatment of secondary peritonitis according to the appropriateness of the first line empirical antibiotic therapy as well as to the patient outcome.
Materials and Methods: Prospective observational study over a 6-month period. Patients undergoing emergency abdominal surgery with intraoperatively proven peritonitis and expected to stay in surgical ICU for at least 72 hours were enrolled. Demographic data and primary site of infection were recorded. Intra-abdominal bacteriologic cultures were obtained and appropriateness of empirical antibiotic therapy (AEAT) was assessed. Procalcitonin measurement was obtained on postoperative days 1 and 3; absolute and percentage change between days 1 and 3 were estimated (ΔPCTa, ΔPCTp). Clinical outcome measured as need of surgical reintervention and mortality was collected. Mann-Whitney test was used for statistical analysis.
Results and Discussion: 53 patients were included: 32 male (60.4%), 21 female (39.6%). Mean age was 68 years ± 16.8. Primary site of infection distribution was: Gastro-duodenal 9.4%, Small bowel 15.1%, Colon 26.4%, Appendicular 9.4% and Biliary 39.6%. 39 patients (73.6%) received an adequate

empirical antibiotherapy and 3 (5.7%) did not. 5 patients died (9.4%) and 6 needed surgical reintervention (11.3%).
No relation between ΔPCT and clinical outcome or adequate empirical antibiotherapy was found. Though a decrease in almost 50% of ΔPCT was found in AEAT, there was no statistical association; little sample of patients with inadequate treatment could be the cause. PCT values at day 1 and 3 correlate with mortality.
Conclusion(s): In secondary peritonitis, higher levels of PCT at day 1 and 3 after surgical treatment were associated with higher mortality. No relation between adequate empirical antibiotherapy and PCT time course were found. More studies are needed to test this correlation.

12AP3-7

Procalcitonin and c-reactive protein pharmacokinetics after oncologic non-emergent colorectal surgery

Vidal P, Sadurní M., García C.A., Rojo A., Sánchez S., Samsó E.
Parc de Salut Mar, Department of Anaesthesiology, Barcelona, Spain

Background and Goal of Study: Procalcitonin (PCT) is a protein used as a diagnostic marker in infections. It has been proposed as a marker for early diagnosis of intrabdominal infectious complications after abdominal surgery[1]. However, up to date the pharmacokinetic profile of PCT after non-emergent elective abdominal surgery has not been completely elucidated[2]. The goal of the study is to determine the pharmacokinetics of PCT and c-reactive protein (CRP) during the immediate 3 days after non-emergent and non complicated oncologic colorectal surgery. Also, we aim to determine if there is a correlation between their peak values and surgical duration and type of colorectal resection.
Materials and Methods: Observational and prospective study of 34 patients scheduled for oncologic non-emergent colorectal surgery via mid laparotomy. Preoperative values of PCT and CRP were recorded as well as at 24, 48 and 72 hours after surgery. Duration and type of surgery (right hemicolectomy, sigmoidectomy or rectal resection) were also recorded. Normal values in our laboratory for PCT and CRP are < 0.05 ng/mL and < 1mg/dL respectively.
Results and Discussion: Four patients were excluded because of postoperative surgical infectious complications. Values of PCT and CRP are expressed as median and percentile 25-75. Preoperative PCT and CRP median values were 0.05 ng/mL and 0.3 mg/dL respectively.Values of PCT were 0.18 (0.1-1.00) at 24h, 0.17 (0.09-0.36) at 48h and 0.15 (0.07-0.81) at 72h.Values of CRP were 8.75 (5.47-11.7) at 24h, 10.15 (8-13.3) at 48h and 8.1 (7.3-11.8) at 72h. Maximum value of PCT was achieved at 24h (67% of the patients) and CRP's at 48h (52%).PCT and CRP peak values did not reach statistical significance when type and duration of surgery was taken into account.
Conclusion(s): In colorectal surgery, values of PCT and CRP remain elevated throughout the 3 postoperative days. Peak PCT values occurs at 24h after surgery and does not achieve critical levels (2ng/mL) suggested for bacterial infectious diagnosis. CRP peak value occurs at 48 h after surgery and was 10 times of magnitude higher of normal range.
There was no significant correlation between CRP/PCT elevation and duration and type of surgery.
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12AP3-8

Correlation between arterial blood PH on admition and outcome in ICU patients

Vakalos A., Petkopoulou M., Amanatidou A.
Xanthi General Hospital, Department of Anaesthesiology and Intensive Care, Xanthi, Greece

Background and Goal of Study: Arterial blood PH affects the APACHE II (Acute Physiology and Chronic Health Evaluation) scoring system. APACHE II score was developed to provide an objective assessment of severity of illness in the ICU.. The aim of our study was to test the hypothesis that correlation exists between arterial blood PH on admition and outcome in ICU patients.
Materials and Methods: During November 2005 and July 2010, 253 patients admitted to our both medical and surgical ICU and included retrospectively in our study. Mean age: 61.9 years, mean APACHE II score: 18.5, mean length of stay (LOS): 13.1 days, with predicted and actual mortality: 31.6 % and 23.71 % respectively, normalized mortality ratio (NMR): 0.75. The patients separated in two groups. Group A involved 193 patients who survived and discharged ICU and group B 60 patients who died into the ICU. We looked for statistical significant difference (p value two tailed) between the medians PH values on admition of group A and group B, using the unpaired Mann - Whithney test (nonparametric) or the unpaired t test Welch corrected (parametric), according to the normality test.
Results and Discussion: Values passed normality test, so we used parametric test.The two-tailed p value was < 0.0001, considered that there was extremely statistical significant difference between the two groups.

	Mean	S.D.	Lower 95 % C.L.	Upper 95 % C.L.	Min	Max	Median
Group A	7.35	0.12	7.34	7.37	6.91	7.6	7.35
Group B	7.23	0.17	7.18	7.27	6.70	7.5	7.25

[Results]

Conclusion(s): According to our data, patients who died into the ICU had extremely statistical significant lower arterial PH values on admition. The statistical significant correlation recorded between arterial PH values on admition and the outcome, may be due to multiple organ dysfunction in patients with severe acidosis.
We suggest that PH values on admition alone may be used as an indicator of severity of illness.

12AP3-9

Correlation between PCT levels and SIRS: Is there any PCT cutoff for the prediction of SIRS?

Kallel S., Ben Soltana M.H., Ghariani S., Triki Z., Chaari M., Karoui A.
Academic Medical Center Habib Bourguiba of SFAX, Department of Anaesthesiology and Intensive Care, SFAX, Tunisia

Background and Goal of Study: Several clinical studies have confirmed the superiority of Procalcitonin (PCT) as a specific biomarker for microbial infection diagnostic utility. It is also of a great reliability in predicting the happening of severe postoperative inflammatory phenomena such as in cardiac surgery, since it could increase without any infectious disease. Our objective was to study the predictive role of PCT in the occurence of severe SIRS after cardiac surgery with CPB
Materials and Methods: This is a prospective study focused on patients who underwent cardiac surgery with cardiopulmonary bypass (CPB). The exclusion criteria were: urgent surgical intervention, infective endocarditis, age less than 18 years and/or bacteriologically documented infection. Assays of PCT were performed before and after CPB, in the fourth postoperative hour and every day during the first four days.
PCT measurements were performed by enzyme immunoassay method based on Elecsys2010. Severe SIRS was defined by a SIRS with at least one organ dysfunction. SIRS and severe SIRS were sought for all patients early on the first postoperative day and then, the classification was daily reassessed.
Results and Discussion: In total, 40 patients were selected. The average age was 56.1 ± 15 years, a sex ratio of 1.3 and the distribution by type of surgery was as follows : 23 coronary artery bypass graft, 17 valve replacements. Among the 40 patients studied, five did not develop SIRS. SIRS was simple in 18 patients (45%) and severe with organ dysfunction in 17 patients (42.5%). PCT levels were significantly higher in patients with organ dysfunction from the fourth postoperative hour until day 4, with a peak of 1.7 ± 1.2 ng / ml on Day 1.While they didn't exceed 0.5 ng/ml in patients without SIRS. CRP and WBC levels showed no significant differences between the 3 studied groups (no SIRS, SIRS and severe SIRS).
Analysis of ROC curves of PCT at different times studied for the prediction of severe SIRS showed that PCT levels at H24 and H48 had the best area under the curve (AUC). For a threshold of 0,958 ng/ml measured on the first postoperative day,PCT has a sensitivity of 85% and a specificity of 95% for the prediction of organ dysfunction with an AUC = 0.925.
Conclusion(s): PCT levels on the first postoperative day above the threshold of 0,958 ng/ml could play a predictive role in the onset of severe SIRS after cardiac surgery with CPB.

12AP3-10

Prognostic value of c-troponin I after adult cardiac surgery

Kallel S., Ben Soltana M.H., Djemal W., Triki Z., Chaari M., Karoui A.
Academic Medical Center Habib Bourguiba of Sfax, Department of Anaesthesiology and Intensive Care, Sfax, Tunisia

Background and Goal of Study: In addition to its interest as a myocardial damage marker, c troponin I has proved its value as a prognostic factor in cardiac surgery. Its postoperative rate plays an important role in predicting the short-and long-term evolution.

The aim of this study is to determine the prognostic value of cTnI after cardiac surgery with CPB and to establish threshold values for predicting the evolution.
Materials and Methods: This is a prospective monocentric study focused on patients who underwent heart surgery with CPB. We have not included patients operated in emergency or those with increased preoperative troponin rates nor those who developed a myocardial infarction (MI) within 15 days before surgery. We also excluded any patient who presented a postoperative cardiac complication.
The determination of cTnI was performed before and after CPB, in the fourth and twelfth postoperative hours (H4 and H12) and then every day during the first 4 days. cTnI assays were performed by enzyme immunoassay on mini-VIDAS®.
Results and Discussion: 37 patients were included and two were excluded because they died before the fourth postoperative day. The 35 remaining patients were divided into two groups: a coronary (22 patients) and a valvular (13 patients) populations. The mean age was 54.3 ± 15 years and the sex ratio was 1.2. Our population had an average Euro SCORE of 4 ± 2.1.
All the preoperative cTnI values were below the detection limit of the test (< 0.01 mg/l).
The average length of the ICU stay was 5.3 ± 4.9 days. Only one patient (2.9%) from the coronary population died. The length of stay was positively correlated with the H4 cTnI rate ($r = 0.589$, $p = 0.044$). Fourteen patients (40% of the general population) showed a SIRS with organ dysfunction (severe SIRS). The rate of cTnI were significantly increased at H0 and H4 (1.4 ± 1.03 against 0.8 ± 0.56 and 2.3 ± 1.27 against 1.5 ± 0.81, respectively). Analysis of the ROC curve showed that a rate of cTnI at H0 greater than 0.80 mcg/l had a sensitivity of 70% and a specificity of 65% for predicting the occurrence of postoperative severe SIRS.
Conclusion(s): A rate of cTnI exceeding the 0.8 mcg/l at the end of the CPB could play a predictive role of postoperative adverse with higher ICU stay and complication rate.

12AP3-11

Prognostic value of the central venous-to-arterial carbon dioxide difference (PCO_2 gap) for postoperative complications in high-risk surgical patients

Robin E., Futier E., Pires O., Lebuffe G., Vallet B.
University Hospital of Lille, Univ Nord de France, Lille, France, Department of Anaesthesiology and Intensive Care, Lille, France

Background and Goal of Study: Tissue hypoperfusion is a key trigger of postoperative organ dysfunction. Our objective was to evaluate the prognostic value of the PCO_2 gap, a global index of tissue perfusion, in patients after major abdominal surgery.
Materials and Methods: A prospective and observational study of 115 patients admitted in the ICU following major abdominal surgery. In all patients, measurements of the PCO_2 gap, central venous oxygen saturation ($ScvO_2$), serum lactate and conventional hemodynamic and biological parameters were performed on admission (H0), and over 6 hours until 12 hours after admission. Postoperative complications, the duration of mechanical ventilation, and the hospital length of stay and mortality up to 28 days were evaluated. Area under the ROC curves for PCO_2gap, $ScvO_2$ and lactate were compared to discriminate between patients with and without complications.
Results: A total of 78 patients developed at least one complication including 57 (50%) patients with postoperative septic complications. At T0 there was no significant difference in demographic and hemodynamic data, type and duration of surgical procedures between patients with and without complications. There were 9 deaths (7.8%).
There was a significant difference for PCO_2 gap (8.1 ± 3.2 mmHg vs. 5.5 ± 2.8 mmHg, $P < 0.001$), $ScvO_2$ (76.5 ± 6.4% vs. 78.9 ± 5.8%) and serum lactate ($P < 0,001$) between patients with and without complications. After multivariate analysis PCO_2 gap and lactate level, but not $ScvO_2$, were associated with postoperative complications ($P < 0.001$ and $P = 0.018$, respectively). Area under the ROC curves were 0.66 (95%CI 0.55-0.76) for lactate, 0.57 (95%CI 0.46-0.68) for $ScvO_2$ and 0.85 (95%CI 0.77-0.93) for PCO2 gap, with 6 mmHg as the best threshold value for discriminating patients with and without complications.
Patients with a PCO_2 gap > 6 mmHg (68%) had a longer duration of mechanical ventilation (4.1 ± 3.4 days vs. 5.6 ± 3.8 days, $P = 0,047$), a longer hospital stay (Figure 1). Patients who died all had enlarged PCO_2 gap ($P = 0.056$).
Conclusion(s): Both low and "supranormal" values of $ScvO_2$ were found to be warning signals of impaired tissue oxygenation. A PCO_2 gap> 6 mmHg could be a useful prognostic factor to identify patients at risk of postoperative complications following major abdominal surgery, especially when $ScvO_2$ exceeds 75%.

12AP4-1

Noninvasive positive pressure ventilation in patients with severe pneumonia caused by the H1N1/09 pandemic influenza virus

Dubrov S., Glumcher F., Semiankiv A.
National O. Bogomolets Medical University, Department of Anaesthesiology and Intensive Care, Kiev, Ukraine

Background and Goal of Study: The problem of mechanical ventilation (MV) usually arises in all cases of severe pneumonia accompanied by the development of the respiratory failure. Conduction of conventional MV is justified in the majority of such cases. According to Australian authors in patients with viral pneumonia during the H1N1/09 Pandemic Influenza the beginning of invasive MV at admission to the ICU was an independent factor associated with a significant increase in the level of mortality [1]. The analysis of patients who were on invasive MV in ICU in Ukraine revealed that the mortality in this population was 83.63% (38.7% -100%). The aim of the study was to investigate the efficiency of non-invasive respiratory support techniques in patients with severe respiratory failure due to viral pneumonia.
Materials and Methods: The survey was conducted from 02.01.2010 to 02.03.2010 in the ICU of National Medical University Clinic. Non-invasive ventilation was performed in 18 patients with bilateral polysegmental confirmed viral pneumonia, who developed severe respiratory failure and required mechanical ventilation. Non-invasive ventilation was performed using the Biphasic Positive Airway Pressure (BiPAP) mode through the face mask. The efficiency of ventilation was estimated clinically, arterial blood gas composition and acid-base status of blood were evaluated.
Results and Discussion: In the studied group 3 patients (16.7%) were subsequently intubated, 2 of them died (mortality rate - 11.1%). The rest 15 patients (83.3%) were discharged from the hospital in satisfactory condition with no signs of pneumonia. Duration of non-invasive ventilation ranged from 2 to 7 days (average - 3.2 days).
Conclusion(s): The use of noninvasive ventilation in patients with severe respiratory failure due to viral pneumonia requires further study. Our survey showed, that it can reduce mortality, avoid the complications associated with tracheal intubation and conduction of classical mechanical ventilation, reduce the terms of treatment in ICU and thus should be recommended for respiratory support in patients with severe respiratory failure due to viral pneumonia.
References:
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12AP4-3

Clostridium difficile associated diarrhoea in a teritiary referral neurocritical care unit

Tripathy S., Kataria C., Nair P.V.
Walton Centre of Neurosciences, Department of Anaesthesiology and Intensive Care, Liverpool, United Kingdom

Background: Clostridium difficile associated diarrhoea (CDAD) occurs following long term hospitalisation or multiple antibiotic usage especially cephalosporins. Neurointensive care patients on average have higher bed days,greater incidence of ventilator associated pneumonia (VAP) and higher antibiotic use. We aimed to study the aetiology, acquisition rate and outcome of NICU (neurointensive care unit) acquired CDAD.
Methods: Intensive care admission and hospital infection control databases from April 2008 to August 2010 were studied and the case notes reviewed retrospectively. Patients who acquired CDAD within 48hrs of ICU admission were excluded. Diarrhoea was classified as mild, moderate or severe depending on frequency and volume. Information on use of antibiotics, frequency, duration and type was gathered. Admission diagnosis, days of intensive care stay and incidence of complications were noted.
Results: Of the 2212 patients with a total of 10,825 bed days nine patients developed CDAD. The median ICU stay was 26 (11-103) days. The median interval between ICU admission and developing CDAD was 11 (3-93) days (7 in other neurocritical care units). Median age of the patients were 55 (20-72) years. Patients had a mean 6.7 (+/_ 5.2) days of diarrhoea prior to a positive assay and at the time of diagnosis most patients 4 (44%) had moderate CDAD. Three patients had a perceived delay in discharge from ICU (1-8 days) due to infective status. Concurrent infections occurred in 77% of patients, 33% of which were VAP. 44.4% of the antibiotics used prior to CDAD development were cephalosporins.There were no major complications attributed to CDAD. Identified risk factors for ICU acquired CDAD included age > 65 (22%), antibiotics (67%), laxatives (100%), steroids (33%), proton pump inhibitors (88%) and medical device requirement (100%). All of the cases were emergency admissions.

Conclusion: In spite of a patient population who is at high risk of CDAD the rates of infection in our unit are 8.3 per 10,000 bed days or 0.40 % incidence which is below the average incidence for general intensive care (10.6 per 10,000 bed days) and neurocritical care units (0.60%) in the UK.This can only be attributed to the presence of an efficient infection control team, isolation practises with patients immediately being isolated to barrier nursing and a protocol for CDAD detection, and management as well as a high degree of awareness amongst the medical and nursing staff.

12AP4-4

Evaluation of the efficiency of confirming Howell-Jolly body in peripheral erythrocytes and splenic hypoplasia on CT to screen for a group at high risk of fulminant pneumococcal infection

Nakagawa H., Ishikawa M., Sasaki A., Matsumoto J., Morimoto A.
Kure Kyosai Hospital, Clinical Laboratories, Kure, Japan

Background and Goal of Study: Howell-Jolly body disappears due to the filtering function of the spleen. Pneumococcus is a main bacteria causing community-acquired pneumonia and the main host defense process involves the spleen. Some reports have shown that pneumococcal infection became fulminant in patients that were not only post splenectomy or showing spleen dysfunction but also normal population without high risk factors. We encountered two cases of fulminant pneumococcal infection in which Howell-Jolly body was confirmed in peripheral erythrocytes and hypoplasia of the spleen was shown on abdominal CT. This study evaluated the efficiency of confirming Howell-Jolly body in peripheral erythrocytes and splenic hypoplasia on CT to screen for a group at high risk of fulminant pneumococcal infection.
Materials and Methods: Between September 2007 and October 2010, peripheral blood samples from about 230000 cases were examined for various reasons in our hospital.
Results and Discussion: Howell-Jolly body was confirmed in peripheral erythrocytes in 149 cases. Of these, the cases in which splenectomy had been performed or spleen was not demonstrated on CT were excluded. The spleen volume was measured on CT imaging in the remaining 20 cases. Seventeen patients were male and the two cases of fulminant pneumococcal infection described above were included among these cases. Spleen volume was small in all cases and ranged from 12.9 to 124.4cm^3. We considered that Howell-Jolly body was confirmed in peripheral erythrocytes due to dysfunction of the spleen. It is necessary to use a vaccine against pneumococcus to prevent a fulminant pneumococcal infection in the high risk group.
Conclusion(s): Confirmation of Howell-Jolly body in peripheral erythrocytes and hypoplasia of the spleen may be useful to screen for a group at high risk of spleen dysfunction and fulminant pneumococcal infection.

12AP4-5

CD3ζ expression and arginase activity after cardiac surgery with cadiopulmonary bypass

Palomero-Rodriguez M.A., Mollinedo F., Sanchez Conde M.P.,
Garcia Navas R., Laporta Baez Y., Suarez Gonzalo L.
Hospital Universitario Salamanca, Department of Anaesthesiology and Intensive Care, Salamanca, Spain

Background and Goal of Study: An excessive inflammatory response following cardiac surgery appears to underlie an enhanced susceptibility to the development of septic complications. In order to examine the role of arginase in the outcome of these patients, we analyzed the putative relationship between arginase activity and CD3ζ expression in patients undergoing cardiac surgery with cardiopulmonary bypass (CPB).
Materials and Methods: Fourteen patients undergoing cardiac surgery with CPB were enrolled in the study. CD3ζ expression, arginase activity, and levels of CRP, troponin I, leucocytes, platelets, fibrinogen and hemoglobin were determined preoperatively (d0), and 20 h (d1), 44 h (d2), 72 h (d3) and 96 h (d4) after CPB termination. All postoperative complications were assessed. Data were analyzed by a mixed linear regression model.
Results and Discussion: Preoperative arginase activity was inversely correlated with preoperative CD3ζ expression ($p < 0.05$) (Fig 1). Absolute numbers of leucocytes ($p < 0.05$) and neutrophils ($p < 0.05$), as well as the values for CRP ($p < 0.05$) and arginase activity ($p < 0.05$) increased after surgery, whereas the number of lymphocytes ($p < 0.05$) and CD3ζ expression ($p < 0.05$) decreased. We found a significant correlation ($p < 0.05$) between an increase in arginase activity and CD3ζ downregulation following surgery. Sorting out patients with preoperative CRP < 3 mg/dL or CRP > 3 mg/dL, we found higher levels of arginase activity ($p < 0.05$) and lower levels of CD3ζ expression ($p < 0.05$) in the CRP > 3 mg/dL patient group during the study (Fig 2). Our results suggest that an increased production of arginase I could underlie the decreased CD3ζ expression found in T cells in our patients.
Conclusion(s): Our data suggest that patients with high preoperative PCR levels are accompanied by high levels of arginase activity and lower CD3ζ expression before and after surgery, these patients being more susceptible to septic complications after surgery.
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Acknowledgements: This work was supported by Junta de Castilla y León (Biomedicine Project 2010), and GR15-Experimental Therapeutics and Translational Oncology Program).

12AP4-6

Multidrug-resistant pathogens should not be considered in postoperative early-onset pneumonia: A retrospective cohort analysis

Serrano A., Bermejo S., Soler E., Garcia C., Sanchez A., Samsó E.
Hospital del Mar (Parc de Salut Mar), Department of Anaesthesiology and Intensive Care, Barcelona, Spain

Background and Goal of Study: Time onset of pneumonia is an important risk factor for specific pathogens and outcomes. Early-onset pneumonia (occurring within the first 4 days of hospitalization) usually carries better prognosis and is more likely to be caused by antibiotic-sensitive bacteria**.** The aim of the study was to describe the microbiology of early pneumonia in a post-anaesthesia care unit (PACU) of a third-level hospital, focusing in multidrug-resistant (MDR) pathogens (resistant to 3 or more antibiotic families).
Materials and Methods: We retrospectively analysed a cohort of 103 patients (January/08-October/10) with clinical suspect of postoperative pneumonia and only those with early-onset pneumonia were included. Variables: age, sex, co-morbidities, type of surgery, hours of mechanic ventilation in the operating room (OR) and PACU, type of respiratory tract culture, pathogen, days at first symptom, type of pneumonia (community-acquired (CAP), hospital-acquired (HAP), health-care associated (HCAP)) and previous antibiotic treatment.
Results and Discussion: 86 patients (75% male, 25% female) with an average age of 69(55-83) years old were included. The most frequent surgery was abdominal (51%). All patients but two were ventilated in the OR, with an average time of 4(2-6) hours. Respiratory tract cultures were obtained through both non-bronchoscopic (37%) and bronchoscopic (63%) methods. CAP was presented in 51%, HAP in 37% and HCAP in 12% of cases. Microbiology is described on the table. MDR pathogens were isolated in 3 cases: one CAP, one HCAP and one HAP. 40 patients had negative cultures probably related to previous antibiotic treatment (91%). Empiric antibiotic therapy was prescribed following the local protocol.

Pathogens	No-MDR(n/%)	MDR(n/%)	Total(n/%)
P.aeruginosa	6/7	2/2.5	8/10
E.coli	6/7	1/1.5	7/8
K.pneumoniae	10/13	0	10/13
Other enterobacteriaceae	11/14	0	11/14
H.influenzae	6/7	0	6/7
S.pneumoniae	5/6	0	5/6
S.aureus	7/9	0	7/9
Other pathogens	26/33	0	26/33
TOTAL	77/96	3/4	80/100

[Microbiology]

Conclusion(s): In our population, according to our results, we should not consider to empirically treat MDR pathogens in postoperative early-onset pneumonia, even in the case of HAP or HCAP, since this sort of germs are not frequently isolated.

12AP4-7

Ventilator-associated pneumonia (VAP) is the main mortality risk factor in patients following cardiac surgery

Heredia Rodríguez M., Fernández Urbón A., Carrasco Serrano E.,
Peláez Jareño M.T., Martínez Rafael B., Tamayo Gómez E.
Hospital Clínico de Valladolid, Department of Anaesthesiology and Intensive Care, Valladolid, Spain

Background and Goal of Study: VAP is the most frequent serious infection among patients undergoing heart surgery (1).

We aim to assess whether the development of ventilator-associated pneumonia (VAP) during the post-operative period following cardiopulmonary bypass (CPB) is associated with an excess of in-hospital mortality not attributable to the underlying severity of the patient's illness or intra-operative and post-operative events

Materials and Methods: We performed a prospective observational study, between July 2004 to January 2009, where 1,610 postoperative cardiac surgery patients status post CPB were included.

The nosocomial pneumonia during mechanical ventilation and for 48 hour following extubation were studied as well as demographic, clinical characteristics, and the data concerning intraoperative and postoperative course.

The aim of our research was to study in-hospital mortality (as outcome variables) and; preoperative, intraoperative and postoperative potential risk factors (as independent variables).

Results and Discussion: VAP was observed in 124 patients (7.7%). Patients with VAP had a longer length of hospitalization (40.7 ± 35.1 days vs. 16.1 ± 30.1 days, $p < 0.0001$) and greater in-hospital mortality (49.2% (61/124) vs. 2.0% (30/1486), $p=0.0001$) in comparison to patients without VAP. VAP was identified as the most important independent mortality risk factor (adjusted hazard ratio (HR) = 8.53, 95% CI (4.21-17.30), $p = 0.0001$). Other independent risk factors of in-hospital mortality were chronic renal failure (HR = 2.56), diabetes mellitus (HR = 1.90), CPB time (HR = 1.51), respiratory failure (HR = 2.13), acute renal failure (HR = 2.39), and mediastinal bleeding ≥ 1000 mL (HR = 1.81).

Conclusion(s): The development of VAP following CPB is the most important independent risk factor for in-hospital mortality. Identification of effective strategies for the prevention of VAP is needed.

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12AP4-8

Efficacy of recombinant soluble thrombomodulin in disseminated intravascular coagulation associated with sepsis

Nakahara M., Yasuda T., Ikoma K., Daiguuji A., Kikuchi T., Kakihana Y.
Kagoshima University, Department of Anaesthesiology and Intensive Care, Kagoshima City, Japan

Background and Goal of Study: Sepsis is a life-threatening disorder that results from systemic inflammatory and coagulatory responses to infection. Recombinant human soluble thrombomodulin (rhs TM) is newly developed for treatment of disseminated intravascular coagulation (DIC).[1] We conducted a single center, retrospective study. The purpose of this study was to evaluate the efficacy of the administration of rhs TM and to compare the efficacy of rhs TM against to that of danaparoid.

Materials and Methods: We studied 50 patients with DIC associated with sepsis. Thirty of the 50 patients (thrombomodulin group: TM group) were assigned rhs TM for 6 consecutive days (0.06mg kg-1 for 30 min, once daily). Twenty of the 50 patients (danaparoid group: DS group) were administered with 1250-2500 IU/day. Haemostatic markers (soluble fibrin,(SF), D-dimer etc.) and endothelial damage markers(Plasminogen activator inhibitor-1 (PAI-1), soluble E-selectin (s ES) etc.) were measured at day 1 (before treatment), and day 7. DIC resolution rate and mortality rate at 28 days were evaluated. All results are expressed as mean ± SD, data were subjected to a one-way ANOVA followed by Fisher's PLSD (p value less than 0.05 being considered statistically significant).

Results and Discussion: The baseline characteristics at the study entry in both groups were almost similar. SF values in DS group were significantly decreased from 48.8 ± 31.1 (at day 1) to 20.1 ± 26.2μg/ml (at day 7) ($P< 0.01$). D-dimer values in DS group were significantly decreased from 48.8 ± 31.1 (at day 1) to 20.1 ± 26.2μg/ml (at day 7) ($P< 0.01$). While, sES values in TM group were significantly decreased from 62.6±54.2 to 41.0±25.2 ng/ml ($p< 0.01$). PAI-1 values were significantly decreased between day1 and day7 in both groups. The Sequential Organ Failure Assessment (SOFA) score on the day7 significantly improved when compared with those on day 1, only in TM group. In this study, we demonstrated that rhs TM significantly improved DIC associated with sepsis with significant changes in plasma levels of sES and PAI-1.

Conclusion: When compared with DS therapy, rhs TM for 6 consecutive days more significantly improves DIC.

References:

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12AP4-9

Risk factors for multidrug resistant bacteria in secondary peritonitis

La Macchia F., Garcia Bernedo C.A., Sadurni Sarda M.,
Beltrán de Heredia Marrodán S., Sánchez Navas S., Samsó Sabe E.
Hospital del Mar-Esperança (Parc de Salut Mar), Department of Anaesthesiology and Pain Medicine, Barcelona, Spain

Background and Goal of Study: Antibiotic therapy and surgical source control are essential for intraabdominal infection (IAI) treatment. Empirical treatment relies on the origin of IAI:community (low prevalence of multidrug resistant bacteria (MDRB)) and nosocomial (associated with MDRB)

(1). However, emergence of MDRB on community peritonitis have been recently stressed.

Several community infections causes by MDRB are related with health-care-associated (HCA) treatments, as in pneumonia

(2). The main objective of this study was to determine risk factors for MDRB in secondary peritonitis focused on those related with HCA treatment.

Materials and Methods: 5 months period, patients admitted to our surgical care unit with diagnosis of secondary IAI with microbiological culture performed. Demographic data, ASA and comorbidity, steroids therapy, previous antibiotic use (3 months before surgery) and APACHE II score were recorded. Risk factors for HCA peritonitis: home medical care attention and admissions from a senior's residence. The unit discharge length of stay (LOS) was recorded. Positive cultures for bacteria and antimicrobiological susceptibility test were reviewed. MDRB was defined as resistant to at least 3 antibiotic families. Chi square test was used for statistical analysis.

Results and Discussion: 48 patients were included.30 male (62.5%),18 female (37.5%). ASA classification distribution was: I (17 %), II (42 %), III (29 %), IV (13 %). Mean APACHE II severity score was 11.85 (± 8.4) and mean LOS was 3.26 days (±3.3). Factors statistically associated with presence of MDRB included previous antibiotherapy and nosocomial origin. No relation was found between HCA risk factors and MDRB in secondary peritonitis (SP).

Conclusions: Prior antibiotic use and nosocomial origin are the main risk factors for MDRB in SP. Identification of these items are mandatory to adequate empirical antibiotherapy. Although HCA risk factors did not correlated with the presence of MDRB in SP, our results could be partially related to the small sample.

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Acknowledgements: Sergi Mojal (Epidemiology Department).

12AP4-10

Epidural bupivacaine decreases inflammatory processes and attenuates intestinal lipid peroxidation, oxidative injury and mucosal apoptosis induced by mesenteric ischemia/reperfusion in a rat model

Bedirli N., Akyurek N., Kurtipek O., Kavutçi M., Kartal S., Cavunt Bayraktar A.
Gazi University School of Medicine, Department of Anaesthesiology and Intensive Care, Ankara, Turkey

Background and Goal of Study: This study was conducted with the hypothesis that thoracic epidural anaesthesia (TEA) will attenuate the intestinal injury caused by mesenteric occlusion. This was evaluated by the systemic inflammatory response, intestinal lipid peroxidation, oxidative stress, and mucosal apoptosis in a rat model of mesenteric ischemia reperfusion (MIR).

Materials and Methods: Twenty four rats were divided into four groups: sham (Sh) (n= 6; sham laparotomy), control (C) (n= 6; MIR), bupivacaine (B) (n=6; MIR; 20 μL/hr 0.5 % bupivacaine), and saline (S) (n=6, MIR; 20 μL/hr 0.9 % saline).

Rats were anaesthetized with 1.5% isoflurane and epidural catheters were inserted at intervertebral space L3-L4 and advanced to T6. MIR was established by occluding the superior mesenteric artery for 1 hour and followed by 12 h reperfusion. Blood and tissue samples were collected for blood gas, tumour necrosis factor-α (TNF-α), interleukin-6 (IL-6), interleukin-1β (IL-1β) measurements, glutathione peroxidise (GPX), superoxide dismutase (SOD), catalase (CAT), myeloperoxidase (MPO), malondaldehyde (MDA), injury score, intercellular cell adhesion molecule-1 (ICAM-1), apoptosis and wet/dry ratio determinations.

Results and Discussion: The blood gas analysis did not show any difference between groups ($P>0.05$). Bupivacaine decreased TNF-α and IL-1β and increased GPX and SOD compared to C and S groups ($P< 0.05$). Bupivacaine treatment associated with a decrease in lipid peroxidation product MDA and

neutrophil accumulation in the intestine tissue showed by MPO compared to S and C groups (P< 0.05). Wet/dry ratio showed a decrease in B (2.88 ± 0.17) group compared to C (5.45 ± 0.67) and S (5.87 ± 0.17) groups (P< 0.05). Injury score was significantly decreased in B (1(1-2)) group comparing to C (3(2-3)) and S (3(2-4)) groups and apoptotic cells decreased in B group compared to C group only (P< 0.05). ICAM-1 levels in B (27.4±7.1) group decreased comparing to C (12.3±7.4) and S (24.9±3.2) groups (P< 0.01). In Sh group, TNF-α, IL-6 were significantly lower and SOD was higher than C and S groups while IL-1β was significantly lower and GPX and CAT were higher than C, S and B groups.
Conclusion(s): Therapeutic effects of TEA on intestinal injury associated with MIR are shown and this may be clinically interesting in restoring the intestinal mucosal injury and decreasing the mortality of mesenteric occlusion when used for both anaesthesia and pain control.

12AP5-1

Centrally acting α2-agonists added to sedation/analgesia regimen has opioid sparing effects in trauma patients

Luca Vasiliu I., Mirea L.E., Balanescu A., Ungureanu R.I., Pavelescu D., Grintescu I.M.
Clinical Emergency Hospital of Bucharest, Department of Anaesthesiology and Intensive Care, Bucharest, Romania

Background and Goal of Study: The ideal regimen of sedation and analgesia in ICU patients should provide adequate pain control, be easy to titrate, with a rapid onset and offset of action and without accumulation; it should also be cost effective, reducing the time spent on mechanical ventilation and the length of stay in the ICU. Centrally acting α2-agonists have well studied sedative and analgesic properties.
Our study evaluated opioid sparing effect and shortening of the weaning period when clonidine was added to sedation/analgesia regimen of ICU patients.
Materials and Methods: We included 42 patients with multiple trauma lesions including severe brain injury, with estimated length of mechanical ventilation and analgo-sedation of at least 72 hours.
Patients were divided in two groups. First group (21 patients) had a regimen of sedation and analgesia including Midazolam 0,04mg/kg/h±0,01 and Fentanyl 0,05μ/kg/min ±0,015.
Second group (21 patients) received Midazolam 0,04mg/kg/h±0,01, Clonidine 0,01μ/kg/min±0,005 and Fentanyl infusion was titrated in order to keep the same level of sedation assessed by Ramsey Sedation Scale in all 42 patients. The sedation level was assessed every 4 hours, our goal being to keep a score of 4. We also evaluated the hemodynamic changes and the ICP level (in patients who had invasive monitoring) during painful maneuvers and quantified the opioid bolus requirement during these procedures.
After 72 hours patients with severe brain injury had a CT reevaluation. In 24 cases CT examination showed reabsorption of sanguine effusions and diminished brain edema and we decided to start weaning from sedation and mechanical ventilation.
Results and Discussion: The level of analgesia/sedation was similar in all patients according to Ramsey Sedation Scale evaluation. Also for the hemodynamic parameters and the ICP (CPP) values. Patients in the second group necessitated lower Fentanyl infusions rate (about 0,03μ/kg/min±0,01) and fewer boluses than patients in the first group.
Also, patients proposed for weaning, coming from the second group had a much shorter period until recover of spontaneous breathing and developed less agitation and withdrawal symptoms.
Conclusion: Adding Clonidine to sedation/analgesia regimen in traumatized ICU patients, has an opioid sparing effect and a shorter and smoother weaning period without any hemodynamic or neurologic impairment.

12AP5-2

Is sevofluorane cardioprotective during inhalatory sedation?

Anaya R., González-Rodríguez R., Laura G., Koller T., Galan J., Moral M.V.
Hospital de la Santa Creu i Sant Pau, Department of Anaesthesiology, Barcelona, Spain

Background and Goal of Study: Experimental evidence has indicated that volatile anesthetics may have direct cardioprotective properties with a beneficial effect on myocardial reperfusion injury during coronary surgery. Creatinine kinase (CK) and T-Troponine (TT) are correlated with miocardium damage. We wanted to know if sevofluorane inhalatory sedation, during postoperative care of coronary surgery, would have that cardioprotective properties as well.
Materials and Methods: We have prospectively studied, patients during the coronary revascularization postoperative period. Inhalatory anesthesia with sevofluorane were used in all of them. Group S of patients (n=14) were postoperative sedated with sevofluorane, using the Anaesthetic Conserving Device (AnaConDa®), maintaining an expired average sevofluorane concentration (ETsevo) of 0'5%. And Group R (n=22) were sedated with remifentanil (0'05-0'15 mcg/kg/min). We compared postoperative levels of CK at the 0, 6, 12 and 24 hours (CK1, CK2, CK3 and Ck4) and TT at the 0, 6 and 12 hours (TT1,TT2 and TT3). ANOVA analysis was used to compare the samples.
Results: CK and TT media enzymes are shown in Table 1 and 2, respectively.

	GROUP	MEDIA
CK1	S	229,8
	R	111,9
CK2	S	441,8
	R	539,5
CK3	S	601,4
	R	579,5
CK4	S	482,2
	R	571,7

ANOVA p> 0'05

[Table 1. Creatinine Kinase Media Levels]

	GROUP	MEDIA
TT1	S	0,318
	R	0,262
TT2	S	0,321
	R	0,273
TT3	S	0,364
	R	0,244

ANOVA p>0'05

[Table 2. T_Troponine Media Levels]

Conclusions and Discussion: We can't conclude that sevofluarne inhalatory sedation after coronary surgery is cardioprotective. Randomized studies are necessary to answer that question.
Other factors must be involved in this difference of data between the two groups.

12AP5-3

Mortality and quality of life in patients with delirium after carotid endarterectomy (CE)

Parente D.F., Fernandes V., Luís C., Botelho M., Santos P., Abelha F.
Hospital São João, Department of Anaesthesiology, Porto, Portugal

Background: After vascular surgery there is a high prevalence of Postoperative Delirium (POD) and associated with it there are negative clinical outcomes like the occurrence of complications and increased mortality.The aim of this study was to evaluate the influence of delirium on mortality and quality of life six months after CE.
Methods: Observacional prospective study conducted in a a Post Anesthetics Care Unit (PACU) with 5 intensive care beds, during a 10 months period. Seventy patients were consecutively admitted after CE. Patient pre-operative characteristics, intra-operative anesthesia management and outcome were evaluated. Patients were evaluated for the occurrence of POD with Intensive Care Delirium Screening Checklist (ICDSC).
At admission and six months after surgery patients completed the Short Form-36 questionnaire (SF-36). Non parametric tests, Chi square or Fischer's exact test were used to compare group and univariate analysis with multiple regression binary logistic were used calculating odds ratio (OD) and its 95% confidence interval (95%CI).
Results: Twelve patients (17%) developed POD. Mortality rate at 6 months was higher for patients with POD (25% versus 3%, OR 9.3, 95% CI, 1.4 to 63.8, p= 0.023). Comparing with patients that did not develop delirium, either at admission and six months after CE they had similar scores for all of SF-36 domains.
Conclusions: The development of POD after CE had impact on mortality 6 months after PACU discharge but did not influenced quality of life six months after surgery.
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12AP5-4

Aorto-bifemoral bypass surgery and delirium

Luis C., Fernandes V., Veiga D., Santos P., Botelho M., Abelha F.
Hospital São João, Department of Anaesthesiology and Intensive Care, Porto, Portugal

Background and Goal of Study: After vascular surgery there is a high prevalence of Postoperative Delirium (POD) and associated with it there are negative clinical outcomes like the occurrence of complications and increased mortality. The aim of this study was to evaluate the incidence of delirium after aorto-bifemoral bypass (ABFB), to study its determinants and impact on patient's quality of life.
Materials and Methods: Observational prospective study conducted in a Post Anesthetics Care Unit (PACU) with 5 intensive care beds, during a 10 months period. Of 37 patients consecutively admitted, after ABFB, 35 met the inclusion criteria. Patient pre-operative characteristics, intra-operative anesthesia management and outcome were evaluated. Patients were evaluated for the occurrence of POD with Intensive Care Delirium Screening Checklist (ICDSC). At admission and six months after surgery patients completed the Short Form-36 questionnaire (SF-36). Non parametrics tests, Chi square or Fischer's exact test were used to compare groups; univariate analysis with multiple regression binary logistic with odds ratio (OD) and its 95% Confidence Interval (95%CI) were used to assess predictors for POD occurrence.
Results and Discussion: POD occurred in 10 patients (29%). Congestive heart disease (OR 5.0, 95%CI 1.0-24.4, p=0.049) and ischemic disease (OR 7.3, 95%CI 1.3-41.4, p=0.024) were considered predictors of POD after ABFB. Patients who developed POD had higher SAPS II scores (OR 1.1, 95%CI 1.0-1.2, p=0.020), APACHE II scores (OR 1.2, 95%CI 1.0-1.4, p=0.017) and stayed longer in the PACU (median duration of PACU stay of 68 versus 42 hours, p=0.033) but mortality rates were similar 6 months after PACU discharge (10% versus 4%, OR 2.7, 95%CI 0.2-47.3, p=0.504). At admission and six months after ABFB patients that developed POD had similar scores for all of SF-36 domains.
Conclusion(s): Congestive heart disease and ischemic heart disease were considered risk factors for the development of POD after ABFB. The development of POD after BABF had impact on length of PACU stay but did not influenced mortality or quality of life six months after surgery.
References:
Care Med 2001; 27(5):859-864. Ann Surg.2003 Jul; 238(1): 149-56.

12AP5-5

Delirium incidence in a postoperative ICU using the ICDSC test

Martínez-Gimeno L., Moret E., Castillo R., Llubià C.
University Hospital Germans Trias i Pujol, Department of Anaesthesiology and Intensive Care, Badalona-Barcelona, Spain

Background and Goal of Study: Delirium is a neuropsychiatric disorder often seen in ICU with an incidence range from 20 to 80% depending on the diagnostic methods used and the clinical severity. Nowadays there are 2 different diagnostic tools for delirium in critical ill patients: CAM-ICU and ICDSC. The aim of this study was to evaluate the delirium incidence in our postoperative ICU using the ICDSC test and to associate delirium with other predisposing factors.
Materials and Methods: Over a period of 3 months all consecutive patients at our postoperative ICU were analysed twice a day using the ICDSC test. Exclusion criteria were: age < 18 years, ICU stay < 24 h, previous mental disorder, head injury, CNS infection, ictus, neurosurgery, alcoholisms or drug abuse, hearing or visual deficiencies, foreign language speaking patients. The recorded variables were: age, gender, surgery indication (scheduled or urgent), surgical speciality, APACHE II admission score and presence of delirium. Data are presented as means and percentages.
Results: Fifty patients, 42 men and 8 women, mean age 64.94 ±12 were enrolled. The mean APACHE II admission score was 16 points, 26 schedule surgery and 24 urgent surgery. Included surgery types were: 31 abdominal surgery, thoracic surgery 6, vascular surgery 6, urological surgery 5 and 4 other surgery types. The global delirium incidence was 18%, similar to that described in the literature.
We observed a statistically significance between delirium and age (p=0.05) and APACHE II admission score (p = 0.002). No other statistical significance was found.
Conclusion(s): In our postoperative ICU, the delirium incidence was 18% as described in the literature and was significantly associated with advanced age and patients' severity. We should pay more attention to delirium screening and monitoring as an additional vital sign among all critical ill patients. The ICDSC test is a simple, easy and useful screening tool for helping us not to underestimate such a common neuropsychiatric disorder in ICU.
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12AP5-6

Scavenging device contraflurane efficacy during inhalatory sedation with anaesthetic conserving device (AnaConDa®) - occupational exposure and environmental pollution of sevofluorane

González-Rodríguez R., Muñoz A., Becker Á.H., Grau L., Anaya R., Moral M.V.
Hospital de la Santa Creu i Sant Pau, Department of Anaesthesiology, Barcelona, Spain

Background and Goal of Study: Levels of chronic exposure to sevofluorane of the sanitary professionals should not exceed 2 parts per million (ppm).
The AnaConDa filter system is used to deliver low concentrations of volatile anaesthetic agents for sedation. We should use scavenging systems to reduce those levels.
We aimed
(1) to evaluate the environmental quality and
(2) the occupational exposure of workers to sevofluorane in reanimation areas using the scavenging system contrafluorane.
Materials and Methods: We carried out an observational study on environmental pollution, in conjunction with a healthcare professional exposure of recovery staff, to sevofluorane when the AnaConDa delivery system was used in inhalator sedation. We incorporated an active scavenging gas device (contrafluorane) to the ventilator during eight inhalatory sedations after coronary by-pass surgery.
The average expired sevofluorane concentration during the course of the study was 0'5% .
We measured levels of sevofluorane during those different periods using passive diffusion monitors, called SKC-575-002 Anasorb 747.
We placed a monitor eight meters from the ventilator and, the responsible nurse of those patients carried a second monitor during sedation period.
We stopped sevofluorane infusion two minutes before any ventilator disconnection. All the system disconnections were registered.
Posterior analysis of the monitors was done according to OSHA-29 procedures.
Results: Results are shown in the table below.

	Sedation Time (minutes)	Professional Exposure	Environmental Pollution	Disconnections
Case 1	118	0,3	0,45	0
Case 2	187	0,11	0,11	1
Case 3	267	0,08	0,08	2
Case 4	139	0,14	0,14	0
Case 5	156	0,14	0,14	0
Case 6	136	0,17	0,17	0
Case 7	165	0,14	0,14	1
Case 8	203	0,1	-	1
Media	**171,38**	**0,15**	**0,18**	**0,63**

[Contamination Results (values are in ppm)]

2 ppm safe level were never exceeded. We didn't found significant difference between professional exposure levels and environmental sevofluorane levels. Disconnections number and time were independents (p< 0'05).
Discussion: Use of sevofluorane in reanimations areas through the AnaConDa delivery system using an active scavenging gas device is safe for the staff and reduces the environmental pollution.
Efficacy of contrafluorane device is optimal because of the homogeneity of the results.

12AP5-7

What are the threshold levels of PCT and Pro-BNP in the assessement of poor prognosis after cardiac surgery with CPB ?

Kallel S., Ben Soltana M.H., Djemal W., Triki Z., Chaari M., Karoui A.
Academic Medical Center Habib Bourguiba of Sfax, Department of Anaesthesiology and Intensive Care, Sfax, Tunisia

Background and Goal of Study: The availabilty of a marker that predicts early onset of complications would be a substantial contribution to the imple-

mentation of an adequate therapeutic strategy. The aim of our study was to determine the thresholds PCT and pro-BNP associated with poor prognosis after heart surgery.

Materials and Methods: This is a prospective study focused on patients who underwent cardiac surgery with CPB. Exclusion criteria were : emergency surgery andage less than 18 years. Assays of PCT, BNP and CRP were performed before and after CPB, in the 4th postoperative hour (H4) and every day during the first 4 days. To determine the different thresholds values, we used ROC curves.

Results and Discussion: 42 patients were selected. PCT levels were higher in patients with severe SIRS from the 4th postoperative hour until D4.CRP and WBC levels showed no significant differences between the 3 studied groups. For a threshold of 0,958 ng/ml,PCT at H24 had a sensitivity of 85% and a specificity of 95% for the prediction of organ dysfunction (AUC = 0.925).Duration of ICU stay was correlated with PCT levels at H24.CRP levels didn't correlate with ICU period of stay. For a threshold value of 0.737 ng/ml,PCT at H24 had a sensitivity of 76% and a specificity of 91% for predicting an ICU stay longer than 3 days with an AUC = 0.925

Rates of Nt-proBNP were greater in patients with severe SIRS starting from the first day. For a cutoff of 1662 pg/ml measured at H24 after surgery, Nt-proBNP had a sensitivity of 92% and 95% of specificity for predicting severe SIRS. Patients kept more than 3 days in ICU presented rates of Nt-proBNP significantly greater from H24 to H72. For a cutoff of 1235 pg / ml measured at H24, Nt-proBNP had a sensitivity of 74% and a specificity of 64% for predicting an ICU stay longer than 3 days with an AUC = 0.805. The association of Nt-proBNP to procalcitonin (p = 0.009) better predicted the ICU stay then PCT alone or Nt-proBNP alone. The best combination is Nt-proBNP + PCT + CRP

Conclusion(s): PCT levels on D1 did correlate with the onset of severe SIRS with an ICU duration of stay > 3 days with respective thresholds 0.958 and 0.737 ng/ml. Rates of Nt-proBNP on D1 were also correlated with the occurrence of severe SIRS and a duration of stay in ICU > 3j with respective thresholds 1662 and 1235 pg/ml.A biomarker approach combining PCT, CRP and BNP is superior to a traditional single marker for predicting ICU stay.

12AP6-1

Multimodal analgesia and glutamine association, an interesting option in glycemia control in surgical patients with necrotising pancreatitis

Pavelescu D., Grintescu I., Cucereanu-Badica I., Mirea L.
The Emergency Hospital Floreasca, Department of Anaesthesiology and Intensive Care, Bucharest, Romania

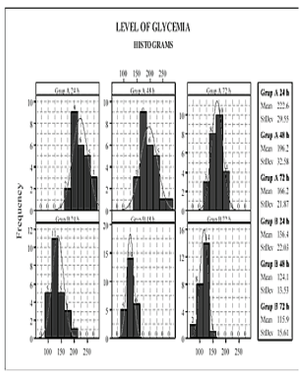
Background and Goal of Study: To analyze the impact of glutamineand multimodal analgesia on surgical stress response in patients with necrotising pancreatitis

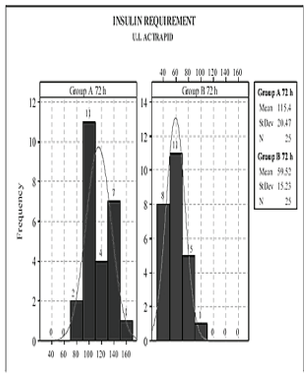
Materials and Methods: Prospective study on 50 patients operated for necrotising, infected pancreatitis. Patients were randomly allocated to one of the 2 groups:

A - received standard postoperative analgesia (tramadol 100 mg and 1g i.v.perfalgan at 8 hours) and no i.v. glutamine

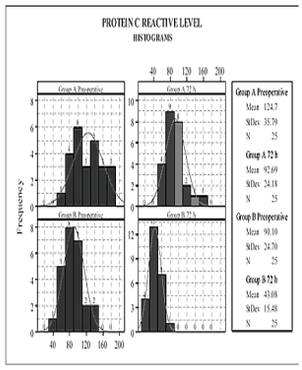
B - received multimodal analgesia (sufentanyl 0,5 μ/ml + ropivacaine 0,2% via thoracic epidural catheter + i.v. ketorolac 30mg x 3/day) and 2 ml/kg/day dipeptiven (0,4 g/kgc glutamine/day) starting 1 day before surgery and then for 5 days postoperatively. We compared the insulin requirements, the level of glycemia and cortisol, the value of procalcitonin, reactive C protein at 24, 48 and 72 hours. Time to oral refeeding, duration of postoperative ileus and time to discharge from ICU were also analyzed.

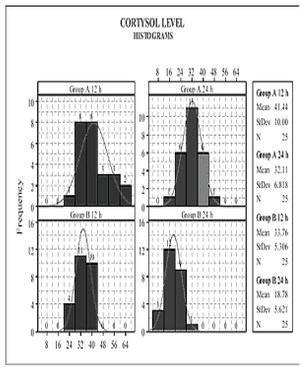
Results and Discussion: There is a significant difference concerning the level of glycemia(p< 0,05) The insulin requirements were significantly lower in group B(p< 0,05) .





P<0,05 p<0,05

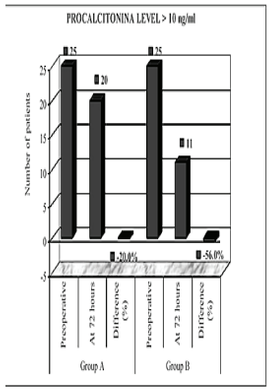


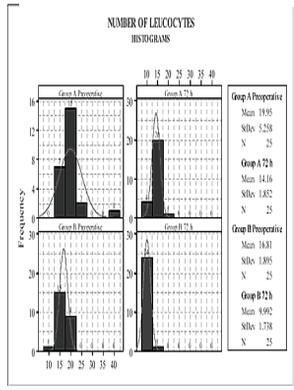


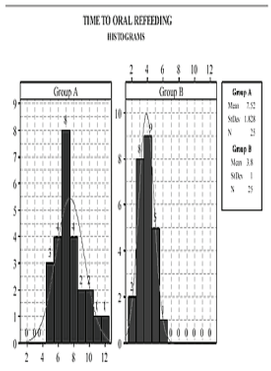
P<0,05 p<0,05

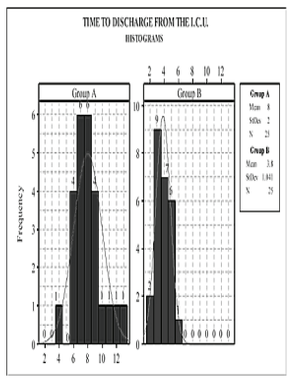
[Grafic 1]

Time to oral refeeding and time to discharge from ICU were significantly lower in group B(p< 0,05). The cortisol and procalcitonin levels decreased significantly in group B(p< 0,05) .









[Grafic 2]

Conclusion(s): Postoperative administration of glutamine together with multimodal analgesia reduce the postoperative stress response, improves glycemic control and promote an early recovery of gut functions.

12AP6-2

Captopril improves survival in LPS - induced endotoxemic mice

Kwak S., Jeong C.W., Jeong S.W., Chung S.-T., Jeung H.-J.
Chonnam National University, Department of Anaesthesiology and Intensive Care, Gwangju, Korea, Republic of

Background and Goal of Study: Angiotensin - converting enzyme (ACE) mediates inflammatory response in healthy lungs via angiotensin II and plasminogen activator inhibitor -1. Neutrophils play an important role in the development of acute lung injury associated with severe sepsis. However, the ability of ACE directly participating in LPS-induced neutrophil activation has not been fully examined. This study was performed to evaluate the effects of the ACE inhibitor captopril on lipopolysaccharide (LPS) - induced neutrophil activation and mortality in LPS - induced endotoxemic mice.
Materials and Methods: To assess possible interactions between captopril and LPS on neutrophil activation, neutrophils from human blood were incubated with various concentrations of captopril (0, 1, 10, 50 and 100 nM) and LPS (100 ng/ml). The protein levels for interleukin (IL)-6, 8 and tumor necrosis factor (TNF)-α were measured using ELISA 4 hr after incubation period. To elucidate the intracellular signaling pathway, We measured the levels of phosphorylation of p38 mitogen activated protein kinases (p38), extracelluar signal-regulated kinase (ERK)1/2 and c-Jun amino-terminal kinases (JNK) with western blot analysis and nuclear levels of nuclear factor (NF)-κB with electrophoretic mobility shift assays 0.5 hr after incubation period. We also examined the effect of captopril (30mg/kg, IP) on mortality of mice treated with LPS (20 mg/kg, IP) to determine whether these effects of captopril also have in vivo significance.
Results and Discussion: Captopril attenuated LPS - induced neutrophils activation including expression of p38, JNK, NF-κB, IL-6, 8 and TNF-α. Captopril also attenuated mortality in LPS - induced endotoxemic mice.
Conclusion(s): Captopril can attenuate mortality in LPS - induced endotoxemic mice via the attenuation of neutrophil activation caused by LPS.

12AP6-3

Goal directed fluid management in resuscitated sepsis: Evaluation of an algorithm based on volumetric parameters

Bataller A., Silva L., de Miguel M., Echaniz G., Camps A., de Nadal M.
Hospital Universitari Vall d'Hebron, Department of Anaesthesiology, Barcelona, Spain

Background and Goal of Study: Fluid management in septic shock following initial resuscitation has to ensure sufficient volume resuscitation while preventing unnecessary large fluid loads that may cause or exacerbate lung edema[1,2,3]. We describe an algorithm based on optimizing the global end-diastolic volume index (GEDI) and the extravascular lung water index (EVLWI) for guiding fluid therapy in surgical patients with septic shock and its results in terms of ICU stay and mortality.
Materials and Methods: Forty-two surgical patients with septic shock were included prospectively and monitored at ICU admission. All patients were treated according to the guidelines for the management of septic shock and were followed until death or discharge from hospital. During the first 48 hours, fluid management was targeted to a goal-directed therapy algorithm based on GEDI (< 700 mL/m² or ³700 mL/m²) and EVLWI (< 10 mL/kg or ³10 mL/kg). We evaluated total fluid balance, the relationship between EVLWI, GEDI and oxygenation index (PaFi=PaO_2/FiO_2) as well as ICU stay and mortality depending on admission EVLWI values. Results are expressed as mean±SD.
Results and Discussion: 42 patients (19F,23M, mean age 66±17 yrs, APACHE II score 29± 6) were studied. At admission, mean value for SOFA score was of 9 ±3, serum lactate levels of 4.2 ±2.4 mmol/L, $ScvO_2$ of 72± 11% and PaFi of 247±109 mmHg. Fluid balance at 48 hours after admission was of 1250±382 mL. Initial EVLWI was of 9.1±3.8 mL/kg and rised up to 10.4±3.8 at 48 hours (mean±SD). A significant correlation was found between EVLWI and GEDI (r=0.2, P< 0.0001) and between EVLWI and PaFi (r=-0.1, P=0.049). Lenght of ICU stay was of 14 ±10 days, of hospital stay of 28 ±17 days and in-hospital mortality was of 26.2%. No differences were found in ICU stay neither in hospital mortality between patients with EVLWI< 10 mL/kg and patients with EVLWI³10 mL/kg.
Conclusion(s): In patients with resuscitated septic shock, guiding fluid therapy by an algorithm based on GEDI and EVLWI lead to a moderate positive fluid balance during the first 48 hours after ICU admission.

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12AP6-4

A new clue in the pathogenesis of shock septic: A coordinated and simultaneous immunological response

Fernandez-Urbon A., Carrasco Serrano E., Heredia M., Bermejo J., Murguia E., Gomez-Herreras J.I.
Hospital Clinico Universitario Valladolid, Department of Anaesthesiology and Intensive Care, Valladolid, Spain

Background: Septic shock is associated with high mortality rates.Involvement of cytokine response in the of sepsis is explained by using a bi-phasic model, with an initial state that produces inflammatory cytokines, followed by the secretion of anti-inflammatory.
Relationships between cytokine responses in the pathogenesys of septic shock are poorly known. To improve our knowledge, we have performed a study comparing the plasma levels of 17 cytokines and chemokines in patients with septic shock or Systemic Inflammatory Response Syndrom (SIRS) and healthy controls.
Materials: We have recruited prospectively 20 patients with septic shock, 11 patients with SIRS and 10 healthy volunteers. Recommendations of the Critical Care Medicine Consensus Conference were followed for defining SIRS and septic shock. Severity of illness was assessed by calculating the Acute Physiology and Chronic Health Evaluation (APACHE) II score for the first 24 hours and the Sequential Organ Failure Assessment (SOFA) score. A single blood sample was obtained from each individual. Plasma chemokine and cytokine levels were evaluated using the multiplex Biorad© 17 plex assay.The Mann-Whitney U,Saphiro Wilk,Levene tests and Spearman correlation coefficient have been used to analyze the data. All statistical tests were two-sided,and P< 0.05 was considered significant.
Results: Patients with septic shock evidenced increased levels of IL-6, IL-8, MCP-1, MIP-1β, IFN-γ, GM-CSF and IL-10 compared to controls. Patients with SIRS showed higher levels of IL-6, IL-8, MCP-1, MIP-1β, G-CSF and IL-10 than controls. Patients with septic shock showed higher levels of IL-8, GM-CSF, MIP-1β than those with SIRS. Spearman-Karber test demonstrated a positive association between IL-6, IL-8, MCP-1, MIP-1β, IFN-γ, GM-CSF and IL-10 in septic shock. Bozza et al had demonstrated the potential benefit of the use of multiple cytokine assays in profiling host responses predicting mortality during sepsis. Our study provides evidence on the existence of an immune response program showing simultaneous secretion of both pro-inflammatory (IL-6, IL-8, MCP-1, MIP-1β, IFN-γ, GM-CSF) and anti-inflammatory mediators (IL-10) in septic shock, as demonstrates the comparisons with healthy controls. Contradicting the biphasic models.
Conclusion: Correlation studies support that secretion of pro and anti-inflammatory mediators in septic shock occurs as a simultaneous immune response program initiated early in the course of the disease.

12AP6-7

The revenue break-down of operative intensive care stations through multi-resistant pathogens

Mayr U., Edenharter G., Blobner M.
Klinik für Anaesthesiologie, Technische Universität München, Department of Anaesthesiology and Intensive Care, München, Germany

Background and Goal of Study: The increase of multi-resistant germs is a world-wide problem. The development of new antibiotics can barely keep up with the emergence and propagation of resistant bacteria. Multi-resistant pathogens are also a growing problem for our intensive care units. Many hospitals, also ours, use an internal commissioning system.
That means for the intensive care units, every patient has the same price per minute, regardless to his medical history also those patients who are by far more costly and maybe even block a bed.
This situation is no longer portable for the intensive care units. Therefore we need to find a way to illustrate this in our internal commissioning system.
Materials and Methods: In two post operational intensive care units, the voucher minutes of 119 patients, with multi-resistant pathogens were retrospectively analyzed from January 2010 until October 2010. From January 2010 until the end of February 2010, only 21 beds were available on the intensive care units. Starting from March 2010, 38 beds could be occupied again. Background of this bed reduction was the temporary closing of an intensive care unit due to the outbreak of a panresistant Acitenobacter baumannii.

The stations consist mostly of two bedded rooms. The fact that a reduced number of beds were available resulted mainly from the necessity to isolate patient with multi-resistant pathogens. (MS Excel 2007)
Results and Discussion: The number of patients with multi-resistant pathogens amounted to 23.5% in our analysis, of the total voucher minutes. In consequence of that, both intensive care units created a proceeds deficit of 1.228.680 Euro. On the other hand because of less occupancy we created a cost reduction of 532.849 Euro. So, all in all remains a current account deficit of 695.831 Euro.
Conclusion(s): Due to the rapid increase of the patients with multi-resistant pathogens and the fact that it is impossible to plan the proceeds, it needs to be considerate how this additional expenditure is represented in the internal commissioning.

12AP6-9

Use of Drotrecogin Alpha in a surgical cohort of intra-abdominal infections patients

Sanchez-García E., Navarro-Martinez J.A., Idrissi A., Paya E., Nicolas N., Mas-Serrano P.
Hospital General de Universitario de Alicante, Department of Anaesthesiology and Intensive Care, Alicante, Spain

Background and Goal of Study: The use of Drotrecogin Alfa is included in the Surviving Sepsis Campaign for the treatment of patients with sepsis-induced organ dysfunction with a clinical assessment of high risk of death. The use in surgical patients has a lower GRADE (IIB) but big differences can be seen depending on the type and localization of infection.
There's not been made yet a specific analysis of the use of the drotrecogin alfa in these type of patiens outside of the clinical trials. The goal of the study is to evaluate the use in this subgroup of patients in our hospital.
Materials and Methods: We analyzed retrospectively all the patients (44) 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 2010.
Results and Discussion: We included 44 patients. The age was 63,85± 16,5. The Infusion start time after the 2º organ faiulre was 21,12±12,695. The severity score measured by the APACHE II was 19,19±4,99 and the organ failure number measured by the SOFA was 3,4±1,1 (98,8% had 2 or more organ dysfunction).
The origin of the patient was nosocomial in the 54,5% of the patients and the surgery was emergency in the 88,5% of the cases. Other treatments during the sepsis episode were: Perfusion of insulin (60,5%), corticoids (46,6%) and profilactic low weigh heparin (87,2%). In the 59,1% we did'nt stop the therapy, in the rest we stop it due to exitus (9,1%), central venous exchange (6,8%), surgery (4,5%).In the 86,6% they didn't recived renal replacement.
We found 4/44 serious bleeding complications (9,1%).The 28-day mortality in the intra-abdominal infection group was 29,5%.
Conclusion(s): The data obtain of the use of Drotrecogin alfa in patients with intraabdominal infections is comparable to the data obtained in the mixed surgical patients in the clinical trails. Is needed a specific analysis of the data in the real life registries with more patients to evaluate the reduction in mortality and the security in these type of patients.
References:
Payen D.International integrated database for the evaluation of severe sepsis and drotrecogin alfa (activated) therapy: Analysis of efficacy and safety data in a large surgical cohort. Surgery 2007;141: 548-561

12AP7-1

A new measure of glucose variability in acute brain injured patients: Preliminary results

Prisco L., Zornada F., Ganau M., Berlot G.
School of Specialization in Anesthesiology and Intensive Care, Department of Anaesthesiology and Intensive Care, Trieste, Italy

Background and Goal of Study: Rapid swings in blood glucose (BG) can induce cellular damage and wide osmolarity changes with organ dysfunction. Furthermore these swings may hide the occurrence of hypoglycemia that could affect neurologic recovery.
Studies report glucose variability (GV) to be a better predictor of mortality than average BG. No study has compared the predictive abilities of different definitions of GV, therefore the best expression of GV is still unknown.
Materials and Methods: An intensive insulin protocol was established to maintain BG< 140mg/dl in 47 brain-injured patients († 30%). BG samples were obtained every 4 hours during the first 5 days of ICU stay.
We calculated 7 indexes of GV (see table 1), the average of BG (Mean) and a new index of GV named Mean Delta Threshold (MDT, BG threshold considered *thrs*=140mg/dl).

$$MDT = 1/_N \sum^N_{i=1\,(X)} - thrs)^2$$

All indexes were compared using multiple regression analysis and receiver operating curves. Mann Whitney tests were performed between survivors and deceased for all GV scores.
Results and discussion: No statistical differences were obtained between deceased and survivors in BMI, APACHE II, GCS and SOFA on admission, ISS (in trauma pts) and the average of 5-days insulin therapy. There was a difference in age, GCS and SOFA on the 5th day (p< .05). MDT has been demonstrated to be the best predictor of mortality (p< .05), whereas GLI has the best correlation coefficient with neurological outcome on discharge both from ICU and from hospital (p< .05).

	p Mann Whitney (survivors vs deceased)	AUROC	p AUROC	Sensitivity	Specificity
MDT (Mean Delta Threshold)	0.02	0.72	0.02	64.3	81.8
VI (Variability Index)	0.06	0.68	0.08	50	93.9
AUC (Area Under the Curve)	0.83	0.52	0.88	28.6	93.9
BGD (Blood Glucose Delta, Maximal Glucose Change)	0.26	0.61	0.29	50	78.8
GLI (Glucose Lability Index)	0.1	0.65	0.12	42.9	97
GVI (Glucose Variability Index)	<0.05	0.69	<0.05	71.4	66.7
MAGE (Mean Amplitude of Glycemic Excursions)	0.06	0.68	0.05	71.4	66.7
SD (Standard Deviation)	<0.05	0.71	<0.05	57.1	87.9
Mean	0.06	0.67	0.07	50	81.9

[Table 1]

MDT is a very good index because of its mathematical characteristics: there is no need for stratification of different BG ranges because it already comprehends a threshold within the formule, that can be adapted to different protocols.
Conclusion: Our preliminary results confirm the relevance of GV in predicting outcome in the neurointensive care settings and suggest the importance of strict BG monitoring and intensive insulin therapy reducing as much as possible GV.

12AP7-2

Mortality and quality of life after aorto-bifemoral bypass surgery

Luis C., Parente D., Veiga D., Fernandes V., Santos P., Abelha F.
Hospital São João, Department of Anaesthesiology and Intensive Care, Porto, Portugal

Background and Goal of Study: Aorto-bifemoral bypass (ABFB) is commonly performed to treat aorto iliac occlusive or aneurysmatic disease. Few studies examined the dependency of patients and how they perspective their own health changes after ABFB. The authors aim was to evaluate the determinants of mortality and outcome six months after ABFB.
Materials and Methods: This prospective study was conducted at the Post Anesthetic Care Unit (PACU) during a 10 months period. Patients' demographic, intra and postoperative data were recorded. At PACU admission and 6 months after discharge the Short Form-36 (SF-36) was applied and an assessment of dependency in Activities of Daily Living (ADL) was performed. Non parametrics tests, Chi square or Fischer's exact test were used to compare groups; univariate analysis with multiple regression binary logistic with odds ratio (OD) and its 95% Confidence Interval (95%CI) were used to assess risk factors.
Results and Discussion: Thirty-seven patients were admitted after ABFB. Body Mass Index (BMI) (OR 1.4, 95%CI 1.0-1.9, p=0.038), ASA physical status (ASA-PS) (OR 10.0, IC95% 1.0-98.9, p=0.049, for ASA-PS IV/V), intravenous fluids administration during surgery (OR 1.7, IC95% 1.0-2.7, p=0.049 for units of erythrocytes and (OR 1.6, IC95% 1.1-2.4, p=0.028) for fresh frozen plasma,

Major Cardiac Events (MCE) (OR 21.8, IC95% 1.8-26.1, p=0.015 and Simplified Acute Physiology Score (SAPS) II (OR 1.1, IC95% 1.0-1.2, p=0.038) were considered risk factors for mortality. At PACU admission 14% considered that their general level of health was better than one year earlier; six months after ABFB 43% considered their health better at that time than one year before. Six months after ABFB patients had similar scores for all of SF-36 domains but social function (70.1±26.6 versus 59.4±27.6, p=0.035) compared with admission scores. At this time patients were not more dependent in ADL than before surgery.

Conclusion: The predictors of mortality after BABF were: BMI, ASA-PS, fluids administered intra-operatively, MCE and SAPS II. After surgery patients have similar scores for SF-36 domains but social function domain, and they did not become more dependents in ADL.

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12AP7-3

Increased intrabdominal pressure as an indipendent mortality predictor during acute pancreatitis

Sula H., Domi R., Nunci L., Beqiri A., Ohri I.
UHC ‚Mother Theresa', Department of Anaesthesiology and Intensive Care, Tirana, Albania

Background and Goal of Study: To study the role of abdominal compartment syndrome (ACS) and intra-abdominal hypertension (IAH) as indipendent predictor factors on outcome and mortality in patients during early phase of acute pancreatitis (AP)

Materials and Methods: 102 patients with medically treated AP were recruited in this retrospective study. The patients in which an urgent surgical decompression was performed were excluded by the study. According to intra-abdominal pressure (IAP) determined by indirect measurement using the transvesical route via Foley bladder catheter during the 2 first week after admission, the patients were divided into three groups.

Continuous data are presented as mean ± SD. The comparisons of age, gender, APACHE II score and CT-SI on admission, Ranson score within 48 h after admission, incidences of MODS, and the in-hospital mortality between the two groups were analyzed using the independent sample *t* test or χ2 test, Anova and Kruskall-Wall test considering a value P< 0.05 as statistically significant.

Post-hoc analysis was realised related to the pairwise test for comparison of subgoups according to a value of $P < 0.05$ which was defined as statistically significant.

	Gr 1 (IAP>12mmHg) IAH	Gr 2 (IAP>20mmHg) ACS	Gr 3 (IAP=normal) NIAP	Test	P value
Age (yr)	56.53 ± 11.2	54.47 ± 9.8	54.34 ± 7.7	Anova (F)	0.612
Gender (M/F)	17/15	14/13	23/20	χ2	0.891
APACHE II score	17.35 ± 3.90	16.38 ± 4.25	15.70 ± 4.11	Kruskal-Wallis (H)	0.712
Ranson score	3.72 ± 0.91	4.11 ± 0.94	3.47 ± 0.89	Kruskal-Wallis (H)	0.231
CTSI	5.35 ± 2.12	5.47 ± 1.95	5.12 ± 2.07	Kruskal-Wallis (H)	0.435

[Patients' demographic data on admission in ICU (me]

Results and Discussion:

Complications	IAH (n)	ACS (n)	NIAP (n)	Test	P value
MODS	4 pts	9 pts	2 pts	Kruskal-Wallis (H)	0.02
Sepsis	3 pts	4 pts	1 pts	Kruskal-Wallis (H)	0.03
Early deaths	3 pts	13 pts	0 pts	Kruskal-Wallis (H)	<0.01
Late deaths	4 pts	2 pts	2 pts	Kruskal-Wallis (H)	0.01
Total deaths	7 pts	15 pts	2 pts	Kruskal-Wallis (H)	<0.01

[Complications and mortality]

Conclusion: The increased intrabdominal pressure and abdominal compartment syndrome occurred during the early fase of AP may be predictors of increased MODS and mortality

References:

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12AP7-4

Effects of a sudden reduction of intensive care unit capacity on patient characteristics caused by multiresistant bacteria

Edenharter G.M., Mayr U., Blobner M.
Klinik für Anaesthesiologie, Technische Universität München, Department of Anaesthesiology and Intensive Care, München, Germany

Background and Goal of Study: On intensive care units (ICUs) the number of infections caused by multiresistant bacteria has constantly increased over the last years. Some of the bacteria is resistant against all commonly used antibiotics and cannot be treated sufficiently by medication. In order to avoid a further expansion of those germs the isolation of the infected patient is often the only possibility. If there has been already massive infections of several patients the closing of a whole ICU for new patient admissions is appropriate to prevent further damage to the whole hospitals patients. This leads to a sudden reduction of ICU capacity. We examined case mix index (CMI) as parameter of patients' severity of medical condition and length of stay in the ICU of those patients who received intensive care treatment while ICU capacity was lowered.

Materials and Methods: From January 2009 until March 2010 CMI and length of stay of 3358 patients of 2 postoperative ICUs were retrospectively analyzed. From January 2009 until November 2009 38 beds on the ICUs were available. From December 2009 until March 2010 the capacity was lowered to 21 beds because of several infections with a panresistant Acinetobacter baumanii. The influence of the reduced ICU's capacity on CMI and length of stay was analyzed out of data from the hospital's information system (Mann-Whitney-U-Test, Median [10%-90% percentile]; $p < 0.05$; SPSS 18.0).

Results and Discussion: The analysis showed a significant increase of the CMI from 3.59 [1.41; 11.19] to 4.37 [1.43; 11.30] after the closing of one ICU. The length of stay revealed a non-significant trend to be higher from 25 h [13; 217] to 38 h [11; 375]

Conclusion(s): The sudden reduction of the ICUs' capacity is a serious problem for a hospital. Those patients who recieve ICU treatment while the capacity is low are more diseased. In the analyzed time the CMI of all the hospital's patients remained unchanged.

Therefore those patient who would have received ICU treatment if the capacity would have been regular are a big challenge for a hospital's logistics. Solutions have to found to deal with this upcoming problem in the future.

12AP7-5

Hidden mortality in patients with prolonged stay in postoperative intensive care unit (PICU)

López Martínez M., Guerra Martínez A., López E., Magán Tapia P., Pérez-Cerdá Silvestre F.
Hospital 12 Octubre, Department of Anaesthesiology, Madrid, Spain

Background and Goal of Study: Hospital death after discharge from PICU is known as Hidden Mortality (HM). Identify patients at increased risk of HM may allow us to act to reduce it, e.g. extending the length of stay in the unit in some cases, or transferring patients to a high dependency unit or an intermediate care one in others. The aim of the study is to know HM in patients with prolonged PICU stay and identify any association with patient dependent variables and type of surgery.

Materials and Methods: Cross-sectional study including all patients who stayed 3 or more days in PICU during 2009. The main variable was death at standard ward after PICU discharge. The explicative variables were: age, gender, length of stay in PICU, ASA classification, emergency surgery and type of surgery. Results were expressed as median (IQR) for continuous variables and proportions for qualitative ones. Differences between means were assessed by T-Student test.

The distribution of categorical variables was compared by the X^2 or Fisher's exact test as appropriate, studying the standardized residues when the differences were significant. Multivariate logistic regression was used to identify risk factors independently associated with mortality. For all the analysis p< 0.05 was considered significant.

Results and Discussion: 211 out of 11728 patients admitted in the PICU during 2009 required a prolonged stay. 187 of these were discharged to a standard ward. The median age of these patients was 64 (50-76) years, and the length of stay in PICU was 4 (3-7) days.

Most patients were classified as ASA 3 (45.5%), and 59.9% were men. 51.3% of patients underwent elective surgeries, and most of them (47.1%) general surgery. 27 (14,4%) of patients discharged from PICU died in a standard ward. Statistically significant variables in the univariate analysis were emergency surgery (OR=0.42; 95%CI=0.18-0.99) and ASA classification (OR=1.8; 95%CI=1.06-3.03). Results of multivariate analysis are shown in table.

	OR	95% CI
EMERGENCY SURGERY	0.41	0.17-0.97
ASA	1.82	1.07-3.08

[Multivariate analysis.]

Conclusions: Hidden Mortality observed in patients with prolonged stay in PICU was 14.4%, and factors independently associated with it were emergency surgery and ASA classification (higher ASA increased risk of HM). Age, gender, days in the PICU and type of surgery had no statistically significant association with mortality.

12AP7-6

A comparison of the peri-operative course of two groups of 50 patients undergoing oesophagectomy 20 years apart

Prchalova M., Cahil J.
The Mercy University Hospital, Department of Anaesthesiology, Cork, Ireland

Background and Goal of Study: Despite advances in surgery and anaesthesia for oesophagectomy, it remains one of the most challenging operations patients undergo with a peri-operative mortality of between 8% and 10% and morbidity of between 30% and 50%,(1).
We examined the intra operative and post operative course of 50(group A) consecutive patients who underwent oesophagectomy in our hospital between 2007 and 2009 and compared these to a second group(group B) of 50 patients who underwent oesophagectomy in our hospital 20 years ago, in the years 1985-1988.
Materials and Methods: Data previously gathered on 50 patients who underwent oesophagectomy between 1983-1985(group B), was re-examined and a dataset was compiled which would allow comparison with group(A).These data included patient age,gender, tumour type, surgical technique, duration of surgery, length of stay in Intensive Care (ICU) and supportive therapies required, length hospital stay and hospital mortality. Data for group (B)was retrieved from operating theatre register, ICU records and electronic Patient Administration Records.
Results and Discussion: Patient age and gender were almost identical in the two groups. There were major differences in tumour type, (Adenocarcinoma 63% and 79% for group A and group B respectively), surgical approach, (Thoracotomy 90% and 50% for A and B respectively), while the use of Neo Adjuvant Chemotherapy and Radiotherapy was exclusive to group(A). The mean duration of surgery for group A was 10. 1hrs as against 6.5 hrs for group B. All patients in both groups were returned to ICU directly from theatre, all patients in group B were electively ventilated. Only 43% of group A were electively ventilated. The mean ICU and hospital stay (days) for group B was 13.0 and 27.8 as against 8.0 and 25.0 for group (A). 4 patients in group (B) and 3 patients in group (A) died in hospital post operatively.
Conclusion(s): This comparative study demonstrates how the peri-operative management of patients undergoing oesophagectomy changed in our hospital within the last 20 years.
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12AP7-7

Carotid endarterectomy (CEA) vs. carotid stentig (CAS): postoperative morbidity and mortality in our patients

Rodriguez Losada M., Barreiro Pardal C., Pampin Conde M., Gonzalez Castro A., Varela Durán M., Raposeiras Roubin S.
Complejo Hospitalario de Pontevedra, Department of Anaesthesiology and Intensive Care, Pontevedra, Spain

Background and Goal of Study: CEA was considered the "gold standard" of the treatment of patients with significant carotid stenosis. CAS has emerged as an alternative to CEA. With recent trials the role of CAS is controversial[1]. The goal of the study was to evaluate the postoperative morbidity and mortality in the interventional management of patients with symptomatic carotid stenosis: CEA vs. CAS.
Materials and Methods: A retrospective study about mortality and morbidity in 119 patients with interventional management of symptomatic carotid stenosis.The morbidity was evaluated with the postoperative complications.2 groups: 86 patients with CAS and 33 patients with CEA. The interventions were made from January 2006 to May 2010.The statistical analysis was made using SPSS program (version 17.0).
Results and Discussion: We did not observe significant differences in the characteristics of patients in both groups, respect to age, sex, classification ASA or previous pathology (hypertension, dyslipemia…).
The morbidity was calculated based on postoperative adverse events like ictus, myocardial infarction or major vascular complications. The cumulative postoperative morbidity on CEA group was 15,6% and on CAS group was 19,6%, without significant statistical relationship (p=0.420).The cumulative postoperative mortality on CEA group was 3,1% and on CAS group was 4,6%, without significant statistical relationship (p=0.723).
Conclusions: There is not significant difference of mortality and morbidity between the CEA group and the CAS group in our patients.In the line of the last trials, these techniques are best viewed like complementary than competing modes of therapy[2]. It is necessary to asses the relative risks and benefits to determinate the optimal therapy for the patient[3].
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12AP7-8

Atrial Fibrillation in the surgical critical patients: Associated clinical factors and outcome

Chelazzi C., Villa G., Giugni D., De Gaudio A.R.
University of Florence, Department of Anaesthesiology and Intensive Care, Florence, Italy

Background and Goal of Study: Atrial fibrillation (AF) is common among ICU patients, both medical and surgical. Patients with AF may be at higher risk for increased morbidity/mortality. Surgical patients with AF may have worse outcomes as well. Aim the study was to assess rate, associated factors and outcome of AF in a cohort of ICU patients, either general and surgical.
Materials and Methods: All patients consecutively admitted to a general ICU during the period from 1st January 2009 to 31st January 2010 were considered and prospectively followed.
Based on clinical charts, a diagnosis of chronic or paroxysmal AF was done and the rate calculated. Clinical factors associated to AF were considered in the two groups and differences tested for statistical significance ($p < 0.05$). Differences in ICU length of stay and ICU-mortality were evaluated between patients with and without AF ($p < 0.05$). The same analysis was done on a subgroup of postoperative ICU patients.
Results: On a total of 409 ICU patients, 48 had AF (11.7%). Conditions significantly associated to AF were: previous myocardial revascularization (PTCA/CABG), congestive heart failure end vasculopathy (see Tab A). No differences in ICU length of stay and ICU-mortality were observed between AF and non-AF patients (see Tab A).
In the subgroup of postoperative patients, rate of AF was 16.7% (30/257). In the same subgroup, ICU-mortality was significantly higher among patients with AF ($p < 0.05$, see Tab B).
Conclusion(s): AF is frequent among ICU patients, both general and postoperative. Associated factors are previous myocardial revascularization, heart failure and vasculopathy. In the postoperative ICU patient, AF is associated to increased mortality. Further studies are needed to clarify strength and independency of those factors.

	FA (48)	C (361)	p
PTCA/CABG	18.7%	3.3%	0.001
Heart failure	29.2%	11.4%	0.007
Vasculopathy	45.8%	26.8%	0.01
ICU-length of stay (mean SD)	4.9±8.1	4.6±7.8	N.S.
ICU-mortality	20.8%	14.7%	N.S.

[Tab A: AF associated factors and outcome, all pati]

	FA (30)	C (257)	p
ICU-length of stay (mean SD)	2.8±2.9	3.8±7.5	N.S.
ICU-mortality	16.7%	5.8%	0.04

[Tab B: AF outcome for postoperative patients.]

12AP7-9

Hospital mortality in patients with prolonged stay in non-cardiac postoperative intensive care unit (PICU)

López Martínez M., Guerra Martínez A., López E., Magán Tapia P., Pérez-Cerdá Silvestre F.
Hospital 12 Octubre, Department of Anaesthesiology, Madrid, Spain

Background and Goal of Study: Non-cardiac surgical patients are becoming older, with higher associated comorbidity and undergoing major surgery, which results in higher postoperative mortality.
The aim of the study is to know hospital mortality of patients with prolonged PICU stay, and identify any association with patient variables and type of surgery.
Materials and Methods: Cross-sectional study including all patients staying 3 of more days in our PICU during 2009. The main variable was hospital mortality after surgery (in the PICU or in a standard ward). Explicative variables were: age, gender, ASA (American Society of Anesthesiologists) classification, length of stay in PICU, emergency surgery and type of surgery. Results were expressed as median (IQR) for continuous variables and proportions for qualitative ones.
Differences between means were assessed by T-Student test. The distribution of categorical variables was compared by the X^2 or Fisher's exact test as appropriate, studying the standardized residues when differences were significant. Multivariate logistic regression was used to identify mortality risk factors. For all the analysis $p < 0.05$ was considered significant.
Results and Discussion: 211 out of 11728 patients admitted in the PICU during 2009 required a prolonged stay. The median of age was 67 (54-76) years, and 4 (3-7) days of stay in PICU. 60,7% of patients were men, and most of them were ASA 3 (45.5%). 50.2% underwent elective surgery, and most of them (47.4%) major general surgery. 51 (24%) died in the hospital, 24 in the PICU. Statistically significant variables in the univariate analysis were emergency surgery (OR=0.5; 95%CI=0.26-0.95),
ASA classification (OR=2.33; 95%CI=1.5-3.59), age (OR=1.02; 95%CI=1.003-1.04) and days of stay in PICU (OR=1.05; 95%CI=1.02-1.1).
In the standardized residues study for ASA we find that ASA 4 patients have a significant higher risk of death. Results of multivariate analysis are shown in table.

	OR	95% CI
EMERGENCY SURGERY	2.09	1.04-4.17
ASA	2.43	1.54-3.84
DAYS IN PICU	1.05	1.01-1.10

[Multivariate analysis]

Conclusions: Hospital mortality observed in patients with prolonged PICU stay was 24%, and factors independently associated with it were emergency surgery, ASA classification (higher ASA increased risk of mortality, especially ASA 4 patients) and length of stay in PICU.

12AP7-10

Mortality in postoperative intensive care unit (PICU) versus after discharge from it in patients with prolonged PICU stay

López Martínez M., Guerra Martínez A., López E., Magán Tapia P., Pérez-Cerdá Silvestre F.
Hospital 12 Octubre, Department of Anaesthesiology, Madrid, Spain

Background and Goal of Study: We assume that patients who die in PICU have worse baseline than those being discharged from it.
This study aims to determine differences in patient characteristics or type of surgery between patients that died in the PICU and the ones that did not. We also try to identify factors associated with death in both groups. Patients targeted in the study are the ones with a prolonged stay.
Materials and Methods: cross-sectional study including all patients staying 3 or more days in PICU during 2009. We compared patient characteristics (age, sex, ASA classification,days in PICU) and type of surgery (emergency or not) between patients who died in PICU (group A) and patients who did not (group B).
Results were expressed as mean for continuous variables and proportions for qualitative ones. Differences between means were assessed by T-Student test. Distribution of categorical variables was compared by X^2 or Fisher's exact tests as appropriate, studying standardized residues when differences were significant. Multivariate logistic regression was used to identify risk factors independently associated with mortality.
Results and Discussion: 211 out of 11728 patients admited in the PICU during 2009 required a prolonged stay. 24 patients died in the PICU, and 187 were discharged to a standard ward (27 of them died in the hospital). Statistically significant differences in age (71.83 vs 61.99;$p < 0.001$), days of stay in PICU (11.79 vs 6.39;$p < 0.05$) and ASA (41.7% of ASA 4 vs 13.9%;$p < 0.05$) exist between both groups.
Statistically significant variables in the mortality multivariate analysis in group A were age, ASA and days in PICU, and in group B were emergency surgery and ASA. Results are shown in table.

	GROUP A	
	OR	95% CI
AGE	1.06	1.01-1.10
ASA	3.14	1.55-6.38
DAYS	1.07	1.02-1.12
	GROUP B	
EMERGENCY SURGERY	0.41	0.17-0.97
ASA	1.82	1.07-3.08

[Multivariate analysis]

Conclusion(s): Patients with prolonged stay in PICU which die in it are older, with a greater length of stay and are in a greater proportion ASA 4 patients than those being discharge. Risk factors for PICU mortality are higher age, higher ASA and more days in PICU, and for hospital mortality after discharge are emergency surgery and higher ASA.

12AP7-11

Intermediate care - effect on mortality following emergency abdominal surgery: Rational and design of the InCare trial

Vester-Andersen M., Waldau T., Wetterslev J., Møller A.M.
Copenhagen University Herlev Hospital, Department of Anaesthesiology and Intensive Care, Herlev, Denmark

Background: Emergency major abdominal surgery patients have a 30-day mortality and morbidity rate of 10-20% and 35-57% respectively. Postoperative cardiopulmonary complications, renal complications and sepsis are particularly frequent and are independent risk factors of postoperative death. Emergency major abdominal surgery patients with a perioperative Acute Physiology and Chronic Health Evaluation II (APACHE II) score ≥ 12 have a high risk of postoperative organ failure and death (~40 % mortality).
Aim: To evaluate the effect of postoperative intermediate care on mortality in emergency major abdominal surgery patients with a perioperative APACHE II score ≥ 12.
Hypothesis: Postoperative intermediate care will lead to prevention of or early detection and treatment of complications and result in a reduction of all-cause mortality.
Methods: A multicentre, unblinded randomized trial with 1:1 allocation to either:
A) Intermediate care; observation and treatment in an intermediate care bed for a minimum of 48 hours (experimental treatment) *OR*
B) Protocol based discharge from the recovery unit to the surgical ward (standard treatment). Telephone-based randomization is conducted when patients are judged ready for discharge to the surgical ward according to The Danish Society of Anaesthesia and Intensive care Medicines discharge criteria. The intermediate care bed is situated at a critical care unit, recovery unit or surgical high dependency unit. Surgeons and intensive care physicians carry out daily protocol-based rounds.
The sample size allows detection of a 33% relative risk reduction in all-cause mortality with a power of 80%.
Results: The primary outcome measure is 30-day mortality and secondary outcome measures are long-term mortality, rate of critical care unit admission from ward and postoperative hospitalization time.
Recruitment is ongoing. A total of 400 patients will be enrolled from October 2010 to Marts 2012 at Herlev University Hospital, Hillerød University Hospital, Koege University Hospital, Bispebjerg University Hospital and possibly additional study sites.
Conclusion: Many countries in Europe, including Denmark, have been reluctant to establish intermediate care units. The InCare trial will provide important knowledge about the effect of postoperative intermediate care in emergency abdominal surgery patient.
Acknowledgements: Rosenberg J, Moesgaard F, Jørgensen LN and Møller MH.
ClinicalTrials.gov Identifier: NCT01209663

12AP8-1

Incidence and risk factors of subclavian central venous catheter-related thrombosis in trauma patients: Comparison of two catheters

Gentile A., Petit L., Masson F, Cottenceau V., Cochard J.-F, Sztark F
Robert Picque Hospital, Department of Anaesthesiology and Intensive Care, Villenave d'Ornon, France

Background and Goal of Study: Central venous catheter (CVC)-related deep vein thrombosis (DVT) is a frequent complication in intensive care units (1), but data are poor concerning trauma patients. The objective of our study was to determine if the type of CVC could be a DVT independent risk factor. Secondary objective was to identify CVC thrombosis incidence and other CVC-related DVT risk factors in trauma patients.
Materials and Methods: A prospective monocentric study was performed in our trauma unit after approval by the local ethics committee. Patients undergoing one or several subclavian CVC were included and randomized to receive either A brand CVC or B brand CVC. They were weekly screened by ultrasound for CVC-related DVT. Potential risk factors were collected for each patient, namely history-related, trauma-related and CVC-related characteristics.
Results and Discussion: One hundred eighty-six patients were included, 84 in group A and 102 in group B. Both groups were comparable concerning demographic and trauma characteristics. Total incidence of CVC-related DVT was 37 % (IC95% 26-40). There was no significant difference between both groups: 38% in group A vs 36% in group B (p=0,75). CVC thrombosis occured within 8 days [6-12] in both groups. CVC-related DVT independent risk factors were intracranial hypertension, massive transfusion, CVC tip position into jugular or innominate vein and ipsilateral jugular catheter.
Conclusion(s): Incidence of subclavian CVC-related DVT is high in our trauma unit, but it doesn't depend on the type of CVC. We developed several preventive measures to decrease CVC thrombosis, such as making an educational film about good practices for CVC's pose, echographic guidance, systematic removal of misplaced CVC and anticipation of prophylactic anticoagulation. Further study is needed to assess their efficiency.
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12AP8-2

The effects of the head rotations, and/or Trendelenburg position on the cross-sectional area and relative positions of the right internal jugular vein and common carotid artery according to the body mass index

Kim Y.-J., Hurr S., Kim D.-Y., Baik H.-J., Kim J.-H.
Ewha Womans University, Department of Anaesthesiology and Pain Medicine, Seoul, Korea, Republic of

Background and Goal of Study: Obese patients, especially, are considered to be a "difficult stick" because of the difficulties to access and identify the anatomical land marks during central venous catheterization (CVC) using traditional central approach on the area of the right internal jugular vein (IJV). The goal was to investigate the effects of the head rotations, and/or Trendelenburg position on the cross-sectional area (CSA) and relative positions of the IJV and common carotid artery (CCA) via central approach according to the body mass index (BMI).
Materials and Methods: We obtained ultrasound images to estimate the largest CSA of the IJV and CCA, and overlapping percentages between the IJV and CCA via central approach according to the BMI; Group I (n= 34); BMI< 25 kg/m^2, Group II (n=34); 25 kg/m^2< BMI< 30 kg/m^2, Group III (n=34); 30 kg/m^2 < BMI < 35 kg/m^2. Six combinations of positions were studied for each patient, with supine position, followed by 10° of Trendelenburg position, during the head rotation at 0°, 30°, and 60° to the left
Results and Discussion: In the Trendelen position all patients had significant decrease of IJV depth, and increases of the largest CSA of IJV without change of CCA width, and increase overlapping magnitude of the IJV to the CCA during the head rotation at 0°, 30°, and 60°. In the head rotation, 30°, and 60°of head rotation had significant decrease of IJV depth from skin and increase of overlapping of the IJV to the CCA compared with 0°of head rotation in group II and group III.There were no significant differences in the largest CSA of the IJV and CCA in the position regardless of supine and the Trendelen position among the Groups.
In the depth of the IJV from skin, there was significant difference in Group III compared with Group I and Group II. The magnitude of an overlapping of the IJV to the CCA, Group II and III were significantly increased compared with Group I in the supine position and Trendelen position at 0°, 30°, and 60°of head rotation.
Conclusion(s): In the traditional central approach for CVC via the right IJV, the Trendelen position and head rotation was effective in maximizing the CSA and minimizing the depth of IJV, however, had a significant increase of overlapping of the IJV to the CCA in the higher BMI patients. In the higher BMI patients with more than 30 kg/m^2 of BMI, 30° less than of head rotation with the Trendelen position may be useful for safe and successful CVC.

12AP8-3

Deep vein thrombosis in severe head injury: Which incidence and which prophylaxy?

Bouderka M.A., Bouhouri A., Nsiri A., Bouaggad A., Amraoui K., Harti A.
University Hassan II, Department of Anaesthesiology and Intensive Care, Casablanca, Morocco

Background and Goal of Study: In severe head injury (SHI) patients, Deep vein thrombosis (DVT) increases mortality and morbidity. However, anticoagulant prophylaxis has not found large acceptance due to the underestimation of DVT incidence and the increased risk for intracranial bleeding. The aim of this study is to evaluate the incidence of DVT in SHI and the risk of intracranial hemorrhage after anticoagulant prophylaxis treatment using Enoxaparine.
Materials and Methods: It is a prospective randomized study conduced during 3 years included patients with isolated SHI (GCS < 10). We excluded patients who died within the first 48 hours , with coagulation disorders (Prothrombine Time < 50% or thrombopenia < 150 000 mm-3) and with ventricular haemorrhage. Every patient had CT scan at day 1, 5, 15 and any time we suspected a neurological complication. At day 5 patients were randomized patients in 2 groups: EGroup (n=32) Enoxaparine 30 mg per day subcutaneously and PGroupe (n=33) placebo, did not receive any anticoagulant treatment. For the 2 groups mechanical prohylaxis was provided by graduated compression stockings. A doppler echography of lower limb was done at day 5, 10, 20 and if clinical presumption. We evaluated incidence of DVT, intracranial haemorrhage . We used Student test for continues variables and corrected Chi 2 test for categorical variables. Parameters were analyzed by Epi Info version 6. P< 0.05 was considered as significatif.
Results and Discussion: There is no difference between the 2 groups in term of demographic data and ICU scores. DVT global incidence for the 2 groups was 7.6% (n=5) . It was 15.1% (n=5) for PGroup vs 0% for EGroup (P= 0.01). Mean day of DVT happening was 10±1. All Increased intracranial haemorrhage found in EGroup happened spontaneously before starting Enoxaparine. Others results are expressed in table 1.

Parameters	P Group (n=33)	E Group (n=32)	P
Deep Vein Trombosis (DVT)	5 (15.1%)	0 (0%)	0.01
Marshal Classification (CT scan) stade I-II/ stade III-IV	6 / 27	10 / 22	0.34
Increased intracranial haemorrhage	13 (39.3%)	6 (18.7%)	0.11
Secondary Thrombopenia	2 (6%)	2 (6%)	0.68

[DVT incidence, CT scan lesion and adverse effects]

Conclusion(s): In our study without pharmacological prophylaxis, DVT incidence in SHI is 15.1%. With Enoxaparine 30mg per day this incidence decreases without majoring risk of intracranial bleeding. These results should be confirmed by similar studies with large samples.

12AP8-4

Postoperative atrial fibrillation - risk factors and consequences

Heschl S., Kainz J., Vicenzi M.
Medical University Graz, Department of Anaesthesiology and Intensive Care, Graz, Austria

Background and Goal of Study: Postoperative atrial fibrillation (POAF) is the most common complication after cardiac surgery. It is responsible for increased morbidity and mortality as well as increased use of hospital resources (1,2). Goal of this study is to identify independent risk factors for POAF and to evaluate its effects on length of ICU- and hospital-stay.
Materials and Methods: 564 patients after cardiac surgery were included in this retrospective study. A Kaplan-Meier event time analysis was performed and potential risk factors were investigated for their influence in a multivariate Cox-proportional-hazards-model.
Results and Discussion: 21,3% (n = 120; 95%-CI ±1,4%) of the patients developed POAF, with a peak at postoperative day 2. Patient age was the only independent risk factor in this survey (p< 0,01). Out of these 120 patients with new onset POAF only 67 (55,8%; 95%-CI ±4,9%) were discharged from the

ICU with stable sinus rhythm. Median ICU-(5; 95%-CI ±2,9 vs. 2 ±0,4 days) and postoperative length of hospital-stay (11; 95%-CI ±4,5 vs. 10 ±0,9 days) were longer in the POAF group, however this association was only significant in the univariate analysis.
The incidence of POAF in this study is lower than reported in previous investigations (3), which can be explained by different methods of detection and a shorter observation period. Patient age as the only independent risk factor detected represents the heterogeneous body of evidence in the literature.
Conclusion: POAF is not only an issue of intensive care medicine. As approximately only half of the patients with POAF can be discharged from the ICU with sinus rhythm, further care on the ward plays an important role in therapy and prophylaxis of complications. Due to its high incidence and associated complications together with increased use of hospital resources, further investigations concerning prophylaxis and therapy are needed.
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12AP8-5

Infraclavicular axillary central venous cannulation, using ultrasound, in an intensive care setting, in mechanically ventilated, peep-dependent patients

Glen J., Christie L.E., Lang I.
Wishaw General Hospital, Department of Anaesthesiology and Intensive Care, Lanarkshire, United Kingdom

Background and Goal of Study: Subclavian central venous catheters (CVC) are associated with lower rates of colonisation and catheter-related bloodstream infection. The use of ultrasound (US) to facilitate such CVC insertion has been described, with a high success rate (anatomically, an infraclavicular axillary venous puncture takes place, although the end result is practically indistinguishable from a standard subclavian CVC)[1]. Nevertheless, the infraclavicular option for CVC placement is often rejected in the critically ill, primarily due to concerns about pneumothorax. We evaluated the technique of US-guided infraclavicular axillary CVC insertion in a mixed population of critically ill, mechanically ventilated patients.
Materials and Methods: In 50 consecutive procedures we attempted to catheterise the axillary vein using US. Ethics committee approval was obtained. All patients were receiving mechanical ventilation with a PEEP of at least 5cm H_20. Patients were excluded if they had a contraindication to subclavian CVC insertion. Chest x-ray was performed post procedure.
Results and Discussion: 50 procedures took place in 41 patients. Summary patient characteristics are given in table 1. Median age was 56 years (range 17 - 84). The vein was successfully punctured with the first needle pass in 72% of cases. The vein was catheterised in 98% of cases. There were no pneumothoraces or arterial punctures. Catheter malposition (cephalad) occurred in 6% of cases. 50% of patients were overweight (BMI≥25), 34% had a clotting abnormality, and 58% had an FiO2 of at least 0.5.
Conclusion: To our knowledge, this is the first evaluation of this technique in mechanically ventilated patients dependent on PEEP. We have inserted CVCs in patients with high BMI, high levels of ventilatory support, and with coagulopathy. Although numbers are low at present, this preliminary data suggests that this technique is effective in this group of patients, and is associated with a low rate of complications. We continue to collect data on an ongoing basis.
References:
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BMI, median (range)	**23 (18 - 37)**
FiO_2, *median (range)*	0.5 (0.3 - 1.0)
PEEP (cmH_2O), *median (range)*	8 (5 - 11)
Clotting abnormality*, *n (%)*	17 (34%)

Clotting abnormality: PT≥16; PTT≥46; Platelets ≤100

[Table 1: Patient summary characteristics (n = 50)]

12AP8-6

Reducing monitoring time after carotid stenting: Are we there yet?

Silva L., Bataller A., de Miguel M., Gonzalez A., Tormos P, de Nadal M.
Hospital Universitari Vall d'Hebron, Department of Anaesthesiology, Barcelona, Spain

Background and Purpose: Reducing the time of intensive care monitoring increases patient confort and reduces hospitalary costs by earlier discharge to hospital ward. Hypotension after carotid stenting (CS) is a major concern with an incidence of 10 to 75% (1) and has been associated with an increased risk for cerebrovascular complications in some series, limiting discharge. We aimed to determine the viability of reducing times for vital sign monitoring after CS, by evaluating the incidence and timing of hypotension and its correlation to postoperative complications (TIA: transient ischemic attack, CVA: cerebrovascular accident, AMI: acute myocardial ischemia)
Patients and Methods: We reviewed clinical data of 49 patients who underwent CS under local anesthesia and were monitorized for 12 hours post procedure.
We recorded the incidence of hypotension (systolic blood pressure < 90mmhg) and need for vasopressors. Patients were divided in 2 groups according to the timing of hypotension (< 6 hs vs >6 hs) and were compared in terms of the incidence of cerebrovascular complications during hospital stay. X^2 was used for statistical analysis.
Results: Mean age was 78±7 years, and 59% presented with symptomatic carotid disease. All patients were high risk for endarterectomy. Postoperative hypotension was present in 18 patients (36.8%) and noradrenaline perfusion was needed in 64,3%. Hypotension presented before 6h in 14 patients(77,8%) and was delayed in 4 patients (22,2%). Incidence of cerebrovascular complications was higher (36%) in the earlier hypotension group than in the delayed hypotension group (P:0,02) (Table 1).

Complications	**No hypotension N: 33 (63,2%)**	**Early hypotension (<6h) N: 14 (28,6%)**	**Delayed hypotension (>6h) N: 4 (8,2%)**	**P**
TIA	1 (2%)	1 (2%)	0 (0%)	
CVA	0 (0%)	0 (0%)	0 (0%)	
AMI/angina pectoris	1 (2%)	4 (8%)	0 (0%)	
Total	2 (6,5%)	5 (35,7%)	0 (0%)	0,024

[Table 1]

Conclusion: In patients after CS, reducing from 12 to 6 hours postoperative monitoring would have missed 22,2% of hypotensive patients in our series. None of them presented any complications, suggesting that late onset hypotension could be benign. Nonetheless a minimum of 12 hours monitoring time would be justified. Further analysis of predictive risk factors for delayed hypotension should be encouraged to identified patients at higher risk.
References:
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12AP8-7

Acute cardiac failure in trauma patients with pre-existing coronary artery disease: New inotropic treatment option

Afonin A.N., Karpun N.A.
Main Military Clinical Hospital nmd. after N.N. Burdenko, Department of Anaesthesiology and Intensive Care, Moscow, Russian Federation

Background and Goal of Study: Treatment of Acute Heart Failure (AHF) is particularly challenging in multitrauma victims with existing Ischemic Heart Disease (IHD). We used new calcium sensitizer inotropic drug Levosimendan to achieve improved contractility without increased afterload while decreasing rate of complications as compared to standard therapy with catecholamines alone.
Materials and Methods: We performed a prospective randomized clinical trial of 26 patients with known prior history of Coronary Artery Disease (CAD) and IHD who suffered multitrauma and subsequently developed AHF. All patients had compromised myocardial contractile function as diagnosed by invasive monitoring (Swan-Ganz Pulmonary Artery, arterial catheters) and transthoracic echocardiography. Dobutamine was administered initially to maximum dose or effect and later combined with Levosimendan (Group I, n=12) or with Adrenaline (Group II, n=14). The hemodynamic data was recorded every 6 h. for 72 h. Other parameters collected and analyzed included: ECG, Cardiac Index (CI), serum levels of lactate (SL), troponin-I (TnI), Atrial Natriuretic Peptide (ANP); duration of inotropic therapy, length of ICU stay, and incidence and type of complication.
Results and Discussion: A second inotropic drug infusion was added when AHF persisted with average CI of 2.1±0.15 l/min/м² and Left Ventricular Ejection Fraction (LVEF) of 41±7% despite achieved normovolemia: Central Venous Pressure (CVP) 11±2 mm Hg, Pulmonary Artery Wedge Pressure (PAWP) 15±1mm Hg, and continued Dobutamine infusion to maximum effective dose. CI improved and in Gr. I was 3.5±0.14 and 2.6±0.33 l/min/м²in Gr.

II (p=0,03). Duration of inotropic therapy was 71±10.5 h in Gr.I and 102±13.5 h in Gr. II (p=0,001). Gr. II patients had higher rate of arrhythmias (Lown-Wolf class 3-5), increased SL and TnI. There was no statistical significance in difference of length of ICU stay between the two groups.
Conclusion(s): We conclude that Levosimendan is an effective new addition to standard inotropic therapy in multitrauma patients with refractory AHF as evidenced by improved myocardial contractility, global perfusion, decreased inotropic therapy duration and rate of complications.
References:
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12AP8-8

Comparison of gastric residuel volumes and gastrointestinal complications in patients fed with enteral formulas with fiber and without fiber

Aytunur S., Ozcan N., Kaymak C., Basar H., Kose B.
Ankara Training and Research Hospital, Department of Anaesthesiology, Ankara, Turkey

Background and Goal of Study: The aim of this study is to compare gastric residuel volumes (GRV) and gastrointestinal complications in patients which enteral nutrition is started with formulas with and without fiber.
Materials and Methods: Sixty patients which were on mechanical ventilation, expected to stay more than 8 days in ICU and fed enterally with nasogastric tube were enrolled to the study. Patients with bowel obstruction, paralytic ileus, peritonitis, acute pancreatitis, inflammatory bowel diseases, bowel fistulas, gastrointestinal bleeding, short bowel syndrome, morbid obesity, gastrostomy or jejunostomy, nasogastric tube in ileum, patient-ventilator dyssyncrony, head trauma were excludued. Totally 60 patients were randomised into two study groups.
Without-fiber Group: was fed with standart isoosmolar formula (Osmolite, Abbott, Illinoisi USA),
Fiber Group: was fed with standart isoosmolar fiber formula (Jevity, Zwolle, Holland)
Patients who reached targetted maximum calori value were monitored for 3 days. GRV's were measured 3 times a day. Gastrointestinal complications like abdominal distension, vomitting, regurgitation, aspiration, diarrhea episodes were registered.
Results and Discussion: For 3 day GRV's in Fiber Group were always larger than GRV's in Without-Fiber Group. But the difference was statistically insignificant. GRV's in none of the groups reached maximum acceptable level of 200 ml's.

Days	Hour	Without Fiber (mean +- SD)	Fiber (mean +- SD)	p
Day 1	08:00	34,67±44,16	32,17±47,61	0,42
Day 1	16:00	47,50±53,27	57,67±85,92	0,91
Day 1	24:00	48,00±69,74	58,33±69,04	0,68
Day 2	08:00	46,33±63,87	54,33±81,32	0,89
Day 2	16:00	48,83±69,74	43,00±97,49	0,21
Day 2	24:00	45,00±72,08	47,83±116,07	0,15
Day 3	08:00	35,33±67,09	56,83±92,80	0,31
Day 3	16:00	44,33±64,82	60,83±88,70	0,54
Day 3	24:00	30,50±49,49	85,67±168,84	0,65

[GRV's of the groups]

Vomitting, regurgitation and distension were not different between groups. Diarrhea and aspiration were not observed in either groups. In twenty patients (66,66 %) in Fiber group and in seventeen patients (56,66 %) in Without-Fiber Group at least one complication was observed. The difference between groups was statistically insignificant.
Conclusion(s): As a conclusion, to start and continue the enteral nutrition with an enteral formula with fiber is as safe as to start and continue enteral nutrition with an enteral formula without fiber.

12AP8-9

Lyell syndrome - 20 years of experience in a Portuguese Central Hospital

Pinto R., Martins F, Krebs L., Ormonde L.
Hospital Santarem, Department of Anaesthesiology and Pain Medicine, Santarem, Portugal

Background and Goal of Study: Lyell syndrome (LS) is a severe kind of exfoliative dermatite, with systemic repercussions where is possible to make a clinical and anatomopatological comparison with second degree burn victims. Mortality rate varies between 25 and 70%, seeming that an early intervention from an intensive care unit increases the probability of a positive outcome. Generally, it is etiologically associated to drugs administration with a known extensive list of trigger substances.
The study main goal was to determine, for the last twenty years, the affected population, mortality rate, and the eventual existence of risk factors for predicting a poor outcome.
Materials and Methods: Retrospective analysis of clinical charts from 1/1/1990 to 16/9/2010. Analyzed variables were: Age, gender, percentage of corporal surface, etiological agent, and physical state ASA.
Results and Discussion: Of 1331 patients, 32 were diagnosed with LS (2.4%) with a male to female ratio of 1:1, and associated mortality rate of 37.5%.
It is believed to be risk factors for poor outcome ages higher than 59.5 years old, corporal surface percentages superior to 85%, and physical state ASA>II.
The most common etiologic drug was Alopurinol (18,75%), however, there is no proven association between the responsible agent and outcome.
The study results were limited by the existence of too few number of cases available during the observation (n=32) as well as by incomplete clinical records.
Conclusion(s): LS is a rare but extremely serious disease where an early diagnosis and management in an intensive care unit are very important in order to increase the likelihood of a favorable outcome.
References:
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Acknowledgements: Luzalba Krebs, Lucindo Ormonde

12AP8-10

Sugammadex and stress-free extubation in the critically ill patients

Muthuswamy M.B., Victor V., Hodzovic I.
Royal Gwent Hospital, Department of Anaesthesiology and Intensive Care, Newport, United Kingdom

Background and Goal of Study: Postoperative respiratory failure is not an uncommon complication after general anaesthesia. This is particularly common in people having high risk, emergency surgeries and in those who tolerate respiratory failure poorly.
We present a case series of three patients who had neuromuscular blockade reversed postoperatively with Sugammadex, a selective rocuronium binding agent.
Materials and Methods: Patient 1 is a man in his 60s who had an acute myocardial infarction a week earlier and is listed for an emergency below knee (BKA) and an above knee (AKA) amputation in a span of six days. He has a general anaesthetic on both occasions with the reversal agent being sugammadex for the BKA and neostigmine/glycopyrrolate for the AKA. His past history includes severe Ischemic Heart Disease, Peripheral vascular disease and moderate COPD.
Patient 2 is a lady, 75 years old, who has an elective ENT panendoscopy and has a significant past history of Ischemic Heart Disease.
Patient 3 is a lady who is 40 years old, but a severe COPD with previous hospital admissions. She is listed for an elective ENT panendoscopy as well. The last two patients were both reversed with Sugammadex.
Results and Discussion: Patient 1 was stable throughout with both the heart rate and blood pressure within 10% around the initial values including extubation period with sugammadex. Although these were more than 10% when neostigmine/ glycopyrrolate were used. And he ends up reintubated in the recovery unit for respiratory failure and transferred to the ICU after the AKA surgery when neostigmine was used.
In patients 2 and 3, who both had a MLT 6.0 endotracheal tube, sugammadex enabled us to extubate at deep paralysis and reversed from a profound block to a train-of-four in < 15 sec. They were extubated onto facemask and were spontaneously breathing in < 15 sec post extubation. They were both cardiostable throughout including at extubation without any residual paralysis.
Conclusion(s): Sugammadex may have a role in high risk cardiac and pulmonary patients who tolerate extubation and residual paralysis poorly and may reduce the need for unplanned admission to ICU with significant cost implications.
References:
1. Paton F, Paulden M, Chambers D, et al. Sugammadex compared with neostigmine/ glycopyrrolate for routine reversal of neuromuscular block: a systematic review and economic evaluation. Br J Anaesth 2010; 105: 558-7.

Resuscitation and Emergency Medicine

13AP1-1

Cardiac arrest protocols for patients after cardiac surgery: A survey of intensive care units in the UK

Jadhav R., Prinzlin J., Smith R.
Golden Jubilee National Hospital, Department of Anaesthesiology, Glasgow, United Kingdom

Background and Goal: The European Association of Cardiothoracic Surgery (EACTS) guidelines[1] for cardiac arrest management after cardiac surgery stress early resternotomy and differ in several key aspects from the Advanced Life Support (ALS) protocol. This survey aims to study cardiac arrest protocols for cardiac surgical patients in British intensive care units (ICUs).
Materials and Methods: A telephone survey of 39 ICUs was directed at senior ICU nurses eliciting the unit's demographics, specific management of cardiac arrest, equipment and training.
Results and Discussion: 32 of 39 (82%) ICUs responded to the survey, comprising 18 (56%) cardiothoracic (CT) ICUs, 9 (28%) mixed population ICUs and 5 (15%) cardiac-only units.
22 units (69%), including 2 of the cardiac-only ICUs, use the ALS protocol, 8 (25%), of which 3 are cardiac-only units, follow EACTS guidelines. 2 (6%) ICUs use a local protocol.
In VT/VF arrest external cardiac massage (ECM) is started in 16 (50%) ICUs, the other half defer ECM if DC shock occurs within 1 minute. In 19 (60%) ICUs a single DC shock is given before ECM, 3 consecutive shocks in 13 (40%) units. In VF/VT 1mg adrenaline is given in 19 ICUs (60%), a reduced dose in 7 (22%) and in 6 units (19%) it is avoided. In VF/VT resternotomy is considered within 5 minutes in 23 (71%), 6-10min in 4 and > 10min in 2 ICUs. 4 ICUs have no time trigger for this. The number of unsuccessful DC shocks triggers resternotomy in 27 ICUs. 5 units do not use a trigger protocol.
In PEA/asystole ECM is started immediately in 10 (31%) ICUs, pacing commenced in 8 (25%); 9 units (28%) combine pacing with ECM and 5 (16%) proceed to resternotomy. 19 ICUs (60%) give 1mg adrenaline immediately, 7 (22%) avoid it, and 6 (19%) titrate the dose. 24 units (75%) will reopen the chest in PEA/aystole within 5 minutes.
Conclusion: EACTS cardiac arrest guidelines have not been widely adopted in the UK. Most units use ALS guidelines with varying modifications for cardiac patients. CT and mixed population ICUs face logistical and educational challenges when introducing separate cardiac arrest protocols, however only 3 of 5 cardiac-only ICUs follow the EACTS guidelines. The lack of a protocolised trigger for early reopening in some ICUs could lead to delay and worse outcome.
References:
1. Dunning, A. Fabbri, P.H. Kohl, et al. Guideline for resuscitation in cardiac arrest after cardiac surgery. Eur J cardiothorac Surg 2009;36:3-28.

13AP1-2

Intravenous lipid emulsion is ineffective for acute amitriptyline intoxication in pigs

Litonius E., Niiya T., Neuvonen P., Rosenberg P.H.
Helsinki University Central Hospital, Department of Anaesthesiology and Intensive Care, Helsinki, Finland

Background and Goal of Study: Animal studies[1] and a case report[2] suggest that intravenous (i.v.) lipid emulsion, the recommended therapy for bupivacaine intoxication, could be effective in intoxications by the even more lipophilic amitriptyline (logP 4.9 vs. 3.4).
We determined the sequestration of amitriptyline by lipid emulsion after an acute intoxication and the haemodynamic recovery in comparison with infusions of Ringer's solution.
Materials and Methods: Twenty anaesthetized pigs received a toxic i.v. dose of amitriptyline (30 mg/kg in 15 min). Then, in random order, 20% lipid emulsion (ClinOleic®) or Ringer's acetate was administered i.v.; 1.5 ml/kg in 1 min, then 0.25 ml·kg^{-1}·min^{-1} for 30 min. Total and non-lipid-bound concentrations of amitriptyline were measured from serial plasma samples using high-performance liquid chromatography. We recorded mean arterial pressure (MAP) continuously and measured cardiac output (CO) at the blood sampling time points. The effects of time and treatment were analysed using repeated measures ANOVA. Mann-Whitney's U test was used to examine the effect of treatment at each time point.
Results and Discussion: Within 30 min after i.v. amitriptyline, five pigs from the lipid group and two pigs from the Ringer group had cardiac arrest and could not be resuscitated.
Slight sequestration occurred, since the total amitriptyline concentration was higher than the non-lipid-bound concentration at 5 min (15%, p=0.01) and 20 min (27%, p=0.04). The non-lipid-bound amitriptyline concentration in the lipid group did not differ from that in the Ringer group (p=0.17).
Median MAP and CO dropped to 50% of baseline after i.v. amitriptyline. MAP returned to baseline after 45 min, but CO never recovered completely. There was no effect of treatment on MAP (p=0.91), CO (p=0.41) or incidence of dysrhythmias (p=0.53).
Conclusion(s): Although lipid emulsion sequestered some amitriptyline, this did neither affect the concentration of non-lipid-bound amitriptyline when compared to treatment with Ringer, nor did it have any advantageous therapeutic effect.
References:
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13AP1-3

Emulsified isoflurane postconditioning improves early post-resuscitation myocardial dysfunction in the rat

Yu H., Zhu D., Li Y., Liu J.
West China Hospital,Sichuan University, Department of Anaesthesiology, Chengdu, China

Background and Goal of Study: Post-resuscitation myocardial dysfunction is an important cause of death following initially successful cadiopulmonary resuscitation (CPR) from cardiac arrest (CA) patients. Emulsified isoflurane (Elso) is a new lipid emulsion for intravenous administration and has been proven to have a cardioprotective effect for ischaemic-reperfusion injury in regional ischaemia in beating hearts. However, up to now, no data exists for the effect of Elso on global ischemia due to CA. The aim of present study was to examine whether Elso administered during CPR improves early post-resuscitation myocardial dysfunction after CA in rat.
Materials and Methods: Thirty-two male adult Sprague Dawley rats were randomly allocated to four groups: Sham, Control (Saline), Elso, and 30% intralipid (vehicle for Elso) groups. Rats underwent 6.5 min of asphyxia-induced CA and manual resuscitation with epinephrine and then received isovolumetric intravenous infusion immediate after return of spontaneous circulation (ROSC) with constant speed (4ml/kg/h) for 30min. Echocardiogram was used to measure left ventricular fractional shortening and trans-mitral Doppler E/A ratio after ROSC in each 15min interval and 1hour interval, respectively. Two hour after ROSC rats were killed for immunohstochemical evaluation and apoptosis measurement. Statistical analyses were performed using analysis of variance (ANOVA).
Results: During the first 2 hours after ROSC, Elso significantly attenuated the decreases in left ventricular FS and the increases in E/A ratio in comparison with control and intralipid groups (both P< 0.05). Bcl-2 and Caspase-3 expressions among 4 groups were not significantly different (P>0.05). No significantly differences were also noted in TUNEL apoptosis stain among 4 groups (P>0.05).
Conclusion(s): Administration of Elso during CPR improves early post-resuscitation myocardial dysfunction in this rat model of CA and resuscitation. However, apoptosis was not involved in the mechanism of myocardial protection of Elso in this setting.
References:
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13AP1-4

Swine Hat protocol: A non invasive index to measure the extent of hemorrage in a physiologic controlled hemorrhage swine model

Vettorello M., Silvestre E., Carù F, Vesconi S., SWAT Study Group
Ospedale Maggiore Niguarda ca' Granda, Department of Anaesthesiology and Intensive Care, Milano, Italy

Background and Goal of Study: Haemorrhage is one of the leading causes of death in trauma patients. A rapid non-invasive index to assess prehospital degree of haemorrhage will be of paramount importance. We propose and index based on a modified pulse transit time PTT (mPTT) measured from the onset of ventricular depolarization (the ‚R' wave of the ECG trace) to the systolic peak of the photoplethysmographic pulse oxymetry (PPG) waveform. The index (Heart to Arm Time -iHAT) is the beat-to-beat ratio of mPTT to RR interval.

Materials and Methods: A large white swine was maintained under general anaesthesia. ECG and PPG were continously recorded to calculate iHAT offline.
An arterial Pulsion PiCCO catheter was placed in the left femoral artery. Haemorrhage was induced at a rate of 0.8 ml/kg/min, to 27.6% of total blood volume in 24 minutes, and stopped after 500 and 700 ml for PiCCO system recalibration. PiCCO hemodynamic parameters and invasive blood pressure were recorded each minute. Arterial blood gases, haematocrit (HT), haemoglobin(Hb) and lactates were measured at baseline, after 500 ml and after 700 ml blood withdrawal.
Results and Discussion: iHAT increased after 90 ml (2,9% of blood volume) of blood loss (after 2.5 minutes), while SVI fell from 56 to 46 ml/(beat*m^2). During haemorrhage, no compensatory response was observed. SVRI decreased from 1680 to 1300 dyne*s/cm^5 while CI fell from 3.71 to 1.92 l/min/m^2 and systolic blood pressure dropped from 107 to 64 mmHg. HR remained constant. Lactates increased from 1.8 to 2.1 to 2.2. Hb and HT changed respectively from 11.5 (35%) to 10.5 (32%) to 9.2 mg/ml (28%).
The correlation between iHAT (averaged on 30 beats) and haemorrhage was significant ($R^2 = 0.904$, $p < 0.001$).
The correlation between iHAT (averaged) and stroke volume variation (SVV) was also significant ($R^2 = 0.743$, $p < 0.05$).
Conclusion(s): iHAT correlates significantly both to haemorrhage amount and SVV even in the lower shock classes (I and II).
Moreover, onset of iHAT variation was prompt after 90 ml blood withdrawal whereas SVV and PPV changed only after 150 ml blood loss. To our knowledge this is the first study to assess the feasibility of a beat to beat non invasive index based on pulse transit time and RR interval to monitor haemorrhage continously.

13AP1-5

Engaging a whole community in resuscitation

Nielsen A.M., Isbye D.L., Lippert FK., Rasmussen L.S.
Department of Anaesthesia, Centre of Head and Orthopaedics, Copenhagen University Hospital, Rigshospitalet, Department of Anaesthesiology, Copenhagen N, Denmark

Background and Goal of Study: Survival after out-of-hospital cardiac arrest (OHCA) is influenced by each link in the chain of survival. On the Danish island of Bornholm (population 42.000, area 588 km^2) 22% of witnessed OHCA patients (2004) received bystander basic life support (BLS) and none survived an OHCA in 2001-2003.
Therefore, a project was conducted aiming to improve BLS rates and survival after OHCA by strengthening each link in the chain of survival combined with a mass media focus on resuscitation.
Materials and Methods: Lay people completed a 24-min DVD-based-self-instruction BLS course (MiniAnne, Laerdal) mainly at their workplaces or a 4-h BLS/AED course. The local television station had broadcasts about resuscitation and the purchase of automated external defibrillators (AED) was encouraged. The dispatch centre implemented an IT solution for referring bystanders to the nearest AED.
At the EMS the ambulance attendants were assessed in a mock cardiac arrest scenario and individual feedback was given. Staff at the island hospital completed a BLS course or more advanced courses. Therapeutic hypothermia was implemented.
A telephone survey assessed attitudes regarding resuscitation among randomly selected citizens before (N=824) and after (N=815) the intervention.
The ambulance services collected data on OHCA, e.g. bystander BLS and use of AEDs.
Results and Discussion: During the 2-year project period 9.226 people (22% of the population) completed the short course and 2.453 (6% of the population) completed the 4-h course.
The number of AEDs increased from 3 to 147 and these AEDs were used in 7 cases of OHCA (N=98). The telephone survey revealed that the proportions who would definitely provide chest compressions and mouth-to-mouth ventilation before and after the project were 59% and 63% (p=0.11), and 58% and 59% (p=0.65), respectively. The proportion willing to use an AED increased from 44% to 65% (p< 0.0001).
The bystander BLS rate for witnessed all-aetiology OHCA patients (N=40) increased from 22% [95% CI 3-60] to 67.5% [95% CI 52-80]. The survival to discharge for all-aetiology, all rhythms OHCA (N=96) was 5.2% [95% CI 2-12}, and the survival to discharge for witnessed all-aetiology OHCA with initial shockable rhythm (N=15) was 20% [95% CI 6-46].
Conclusion: Strengthening all links in the chain of survival was associated with significant increases in bystander BLS rates and survival after out-of-hospital cardiac arrest.

13AP1-6

Influence of chest compressions during cardiopulmonary resuscitation on regional ventilation distribution by electrical impedance tomography

Szczyrba M., Boehme S., Klein K.U., Gervais H.W., David M., Markstaller K.
University Medical Center of the Johannes Gutenberg University Mainz, Department of Anaesthesiology and Intensive Care, Mainz, Germany

Background and Goal of Study: Intermittent positive pressure ventilation (IPPV) during cardiopulmonary resuscitation (CPR) after cardiac arrest is still controversial. The influence of chest compressions on regional changes in end-expiratory lung volume (EELV) and distribution of tidal volume (V_t) is not well quantified. Electrical impedance tomography (EIT) is capable to detect thoracic bioimpedance changes to assess variations in regional lung aeration associated with changes in both air and blood content. The aim of this study was to investigate the effects of chest compressions during CPR on EELV and regional V_t distribution during intermittent positive pressure ventilation.
Materials and Methods: With animal care committee approval, n=10 pigs (25±1kg) were anesthetized and mechanically ventilated (IPPV non-synchronized, Vt 10ml/kg body weight, PEEP 5mbar, respiratory rate adjusted to maintain normocapnia). EIT and mean inspiratory airway pressures (P_{mean}) were determined at baseline (BL) prior to cardiac arrest and during CPR. After BL, ventricular fibrillation cardiac arrest was electrically induced and CPR was started after 1 min of untreated arrest. After 3 min of CPR, EIT data were acquired at 13 Hz. Regional relative impedance changes (RICs) were evaluated for global, ventral, middle and dorsal pulmonal regions of interest (ROI). A Fourier transformation was applied to filter either changes by ventilation (RR*2.5) or by chest compressions (85-115). ANOVA was used for statistical analysis ($p \leq 0.05$).
Results and Discussion: The data suggest that non-synchronized ventilation during chest-compressions leads to an increase in Δ amplitude of RICs in the ventral ($p < 0.001$) and to a decrease in Δ amplitude of RICs in the dorsal parts of the lung (p=0.02). Furthermore a loss of EELV as determined by EIT (Δ minima of RICs) was found in all ROIs, in particular in the ventral parts ($p < 0.001$). Signal-filtering differentiated between ventilation- and chest compression induced RICs. During CPR, chest compressions induced more than 60% ($p < 0.001$) of global RICs.
Conclusion(s): The results indicate that chest compressions during cardiopulmonary resuscitation cause a reduction in end-expiratory lung volume and an increase of non-ventilated lung. Mechanical ventilation during chest compressions after cardiac arrest leads to an inhomogeneous ventilation, which may induce lung damage.
Acknowledgements: This study was funded by the DFG Ma 2398/6.

13AP1-7

Quantification of gas exchange disturbances in the early post-resuscitation phase - measured by electrical impedance tomography and multiple inert gas elimination technique

Boehme S., Szczyrba M., Hartmann E.K., Duenges B., David M., Markstaller K.
University Medical Center of the Johannes Gutenberg-University Mainz, Department of Anaesthesiology and Intensive Care, Mainz, Germany

Background and Goal of Study: After Return of Spontaneous Circulation (ROSC) clinical outcome is determined by the severity of impairment of vital organ systems. In recent years, the term post-resuscitation syndrome was well established. In addition to the underlying disease the extent of systemic ischemia-reperfusion and myocardial dysfunction are described to be prognostic factors. Clinical experience shows, that besides this, patients after ROSC often show pulmonary disturbances. These can be manifested as conditions ranging from subclinical functional changes to failure of gas exchange. To assess the degree of pulmonary dysfunction Electrical Impedance Tomography (EIT) and Multiple Inert Gas Elimination Technique (MIGET) were used.
Materials and Methods: With animal care committee approval 16 pigs (25±1kg, ROSC n=8) were anaesthetized and mechanically ventilated (IPPV, 10ml/kg body weight, PEEP 5mbar, RR 20-30). Cardiac arrest was induced by ventricular fibrillation; advanced cardiac life support (ACLS) started after 1 min of lay-down time. Defibrillation was performed after 8min of ACLS. Measurements were acquired at healthy baseline, 15 and 240 min after ROSC. Oxygenation-index (paO_2/FiO_2), MIGET derived pulmonary shunt fraction and relative changes of end-expiratory lung volume (EELV) measured by EIT were evaluated. Friedman test was used for statistical analysis ($p \leq 0.05$).
Results and Discussion: In all animals abnormal gas exchange and poor lung mechanics were routinely detected in the early post-resuscitation phase. A significantly lower oxygenation ($p < 0.001$) was found 15 min and 240 min

post ROSC. Δ minima of relative impedance changes by EIT, reflecting EELV, also decreased significantly (p< 0.001), especially in the dorsal lung areas. Furthermore an increase in pulmonary shunt fraction was observed and remained clinically relevant even after 240 min of restoration (p=0.004).
Conclusion(s): Chest compression during ACLS leads to an increase of intrapulmonary shunt fraction. Due to an increase of non-ventilated lung parenchyma a critical loss of EELV in the post-resuscitation phase is often observed. To detect and quantify this phenomenon at bedside, EIT can be used as a non-invasive technique. However, to further differentiate the mechanisms, causing these critical gas exchange disturbances, limits the use of EIT.
Acknowledgements: Funded by the DFG: Ma 2398/6 and 2398/7.

13AP2-1

The predictive value of the level of brain injury for coagulopathy in patients with isolated traumatic brain injury

Franschman G., Peerdeman S.M., Loer S.A., Greuters S., Boer C.
VU Medical Center, Department of Anaesthesiology, Amsterdam, Netherlands

Background and Goal of Study: The presence of coagulopathy is strongly associated with mortality in patients with traumatic brain injury (TBI), but its relation with the level of brain injury is only scarcely investigated. Here we investigated whether the severity of brain injury and coagulopathy in isolated TBI are related or should be considered as independent predictors for outcome.
Materials and Methods: The medical records of 226 CT-confirmed isolated TBI patients were retrospectively evaluated. Coagulopathy was defined as an activated partial thromboplastin time > 40 seconds and/or a prothrombin time >1.2 and/or a platelet count < 120*109/l. CT scans were assigned to a five-point scale according to the Traumatic Coma Data Bank (TCDB) CT classification.
Results: Patients were mostly male, aged 49 ± 20 years with a median Glasgow Coma Scale (GCS) of 9 (3-13). Coagulopathy occurred in 40% of patients in the first 24 hours post-trauma. The median TCDB CT classification was similar in patients with (2 (2-3)) or without (2.5 (2-5)) coagulopathy, and there were no differences in coagulation parameters among TCDB CT classifications. The CT classification was not predictive for the development of coagulopathy. CT classification (OR 1.51; P=0.03) and coagulopathy (OR 6.85; P=0.001) were independent prognostic factors for outcome in addition to age, GCS and pupil reflex.
Discussion and Conclusion: The TCDB CT classification and the occurrence of coagulopathy in isolated TBI are poorly related and are of independent predictive value for outcome in TBI. These data support addition of coagulopathy as early prognostic marker in predictive models for outcome after brain injury.

13AP2-3

Impedance threshold device (ResQGARD) increases systolic blood pressure in hypotensive patients in the emergency department

Pantazopoulos C., Karacosta E., Vallianatou L., Agaliotis G., Terzidis A., Rozenberg T.
University of Athens, Medical School, MSc International Medicine - Health Crisis Management, Goudi, Athens, Greece

Background and Goal of Study: The Impedance Threshold Device - ITD (ResQGARD) increases the negative pressure that is created in the thorax with every inspiration, resulting in drawing more blood into the chest, thus increasing venous return to the heart. Today, ITDs are mainly used in cardiorespiratory resuscitation. The goal of this study, is to investigate if ResQGARD can be used in the emergency department, in spontaneously breathing patients with hypotension, in order to increase their systolic blood pressure.
Materials and Methods: Eighty (80) patients that arrived in the emergency department with low systolic blood pressure (SBP< / =90mmHg), were randomly divided in two groups. In Group A, patients were breathing for 15 minutes through a fully functioning Impedance Threshold Valve. In Group B, patients were breathing for 15 minutes through a non-functioning Impedance Threshold Valve. Systolic blood pressure was measured non-invasely, with an automatic manometer, as well as manually.
Results and Discussion: The patients that were breathing through a fully functioning ITD (Group A), had a 15mmHg (+/- 5mmHg) increase in their systolic blood pressure, in comparison to patients that were breathing through a non-functioning ITD that had no increase in their systolic blood pressure (Group B).
Conclusion(s): The Impedance Threshold Device (ResQGARD), significantly increases systolic blood pressure in hypotensive patients in the emergency department. The use of ResQGARD, proved to be well tolerated by patients and without any complications.

13AP2-4

The incidence proportion and predictability of transfusion requirements in trauma patients in the context of fast access to trauma care

Korfage A.R., Greuters S., Brinkman A.C., Viersen V., Boer C., and the ALARM-BLEEDING Investigator
VU University Medical Center, Department of Anaesthesiology, Amsterdam, Netherlands

Background: Fast access to trauma care in the urban setting in combination with a large number of mildly injured trauma patients requires more sensitive hemostatic testing methods.
This study investigated whether early changes in rotation thromboelastometry (ROTEM®) values or classical coagulation tests are predictive for transfusion requirements in the first 48 hours after emergency department (ED) admission.
Methods: The ALARM-BLEEDING database included trauma patients admitted to the ED of the VUmc in Amsterdam. Study variables included the injury severity score (ISS), anticoagulant use and administration of blood products. Blood samples were drawn upon ED admission for determination of Hb, Ht, activated partial thromboplastin time (aPTT), prothrombin time (PT), platelet count, glucose, pH, and base excess (BE). ROTEM was performed and included INTEM (intrinsic coagulation), EXTEM (extrinsic coagulation) and FIBTEM (fibrinogen) analyses.
The predictive value of the ROTEM EXTEM clot formation time (CFT) and PT for transfusion requirements was determined using multinomial regression analysis.
Results: Patients (n=142) were mostly male (61%) and aged 46 ± 18 years. Time between the emergency call and ED arrival was 40 ± 12 minutes. Five patients used anticoagulant medication. The incidence proportion of transfusion in the first 48 hours following trauma was low (10%). Patients receiving transfusion products had a higher median ISS (25 (15-29) vs. 4 (1-10); P< 0.05) and received more resuscitation fluids (1036 ± 845 ml vs. 212 ± 264 ml; P< 0.05) than patients not requiring transfusion. There was no difference in the aPTT upon ED admission, whereas the PT was prolonged in patients who received blood transfusion (1.28 ± 0.39 vs. 1.05 ± 0.20; P< 0.05). The aPTT and the PT were not predictive for transfusion requirements. An ISS ≤ 16 reduced the probability for blood transfusion to 0.05 (odds ratio; 95% CI 0.01-0.25). A prolonged EXTEM clot formation time was predictive for the need for transfusion products (OR 15.26 (95% CI 1.47-158.30).
Discussion: Upon ED arrival, the coagulation tests aPTT and PT are not predictive for transfusion requirements in our trauma population. The ROTEM EXTEM clot formation time may however be used as predictor for the need of transfusion.
Since the EXTEM clot formation time can be determined within 10 minutes after blood sampling, ROTEM testing could be a valuable additive to classical coagulation tests in the emergency setting.

13AP2-5

Peripheral tissue oxygenation measurement by NIRS (near-infrared spectroscopy) using the Nonin/Equanox-7600 is not disturbed in helicopter-EMS (HEMS) environment

Schober P., Christiaans H.M.T., Loer S.A., Schwarte L.A.
VU University Medical Center Amsterdam, Dept. of Anaesthesiology and Trauma Center North/West-Netherlands, Amsterdam, Netherlands

Background and Goal of Study: Preservation of adequate peripheral tissue oxygenation remains crucial in treatment of critical patients. Traditional monitoring methods address systemic oxygenation, frequently not allowing conclusions on tissue oxygenation (1).
In addition, in HEMS-settings traditional monitoring may become disturbed by helicopter-inherent factors, e.g., cabin vibrations. The portable Nonin/Equanox-7600 NIRS-monitor appears attractive to measure peripheral tissue oxygenation in EMS, given the size, durability and suggestion that Equanox-technology is specifically artifact-resistant. To our knowledge, no data are available on the impact of a helicopter environment (e.g.,vibrations) on NIRS-measurement of peripheral oxygenation (2,3).
Materials and Methods: The study was conducted at a level-1 university trauma-center (VUmc, Amsterdam, The Netherlands). To limit fluctuations in tissue oxygenation, the study was performed on healthy volunteers (n=6 measurements; informed consent), positioned in the HEMS-helicopter patient cabin (EuroCopter; EC-135). NIRS was measured by a Nonin/Equanox-7600 monitor with 8000CA-probes placed on the forearm/thenar of the dominant arm. Protocol: After sufficient equilibration (“BASELINE”), helicopter engines were started subsequently (“ENGINES”) and kept running for several minutes.

After engine shut-down, subsequent "POST"-data were collected.
Results and Discussion: Inter-individual differences in "BASELINE" (rSO2-range ~75%-85%) were noted based on sensor location, however intra-individual NIRS-measurements by Nonin/Equanox-7600 were not systematically affected by helicopter artifacts, e.g., cabin vibrations ("ENGINES"). In addition, no helicopter-instruments were apparently disturbed by the Nonin/Equanox-7600-monitor.
Conclusion(s): Our findings suggest that NIRS-measurements by Nonin/Equanox-7600 are not disturbed by HEMS-typical confounders, e.g., engines start-up/shut-down and helicopter vibrations. Therefore, the Equanox-technology based NIRS-system could become a valuable addition in HEMS-settings. Further studies will have to define how NIRS-monitoring may support (HEMS-) therapy and ultimately (HEMS-) outcome.
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13AP2-6

Methylene blue and epinephrine, a synergistic association for anaphylactic shock treatment in anesthetized brown Norway rats

Zheng F., Barthel G., Chantal M., Audibert G., Malinovsky J.M., Mertes P.M.
Faculté de Médecine de Nancy Université, Department of Anaesthesiology and Intensive Care, Nancy, France

Background and Goal of Study: Anaphylactic shock may be refractory to epinephrine (EPI). Methylene blue (MB), acting on soluble guanylate cyclase, decreases synthesis of the potent vasodilator NO, and restores arterial blood pressure in septic shock refractory to catecholamines. As its effects in anaphylactic shock have not been investigated, we compared the effects of epinephrine (EPI) and MB, given alone or in association, in a rat model of anaphylactic shock.
Materials and Methods: After induction of anaphylactic shock by ovalbumin in previously ovalbumin-sensitised rats, animals were randomly allocated to receive: (i) group control (C) (n=6) a bolus of saline solution (1ml) at T3', (ii) group MB (n=6) 3 $mg.kg^{-1}$ of MB at T3'; (iii) group EPI (n=6) 2.5 μg of EPI at T3' and T5' followed by a continuous infusion of 10 $\mu g.kg^{-1}.min^{-1}$; (iv) group MB-EPI (n=6) a bolus of 3 $mg.kg^{-1}$ of MB immediately after the first bolus 2.5 μg of EPI at T3' ,then the second bolus of 2.5 μg of EPI at T5' followed by continuous infusion of 10 $\mu g.kg^{-1}.min^{-1}$. Mean arterial femoral blood pressure (MAP) and cardiac output measured (CO) were continuously recorded.
Results and Discussion: The time-courses of MAP and CO were significantly different amongst groups. In group **C** MAP and CO dramatically decreased and all rats died before 15 min. In all other groups rats were alive at the end of experiment. In group **MB**, a rapid decrease in MAP from 128±9.8 to 34±4 mmHg and in CO from 122.6±15.1to 18±2.7 $mL.min^{-1}$ occurred within 10' and remained at these levels throughout experiment.
In group **EPI**, after a similar initial decrease, MAP progressively increased from 42.2±7.6mmHg at 10' to 84±22.6 mmHg at T60' ($p < 0.005$), without concomitant significant increase in CO (from 24.4±9.4 $mL \cdot min^{-1}$ at T15' to 33.1±9.7 $mL \cdot min^{-1}$at T60').
In group **MB-EPI**, after an initial decrease in MAP and CO similar to other groups, MB-EPI restored MAP to baseline values as of T30' and progressively increased CO from 36.1±8.8 $mL \cdot min^{-1}$ at T15' to 50.6±16.9 $mL \cdot min^{-1}$ at T30'.
Conclusion(s): In this lethal model of anaphylactic shock, administration of MB has no significant effect on MAP and CO, whereas EPI significantly improved MAP, but not CO.
A synergistic effect of EPI and MB on hemodynamic parameters was observed. These results support the use of MB as a treatment adjuvant in case of anaphylaxis resistant to catecholamines.

Acute and Chronic Pain Management

14AP1-1

Expression of microRNAs in the rat spinal cord after chronic constriction injury of the sciatic nerve

Brandenburger T., Castoldi M., Brendel M., Schlösser L., Bauer I., Hermanns H.
University Hospital Duesseldorf, Department of Anaesthesiology, Duesseldorf, Germany

Background and Goal of Study: Micro-RNAs (miRs) are small noncoding RNAs that regulate cellular protein levels by degrading messengerRNAs or inhibiting translation. They play an important role in the development of the central nervous system [1].
Neuropathic pain is caused by a primary lesion or dysfunction in the nervous system. These events trigger a cascade of adaptive and maladaptive changes which lead to altered structure and functionality of the nervous system. Whether miRs are involved in these processes in the development of chronic neuropathic pain is currently unknown.
Aim of the study was to investigate whether regulation of miRs in rat spinal cord contributes to the development and maintenance of chronic neuropathic pain.
Materials and Methods: After approval of the local government, male Wistar rats were randomized into 2 groups:
1. CCI: The left sciatic nerve was ligated to induce a chronic constriction injury (CCI) as a model of neuropathic pain.
2. Sham: Sham-operated animals served as controls. 4 different time points were investigated: 4 hours, 1 day, 6 days and 12 days after CCI or sham operation (n=6 each). Mechanical allodynia was determined to assess the development of neuropathy before CCI and at every time point before tissue extraction. Spinal cord (L4-L6) was sampled and total RNA was isolated. Relative miR expression levels were analyzed with miCHIP microRNA arrays [2] and real time quantitative PCR. Statistics: t-test, $p < 0.05$.
Results and Discussion: Behavioural testing confirmed the development of neuropathic pain within 6 days after induction of CCI. Screening pooled samples with miR-arrays suggested changes in the expression levels of 23 miRs after 4 hours, of 6 miRs after 1 day, of 1 miR after 6 days and of 3 miRs after 12 days.
The relative changes of expression were moderate and ranged from 0.69 to 1.26 - fold. qPCR of selected miRs (miR-1, -138, -133a, -10a, -30b and -720) did not show significant changes of expression between sham and CCI at the investigated time points.
Conclusion(s): CCI leads to only moderate changes of miR expression levels in the rat spinal cord. Regulation of miRs in spinal cord does not seem to contribute significantly to the development of neuropathic pain in this model.
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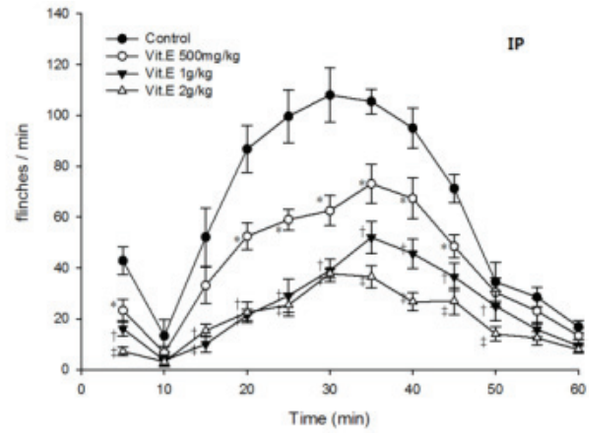
14AP1-2

Antinociceptive effects of vitamin E in formalin-induced nociceptive response in rats

Hong B., Lee W., Ko Y., Ji S., Lee E., Kang Y.
Chunnam University Hospital, Department of Anaesthesiology and Pain Medicine, Daejeon, Korea, Republic of

Background: Reactive oxygen species (ROS) are critically involved in generating pain in various conditions including neuropathic and inflammatory pain. Vitamin E is a widely known antioxidant but studies on its effect as an analgesic is still considerably poor.
This experiment was conducted in order to assess the antinociceptive effects of vitamin E in the modulation of pain in rats subjected to the formalin test.
Methods: Five percent formalin was injected into the hind paw after intraperitoneal (IP) and intrathecal (IT) injection of either vitamin E dissolved in olive oil or olive oil alone (IP : 500 mg/kg, 1 g/kg, and 2 g/kg, IT : 3 mg/kg, 10 mg/kg, and 30 mg/kg). The Number of flinches were measured in a 5 minute interval for 1 hour.
Results: Formalin injected into the left hind paw induced a biphasic nociceptive behavior in all rat. Intraperitoneal injection of vitamin E diminished the nociceptive behavior in a dose dependant manner during phase 1 and 2. intrathecal injection of Vitamin E diminished nociceptive behavior dose dependantly during pnase 2 but showed no significant difference in phase 1.
Conclusion(s): Vitamin E produces analgesia in a rat model of formalin-induced hyperalgesia by central sesitization inhibition.
Systemic administration of vitamin E also has preventive effects on pain of peripheral origin.



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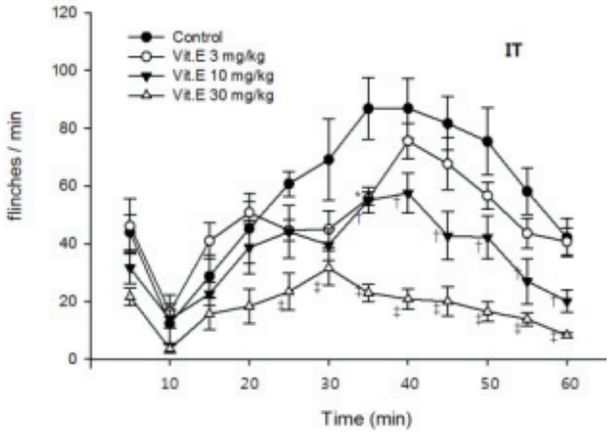

[IT graph]

14AP1-6

Systemic long-term glycine transporter inhibition acts anti-neuropathic in experimental neuropathic pain in rats

Hermanns H., Barthel F, Urban A., Schlösser L., Werdehausen R., Bauer I.
University Hospital Duesseldorf, Department of Anaesthesiology and Intensive Care, Duesseldorf, Germany

Background and Goal of Study: Dysfunction of spinal inhibitory neurotransmission is a major pathogenetic factor in the development of neuropathic pain. Restoration of effective inhibition hence represents a promising therapeutic strategy. Glycine is, beside GABA, the major inhibitory neurotransmitter in the CNS. Its concentration in the synaptic cleft is controlled by the two glycine transporters GlyT1 and GlyT2. Inhibitors of both transporters act antinociceptive in various animal pain models, when applied as bolus [1]. Yet, in some studies, serious neuromotor side effects were reported [2]. Aim of the present study was to elucidate whether continuous inhibition of the respective GlyT can ameliorate neuropathic pain without significant side effects.
Materials and Methods: After approval of the local government, male Wistar rats were randomized to nine treatment groups (n=6 each). All animals received a chronic constriction injury (CCI) of the left sciatic nerve as a model of neuropathic pain. After 10 days, osmotic infusion pumps were subcutaneously implanted for constant substance application for 14 days. 4 groups each received increasing doses of specific GlyT1 and GlyT2 inhibitors (ALX5407 and ALX1393), while one group served as control group (NaCl 0.9%). The development of mechanical allodynia and thermal hyperalgesia as signs of neuropathic pain were assessed before, after CCI and every 2 days during substance application. Paw withdrawal latencies were compared between groups with ANOVA, LSD post hoc test and Bonferroni correction for multiple testing. $P < 0.05$ was considered significant.
Results and Discussion: All animals developed significant neuropathic pain-like behaviour within 10 days after CCI. Both GlyT-inhibitors, ALX5407 and ALX1393, ameliorated thermal hyperalgesia and mechanical allodynia in a time- and dose dependent manner. No side effects were observed.
Conclusion: Continuous systemic inhibition of GlyT can significantly ameliorate allodynia and hyperalgesia in a rat model of neuropathic pain. Thus, GlyT represent interesting pharmacological targets in pain research. Further research is necessary to investigate the precise molecular mechanisms by which GlyT inhibitors exert their anti-neuropathic effects, and whether a translation to the complex condition of human neuropathic pain is possible.
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14AP1-7

Rufinamide alleviates mechanical allodynia in a mouse neuropathic pain model

Suter M.R., Kirschmann G., Abriel H., Decosterd I.
Lausanne University Hospital (CHUV), Department of Anaesthesiology, Lausanne, Switzerland

Background: Finding new drugs to alleviate neuropathic pain is indispensable but getting new molecules through the funnel of clinical trial is an arduous process. We therefore choose to test the potential of rufinamide (RUF), a Na channel blocker anticonvulsant licensed for treatment of Lennox-Gastaud syndrome (a severe form of epilepsy resistant to conventional therapy). Dysregulation of voltage-gated Na channels (Nav1.x) is a central feature of pain hyperexcitability. Nav1.7 isoform is essential to pain perception since mutations in its gene are associated to either inherited pain syndromes or insensitivity to pain. In the present study, we compared the effect of RUF to amitriptyline (AMI, currently used to treat chronic pain) on a model of neuropathic pain and on Nav1.7 channel
Methods: We used the SNI model of neuropathic pain in C57BL/6 mice (n=8-10/group). One week after nerve injury, RUF (5,10,25,50mg/kg) was injected (ip). A week later AMI (10 or 20mg/kg) was tested. Mechanical allodynia was assessed with von Frey filaments for 1 day. Drugs were also tested on naïve animals. Whole-cell patch clamp was performed to test RUF and AMI on Nav1.7 expressed in HEK293 cells
Results and Discussion: RUF dose-dependently alleviated mechanical allodynia for 4h ($p < 0.05$, 25 and 50mg/kg vs ctrl) as well as AMI ($p < 0.05$, 10 and 20mg/kg vs ctrl). At 24 hours effect had worn off. On naïve animals, AMI increases withdrawal threshold to mechanical stimulation and latency of withdrawal to heat stimulation whereas RUF had no effect at the doses used. IC50 to decrease peak current for AMI was 10μM and the reduction for RUF was 21.2% at 100μM (highest achieved in physiological solution). No significant difference on the V1/2 of voltage-dependence of activation was seen; however a shift in the steady-state inactivation curve was observed (-5.76mV for RUF and -9.56mV for AMI, $p < 0.005$). Use dependent block was observed at 5, 10, 25 and 50Hz ($p < 0.05$).
RUF and AMI modulate Nav1.7 in vitro and demonstrated efficacy in alleviating neuropathic in an animal model. At equipotent doses on SNI induced allodynia, AMI showed alteration in behavioral response in naïve animals possibly due to either alteration of basal pain sensitivity or a sedative effect.
Conclusion: Side effect is a major problem with drugs such as AMI. RUF shows a better tolerability in an experimental pain model. Taken together our results suggest RUF could be a new alternative for the treatment of neuropathic pain

14AP2-2

Prevalence of postoperative chronic pain after cardia surgery

Cantero C., Carolina G., Matute P, Tena B., Rovira I., Carmen G.
Hospital Clínic de Barcelona, Department of Anaesthesiology, Barcelona, Spain

Background and Goal of Study: Prevalence of chronic pain (PCP) after cardiac surgery by sternotomy is about 30% at six months (1). Several factors have been related to PCP (2,3). The various mechanisms involved in pain in this surgery justify multimodal analgesic regimens. Our goal was to compare the incidence of PCP after cardiac surgery and risk factors with two analgesic regimens; morphine iv PCA, considered as the gold standard for cardiac surgery, and iv continuous multimodal combination.
Materials and Methods: Randomized double blinded study on 170 patients consecutively submitted to elective cardiac surgery under the same anaesthetic protocol. Analgesic doses were calculated according weight and age. Group morphine (GMO) received iv PCA up 2.5 mg/h and Group multimodal (GMU) a continuous infusion of ketamine 2 mg, tramadol 4.8 mg, dexketoprofen 4.8 mg, methadone 0.4 mg as average hourly doses. At 24-48h post surgery VAS (static and dynamic) was measured. A telephone interview was undertaken between 3 to 6 months after surgery, recording: pain or discom-

fort, need of analgesic drug; VAS, and Neuropathic Pain Symptoms Inventary. VAS > 3 and NPSI > 10 were considered as CPP. T student and X^2 tests were applied for statistical analysis ($p < 0.05$).

Results and Discussion: 138 (81%) patients answered the questionnaire, 59 of GMO (74.6%) and 79 (86.8%) of GMU. Both groups were similar in demographical and procedural variables.Total prevalence of CPO was of 28.26%, significantly lower in GMU (27.8%) than in GMO (28.8%), $p < 0.05$ .Mean VAS was 4.6±1. 4, statistically lower in GMO (4±1.1) than GMU (5.04±1.5), $p < 0.05$. Mean NPSI score was 19.76±9.9, without significant differences between groups. Although there was not statistically significant influence of VAS at 24 and 48 postoperative hours on CPP, it showed a slight trend to be higher in patients developing CPP.

Conclusion(s): The prevalence of CPP was of 28.26%, similar to that previously reported. Multimodal analgesia was associated to lower incidence of CPP, although the difference with morphine analgesia perhaps was clinically irrelevant. Risk factors for CPP named in the literature did not influence CPP in this study.

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14AP2-3

Costs and benefits of an acute pain service in postoperative pain management

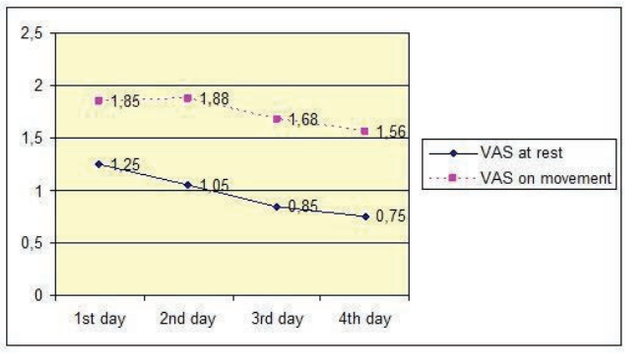
Garufi G., Caristi D., Bigolin T., Pasa L., Presello B., Berlot G.
Cattinara University Hospital of Trieste, Department of Perioperative Medicine, Intensive Care and Emergency, Trieste, Italy

Background and Goal of Study: Pain relief after surgical procedures continues to be a major medical challenge. The recognition that unrelieved pain contributes to postoperative morbidity and mortality has inspired many institutions to develop an Acute Pain Service (APS) in an attempt to provide safe and effective postoperative relief. The goal of the study is to assess the impact of postoperative pain management provided by a nurse based-anaesthesiologist supervised APS on quality of care and costs.

Materials and Methods: We investigated retrospectively 1609 surgical inpatients that had undergone major surgery with an expected moderate to severe pain, enrolled by APS in 2009. We examined pain scores (VAS) at rest and on movement and side effects (nausea, vomiting, neurological effects and hypotension) collected over 96 hours post-operatively. All costs related to the APS management (drugs, devices and materials and the salaries of 4 APS nurses) were calculated and related to the technique used.

Results and Discussion: 1459 patients had received continuous intravenous analgesia with morphine via elastomeric pump and 150 patients (9.3%) continuous epidural analgesia with local anaesthetics (naropine or levobupivacaine) and morphine, associated to paracetamol (86%) or ketorolac (14%) in boluses. The trend of VAS was always< 2 (Gr.1). The VAS values were significantly lower in epidural patients during the first postoperative day ($p < 0.05$). The incidence of side effects was 16.1%.

Total costs of APS management were 194521 € and the costs of staff were 102739 €. Costs per patient per day were higher in epidural vs. intravenous group (59.75 vs. 36.45 €).



[Gr.1]

Conclusion(s): The overall positive results, in terms of pain relief and safety, might lead to the conclusion that the costs of pain management can be considered appropriate at our institution. The major cost of epidural analgesia might also be justified in high-risk patients where a real benefit is expected.

14AP2-5

Independent risk factors for severe early postoperative pain following general anaesthesia in a cohort of chinese patients

Mei W., Qiu J., Tumenjavkhlans S., Li M., Zou H.J., Tian Y.K.
Tongji Hospital, Tongji Medical College,Huazhong University of Science and Technology, Department of Anaesthesiology and Pain Medicine, Wuhan, China

Background and Goal of Study: Despite recent advances in postoperative pain management, the proportion of patients with moderate to severe postoperative pain is still high ranging between 20-80%.[1]This retrospective study was designed to identify possible risk factors associated with severe early postoperative pain (SEPP).

Materials and Methods: we investigated a cohort of 1634 patients between February 2009 and May 2010 in a university affiliated hospital with 2500 beds. SEPP was defined as numeric rating scale > =7 at rest in the post anaesthesia care unit early after awakening from general anaesthesia. The proportion of patients suffered from SEPP was studied and the related risk factors were determined using multivariate logistic regression model.

Results and Discussion: The proportion of patients with SEPP was 26.9%. On multivariate analysis, female gender (OR=1.557 [1.105-2.195], p=0.011), cancer operation (OR=1.744 [1.238-2.456], p=0.001), invasive surgery (OR=1.565 [1.116-2.195], p=0.009), and intraabdominal location of surgery (OR=3.944 [1.054-14.753], p=0,041) were identified to be independent risk factors for SEPP. Patients controlled anesthesia program with fentanil in our hospital failed to reduced severe early postoperative pain (OR=1.181, [0.784-1.780], p=0.426). The patients with SEPP experienced significantly more postoperative delirium defined by DEM-IV (18.3% vs. 11.3%, p=0.003) , stayed significantly longer in PACU (31.0±14.8 min vs. 27.0±12.6min, $p < 0.001$), had a longer median length of hospital stay (15.0 days [10.0-21.0] vs. 11.0 days [8.0-15.0]], $p < 0.001$), and longer postoperative stay (9.0 days [6.0-13.0] vs. 7.0 days [5.0-8.0], $p < 0.001$]).

Conclusion(s): The identification of patients at high risk for severe early postoperative pain, and the implement of standard operating procedure of multimodal analgesia would enable the formation of more effective acute pain management programs.

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14AP2-6

Post-discharge pain after breast surgery: underestimated, underdiagnosed, undertreated

Sturini E., Saporito A., Marengo L., Anselmi L., Tomasetti R.
Ospedale Regionale Bellinzona e Valli, Department of Anaesthesiology, Bellinzona, Switzerland

Background and Goal of Study: Post-operative pain after breast surgery is often undermanaged and some studies have shown its association to a high chronicization rate [1-2]. Aim of this study is to investigate the incidence of Post-Discharge Pain (PDP) after breast surgery.

Materials and Methods: Following ethics committee approval, an observational retrospective study was conducted on a consecutive cohort of patients who underwent mastectomy, quadrantectomy or tumorectomy in our institution from January 2009 until December 2010. Patients were contacted one year after surgery by telephone and -if consent was obtained- a survey was conducted, with regard to incidence, severity, length, characteristics and treatment of PDP. Data are expressed as incidences and means ± standard deviations.

Results and Discussion: Of the 244 patients treated, 127 were successfully contacted, gave their consent and were interviewed (mean age 58.9±14.6, ASA class 1, 2 and 3). 54.3% of them referred PDP at the site of surgery or arm. Mean PDP intensity on NRS was 5.7±1.8. Pain was more frequently (46.3%) described as burning or stabbing. The majority of patients (56.5%) referred PDP as interfering with working and/or sleeping. In 26.8% of patients PDP lasted more than 1 month and in 15.0% it became chronic (>6 months), with a mean length of 7.2±9.3 months. The majority of patients treated PDP with AINS (65.2%), the commonest being diclofenac and paracetamol; in 26.7% of cases this therapy was ineffective and 18.8% of patients went to their physician for a consultation related to their persistent pain.

Conclusion: Our inquiry confirms PDP o be a significant complication of breast surgery, with a severe and prolonged impact on patients' quality of life.

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Acknowledgements: The Authors are in debt to the nursing staff for actively contributing to the study.

14AP2-7

Preoperative analgesic use is a predictor of postoperative pain in ambulatory surgery

Fiddelers A., Hoofwijk D., Klein Ovink J., Gramke H.-F, Marcus M.
Maastricht University Medical Centre, Department of Anaesthesiology and Pain Medicine, Maastricht, Netherlands

Background and Goal of Study: Previous studies have shown that moderate to severe pain after ambulatory surgery varies between 20-40%.
The focus of this study was to assess the prevalence of postoperative pain after ambulatory surgery at the Maastricht University Medical Centre+ and to determine the association between preoperative analgesic use and postoperative pain.
Materials and Methods: Over a period of eighteen months, 1259 patients undergoing ambulatory surgery were prospectively included in our study when visiting the outpatient clinic for preoperative assessment. They were asked to fill out a questionnaire one week before surgery to determine preoperative analgesic use. Four days after surgery patients were approached a second time to fill out a questionnaire regarding postoperative pain, measured by an 11-point numeric rating scale (NRS; where 0 = no pain, and 10 = worst pain imaginable).
Results and Discussion: Of all patients the mean NRS was 2.4 (standard deviation 2.3), whereas 249 patients (19.8%) experienced moderate to severe pain (defined as NRS>4) on day four. Preoperatively, 930 patients (73.9%) used no analgesics, 155 (12.3%) used acetaminophen, 71 (5.6%) used NSAID's, 15 (1.2%) used opioids, 26 (2.1%) used other analgesics, and 62 (4.9%) used a combination of the above. Patients who used preoperative analgesics experienced statistically more often moderate to severe postoperative pain compared to patients who used no medication (x^2=65, p< 0,001).
Conclusion(s): Our study confirmed that postoperative pain in ambulatory surgery remains a problem, as a large amount of the patients still experienced moderate to severe pain four days after the surgery. These results also demonstrated that preoperative use of analgesics can be considered as a risk factor for more severe postoperative pain.
This implies that patients who use preoperative analgesic should gain more attention regarding pain management during the pre- and postoperative period.

14AP2-8

Does preoperative quality of life predict pain after outpatient surgery?

Hoofwijk D., Fiddelers A., Gramke H.-F, Marcus M.
Maastricht University Medical Centre, Department of Anaesthesiology and Pain Medicine, Maastricht, Netherlands

Background and Goal of Study: Many researchers studied the effect of several variables on postoperative quality of life (QoL).
However, almost no studies have been performed to determine the effect of preoperative QoL on postoperative variables such as pain. The focus of this study was to determine the association between preoperative QoL and the severity of postoperative pain at the Maastricht University Medical Centre+.
Materials and Methods: Over a period of eighteen months, 1223 patients undergoing ambulatory surgery were prospectively included in our study when visiting the outpatient clinic for preoperative assessment. They were asked to fill out a questionnaire one week before the surgery to determine preoperative QoL, measured by the EuroQol (EQ-5D) questionnaire. This instrument measures QoL on a scale between -0.59 and 1.00 (Dolan et al, 1997). Patients were asked to fill out a second questionnaire four days after the surgery in order to measure postoperative pain by using a numeric rating scale (NRS).
Results and Discussion: Of all patients mean preoperative QoL was 0.77 (standard deviation 0.23). Patients who experienced little postoperative pain (NRS 0-4) scored a mean preoperative QoL of 0.80 (0.21), compared to a mean QoL of 0.67 (0.29) in patients who experienced moderate to severe postoperative pain (NRS 4-10). The difference in preoperative QoL was statistically significant (independent t-test p < 0.001).
Conclusion(s): Our study confirmed that patients who experience moderate to severe postoperative pain have a significantly lower preoperative QoL compared to patients who experience little postoperative pain. This demonstrates that preoperative QoL might be a predictor for the severity of postoperative pain.

14AP2-9

Can age influence postoperative analgesic needs and perioperative inflammatory response?

Kapota E., Pandazi A., Gouvas N., Kouta A., Kostopanagiotou G.
Attikon University Hospital, Konstadopouleio General Hospital, Department of Anaesthesiology, Athens, Greece

Background and Goal of Study: A recent study has shown that age affected intravenous patient-controlled analgesia (IV PCA) narcotic use [1]. In this retrospective analysis we retrieved data from patients who had been operated for colorectal cancer [2]. Our goal was to examine the influence of age on postoperative morphine consumption and perioperative cytokines.
Materials and Methods: 40 patients who had been studied in the past for a preoperative intervention were devided in two groups regarding the years of age. Group A (21 patients, 66-78 years of age) and group B (19 patients, 40-65) did not differ significantly regarding sex ratio, weight, type and duration of colectomy, intraoperative blood loss and preoperative levels of IL-6 and IL-8. We analyzed Verbal Rating Scale (VRS) scores and morphine consumption at 1, 6, 18, 24 hours (h) after surgery and IL-6, IL-8 blood levels at peritoneal closure (INTRA) and 24 h postoperatively (POST). AN.O.VA for repeated measures and Kruskal Wallis test were used. P< 0,05 was considered important.
Results and Discussion: Patients in Group B experienced less pain at 6 hours postoperatively both at rest (p: 0,015) and during coughing (p: 0,01) and consumed more morphine at 1, 6, and 18 hours after surgery. After the surgical incision IL-6 and IL-8 increased significantly in both groups. In group B IL-6 (INTPA), IL-6 (POST) and IL-8 (POST) were less increased significantly (p: 0,022, p: 0,025, p: 0,036 respectively) compared to group A.
Conclusion(s): Younger patients needed more morphine throughout the first 18 postoperative hours. Additionally inflammatory response as defined by IL-6 and IL-8 values was more suppressed in the same group.
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14AP3-1

Perioperative ketamine administration does not reduce post-thoracotomy chronic pain

Guenoun T., Boccara G., Aka E., Cadi P., Safran D.
European Hospital Georges Pompidou, Department of Anaesthesiology and Intensive Care, Paris, France

Background and Goal of Study: Perioperative ketamine was proposed to reduce hyperalgesia following moderate to severe painful surgery [1]. Thoracotomy is associated with severe postoperative pain levels and delayed neuropathic pain [2,3].
We studied the effectiveness of peroperative ketamine administration to prevent chronic post-thoracotomy pain.
Materials and Methods: After approval of the Ethical Committee of Paris-Necker Medical University, we did a prospective randomized double-blinded trial. After informed consent, eighty patients scheduled to undergo thoracotomy were included in the study. Under standardized general anaesthesia (propofol, sufentanil, desflurane, atracurium), patients randomly received either ketamine (KETA) or saline (PLACEBO). A loading dose of 0.3 $mg.kg^{-1}$ ketamine was injected before skin incision, followed by a continuous infusion of 0.1 $mg.kg^{-1}.h^{-1}$ during 48h in KETA group. After tracheal extubation, postoperative pain was controlled using i.v. paracetamol, ketoprofen, and PCA i.v. morphine. The 48h morphine consumption, sedation score, cognitive scale assessment, VAPS at cough every 6 hours were compared between the two groups. At 2 months, patients were examined using DN4 questionnaire, Von Frey tests and pain areas. Results were compared using T-test or Kruskall-Wallis when appropriated and *P< 0.05 was considered as significant.
Results and Discussion: The demographic data and surgical parameters were similar in both groups. 48h morphine consumption and VAPS were similar postoperatively. Sedation scores and cognitive function were also comparable. At 2 months, patients from PLACEBO and KETA experienced residual pain respectively in 18/32 (56%) and 15/36 (42%) (ns). DNA scores, pain areas and Von Frey filament thresholds were not different.
Conclusion(s): Low doses of perioperative ketamine did not reduce postoperative pain and 48h morphine requirement. Furthermore, chronic pain at two months was not prevented by ketamine although these study results confirmed the large rate (> 40 %) of post-thoracotomy pain syndrome [2].

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14AP3-2

Epidural and intravenous ketamine for chronic postsurgical pain after thoracotomy

Tena B., Cantero C., Jimenez M.J., Fita G., Rios J., Gomar C.
Hospital Clínic de Barcelona, Department of Anaesthesiology and Pain Medicine, Barcelona, Spain

Background and Goal of Study: The incidence of chronic postsurgical pain (CPP) after thoracotomy is ranged between 5-80%. Allodynia and hyperalgesia in the periincisional area and intercostal nerve injury suggest a neuropathic component. Ketamine, NMDAr antagonist, might reduce central sensitization and therefore periincisional hyperalgesia when administered during the perioperative period. The aim of this study was to test the preventive effects of perioperative epidural or iv ketamine on the development of CPP after thoracotomy.
Materials and Methods: Randomized double blind study on 56 patients older than 18 yr scheduled for posterolateral thoracotomy fulfilling inclusion and exclusion criteria. Patients were allocated to one out of 3 groups: iv ketamine (Kiv), epidural ketamine (Kep) or placebo (P). Anesthetic and surgical procedures were the same in all patients. Postoperative analgesia was ensured with an epidural PCA of ropivacaine 0.2% plus fentanyl 2mcg/ml for 48 hours. Intravenous or epidural ketamine (bolus of 0.5mg/kg before surgical incision and infusion of 0.25 mg/kg/h after surgery during 48 hours) was administered in groups Kiv and Kep respectively and saline serum in group P. Recorded variables were: VAS, Neurophatic Pain Symptoms Inventary (NPSI), Catastrophyzing Scale, Quantitative Sensory Testing (QST) measuring periincisional hyperalgesia area. Data were collected the day before surgery, 3 days, 7 days, 3 and 6 months after surgery. Adverse effects were also recorded. Results are expressed by means usual descriptive statistics and analyzed by means appropriate General Estimating Equations models in order to acute intra-individual correlation. SPSS v15 and Type I Error of 5% were used for statistical analyses.
Results: Demographic data were comparable among groups. VAS was significantly lower in group Kiv than in group P at day 3. At 3 and 6 months VAS was significantly lower in group Kpd compared to the other two groups. There were no significant differences in NPSI and Catastrophizing Scale scores among groups. Periincisional hyperalgesia area evaluated with QST was significantly smaller at day 3 and 7 in the group Kpd but no differences were found afterwards. There were no significant differences in adverse effects.
Conclusions: Epidural ketamine was associated to less CPP and smaller hyperalgesia area around surgical incision after thoracotomy than iv ketamine and placebo when added to epidural analgesia with ropivacaine and fentanyl.

14AP3-3

Perioperative intravenous lidocaine has preventive effects on postoperative pain during colorectal surgery

Sekulic A.D., Malenkovic V., Marinkovic O.
KBC Bezanijska Kosa, Department of Anaesthesiology and Intensive Care, Belgrade, Serbia

Background and Goal of Study: Systemic lidocaine is belived to inhibit spontaneus impulse generation arising from injured nerve fibers and the dorsal root ganglion and suppres inflammatory reactions mediated by immune cells (polymorphonuclear cells). The aim is to use a comparative study show that continuous intravenous lidocaine intraoperatively reduces the systemic use of analgesics in the treatment postoperativniog pain than the standard technique of anesthesia and analgesia.
Materials and Methods: Thirty patients undergoing colorectal surgery in OET anesthesia, participated in this study. 15 patients received lidocaine (lidocaine group LG) with 1,5 mg/kg intravenous bolus in 10 min followed by a 1,5 mg/kg/h IV infusion, 30 min before surgycal incision and stopped 60 min after skin closure. Second, (control group GA), were administered postoperatively for analgesia in combination tramadol and ketorolak. Postoperative pain score were evaluated by using visual analog scale score of 0 - 10, every 2 h until the first posoperative day and then every 4 h next 72 h. If pain intensity ≥ 4, analgesia was started. Monitored the amount of administered anlgetic, first flatus, bowel movement and metabolic response(leukocytes, CRP and glucose) were measured 3 h after end of operation and next three days.
Results and Discussion: At the first measurement patients from LG, by the VAS scale incited a pain score between 3 and 6 and received their first ketorolac. From 15 patients in 6 was added, and tramadol (statistically significant difference, p< 0,05). In GA group, the intensity of pain by the VAS scale was between 5 and 9, and docked the tramadol. Application of tramadol was significantly reduced in the LG (40%). And in the later period during movement use of tramadol was significantly reduced in the LG (50 mg + - 25 vs. 200 mg + - 50); Student - t test, p< 0.05. LG had their first bowel movement 79 h (66h-84h) after surgery and the GA had their first bowel movement 85 h (68h-96h), the difference was not statistically significant. The value of Le, CRP and blood glucose levels were some lower in the LG, but the difference was not statistically significant.
Conclusion(s): Perioperative continuous intravenous lidocaine reduces the systemic use of analgetics in the treatment postoperative pain during colorectal surgery, faster return of bowel function and prevent postoperative ileus. For this reason, this old method deserves a new approach.

14AP3-4

Effect of perioperative systemic alpha2-agonists on postoperative morphine consumption and pain intensity - systematic review of randomized controlled trials

Blaudszun G., Lysakowski C., Elia N., Tramèr M.R.
University Hospitals of Geneva, Department of Anaesthesiology, Genève, Switzerland

Background and Goal of Study: Perioperative systemic alpha2-agonists are expected to reduce postoperative opioid requirements and pain intensity.
Materials and Methods: We searched Medline, Embase, Central, and bibliographies (to 4.2010), without language restriction, for randomized trials testing any systemic alpha2-agonist (versus placebo or no treatment), administrated before, during or after surgery, in adults undergoing non-cardiac surgery under general anesthesia, and that reported on postoperative cumulative opioid consumption or pain intensity. Opioid doses were converted to morphine equivalents. We estimated weighted mean differences (WMD) and numbers-needed-to-treat/harm (NNT/H) with 95% confidence intervals (CI) when data from at least five studies or 100 patients could be combined.
Results and Discussion: Thirty studies (1,792 patients, 933 received clonidine or dexmedetomidine) were included. Alpha2-agonists regimens varied widely across trials. Their opioid-sparing effect consistently increased over time: WMD at 2 h -0.4 mg, at 6 h -4.7 mg, at 12 h and 24h -8.5 mg, and at 36h -17.6 mg. Alpha2-agonists significantly decreased pain intensity at 30 min (-1 cm on the 10 cm VAS) and at 2 h (-0.7 cm), but not at 24 h. They also significantly decreased nausea at 8 and 48 h (NNT 8.4 and 6.2, respectively), and vomiting at 48 h (NNT 18), but increased the risk of postoperative bradycardia (NNH 12), and of intraoperative and postoperative arterial hypotension (NNH 11 and 16, respectively). Recovery times were not prolonged.
Conclusion(s): Peri-operative systemic alpha2-agonists have only a weak postoperative opioid-sparing effect and a short lasting effect on pain intensity. Their impact on nausea and vomiting is clinically not relevant while hemodynamic adverse effects may limit their routine usage.

14AP3-5

Comparison between intra operative hemodynamic parameters and post operative analgesia of gabapentin and tizanidine in patients by tibial fractures

Mirkheshti A., Jabbary Moghaddam M., Saadat Niaki A., Kalantar M.S., Razavi S.S., Mirzaei M.
Shahid Beheshti University of Medical Sciences, Department of Anaesthesiology and Intensive Care, Tehran, Iran, Islamic Republic of

Background and Goal of Study: Gabapentin and Tizanidine analgesic effects have been studied but comparison between analgesic effects of these two drugs has not been studied yet .
Materials and Methods: We studied on 60 patients by tibial Fractures between 15-80 yrs. They were divided into two goups: 30 patients were taken 300 mg Gabapentin orally 1 hour before operation (Group G), and 30 patients were taken 8 mg tizanidine by oral 1 hour before operation (Group T). patients' pain was assessed 1 hour before and during 12 hours post operation by visual Analogue Scale (VAS). All patients had General anesthesia . Vital Signs and fentanyl consumption during Surgery, the first time of need to Morphine and total dose of Morphine after operation were assessed.
Results and Discussion: Systolic and diastolic blood pressure and heart rates during operation between two groups were not significant. Intra op fentanyl dose in group G was significantly less than group T(P = 0.001).
The first time of need to Morphine (IV) in group G was Significantly longer than group T (P = 0.001) and total dose of Morphine Consumption during 12 hours

after operation in group G was significantly less than group T (P = 0.003) . VAS was only different between two group in 12th hour after operation.
Conclusion(s): Pre op oral Consumptin of Gabapentin compared to Tizanidine can create better analgesia and opioid Saving during and after operation.
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14AP3-6

A randomized controlled trial of preoperative administration of pregabalin for acute pain after radical modified mastectomy

Macheridou A., Mihailidis M., Giannopoulou A., Vaivai A., Karafotia A., Michaloliakou C.
METAXA Cancer Hospital, Department of Anaesthesiology and Pain Medicine, Piraeus, Greece

Background and Goal of Study: Pregabalin has anticonvulsant, antihyperalgesic and anxiolytic properties. Recently it has been used for the prevention of acute postoperative pain[1, 2]. Aim of this study was to examine if the preoperative administration of pregabalin reduces analgesic requirements after radical modified mastectomy.
Materials and Methods: In a double-blind, prospective study, thirty-four (34) patients, aged 30-68, ASA I-II, scheduled for radical modified mastectomy under general anaesthesia were randomly assigned to receive pregabalin 150 mg, divided into two equal doses (75 mg each) the night and 1 h before surgery (group T) or placebo administered respectively (group P).
The first 24 postoperative hours the patients were given tramadol IV on demand and paracetamol IV as a complementary analgesic, if the cumulative dose of tramadol exceeded 400 mg.
The second and third postoperative days our patients received paracetamol per os. Verbal Analogue Scale (0-10), Prince Henry Hospital Pain Score[3] (0-4), a modified Ramsay Sedation Scale (0-4) and Nausea Scale (0-3) were assessed preoperatively and at 2, 4, 8, 24, 48 and 72 h after surgery. Exclusion criteria were: allergy to pregabalin, pregnancy, lactation, psychiatric and neurological disorders.
Except for sedation, somnolence and nausea, other adverse effects were recorded, as well (dizziness, blurred vision, headache, allergic reactions).
Data were statistically analysed with Mann-Whitney test and x^2 test ($p < 0,05$).
Results and Discussion: Demographic data were comparable in both groups. Tramadol requirements during the first 24 postoperative h were reduced in group T [92,86(33,15)mg] in comparison with group P [162,50(56,30)] (p=0,029). Paracetamol consumption 48 h after surgery was 107,14(212,90) mg in group T and 562,50(403)mg in group P (p=0,018), whereas 72 h postoperatively it was 178,60(316,70)mg and 656,25(396)mg respectively (p=0,0021). Preoperatively and during the first 48 postoperative hours somnolence was slightly more frequent in group T than in group P (p=0,04). After that point somnolence was equally rare in both groups.
Conclusion(s): Preoperative pregabalin seems to reduce postoperative analgesic requirements in radical modified mastectomy, without any statistically significant side-effects.
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14AP3-7

Effects of intraoperative low dose ketamine on remifentanil-induced hyperalgesia

Hong B., Lee W., Ko Y., Lee E., Ji S., Kang Y.
Chunnam University Hospital, Department of Anaesthesiology and Pain Medicine, Daejeon, Korea, Republic of

Background and Goal of Study: Remifentanil is useful during general anesthesia because of its rapid onset and short acting time. However, some studies report that due to opioid-induced hyperalgesia (OIH) and opioid tolerance, it instead increases early postoperative pain. The occurrence of OIH and opioid tolerance is mainly thought to be due to central sensitization by the activation of NMDA receptors. Therefore, we investigated the effects of continuous infusion of ketamine, an NMDA receptor antagonist, on postoperative pain and the quantity of opioids used.
Materials and Methods: 40 patients scheduled to undergo laparascopic gynecologic surgery were randomly allocated into two groups. Anesthesia was equally maintained with sevoflurane and 4ng/ml of remifentanil in all patients. 0.3mg/kg of ketamine was injected following a continuous dosage of 3ug/kg/min in the ketamine group (n=20) while the control group was injected with an equal dosage of normal saline. We compared postoperative VAS up to 7 hours and morphine demand through PCA.
Results: Postpoerative VAS and morphine demand was significantly low in the ketamine group 3 hours and 2 hours after surgery, respectively.
Conclusion(s): When general anesthesia is maintained with sevoflurane and remifentanil in patients undergoing laparascopic gynecologic surgery, continuous infusion of low dose ketamine decreased early postoperative pain and the quantity of opioids used.
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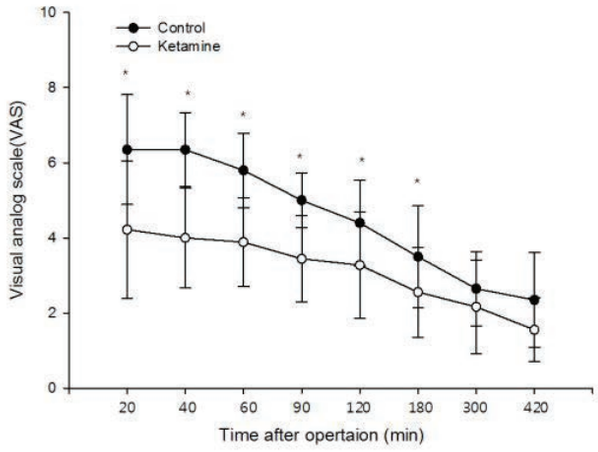
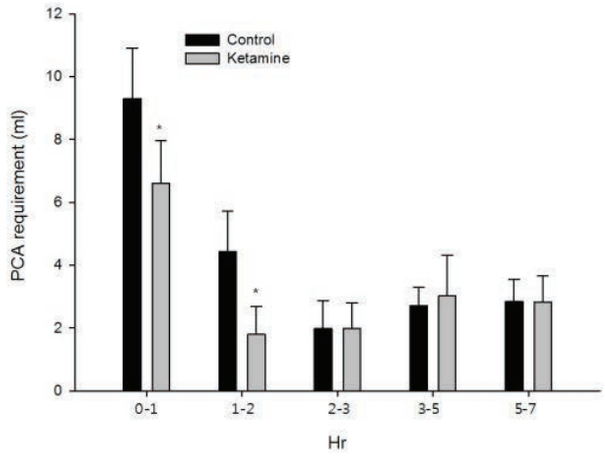


[Postop. vas]



[Postop. PCA demand]

14AP3-8

The utility of gabapentine in decreasing preoperative anxiety, pain and post operative nausea and vomiting after thyroidectomy

Smaoui L., Abid M., Jarraya A., Ayedi M., Gueriani S., Karoui A.
FMS Sfax, Department of Anaesthesiology and Intensive Care, Sfax, Tunisia

Background and Goal of Study: Gabapentine, thanks to its antiallodynic and antihyperalgesic properties may take place in the treatment of post operative pain according to many recent studies.
It was also shown as efficient in preoperative anxiety and in the prevention of post operative nausea and vomiting.We wanted to determine if a preventive use of Gabapentine may have an anxiolytic, antiemetic and analgesic effect in thyroid surgery.

Materials and Methods: This study is a double blind prospective study interesting 40 patients randomized in 2groups. We have given 600 mg of Gabapentine or placebo 2 hours before the anesthesia induction for thyroidectomy. The preoperative anxiety and the quantity of remifentanil used during the operation were noted.
The post-operative pain was estimated on a visual analogical scale (VAS) at rest and during swelling on arrival in the post anesthesia care unit (PACU) and every six hours during the first post operative 24hours. We noted the quantity of titled morphine used in PACU. Nausea, vomiting and side effects were noted within the first 24hours.
Results and Discussion: Preoperative anxiety scores were similar in the 2 groups.The quantity of rémifentanil used during the operation was in decrease comparing to the placebo group(617, 25 μg versus 1039, 75 μg; p=0,006).
We have found a significant decrease of pain scores at the rest and during swelling within the 24 first hours in the Gabapentine group. The quantity of post operative titled morphine used was significantly lower in gabapentine group rather than placebo group (2,4mg versus3, 3mg p=0,023). Nausea and vomiting were similar in both groups.
We have noted no significant difference in gabapentine side effects as drowsiness and dizziness.
Conclusion(s): Preoperative administration of 600 mg of gabapentine reduces the peroperative consumption of rémifentanil and reduses the post operative pain scores after thyroidectomy.

14AP3-9

The advantages of intraoperative small dose of ketamine in reducing postoperative pain after the foot joint surgery with spinal anaesthesia

Malenković V.M., Marinković O., Petković M.
KBC Bežanijska Kosa, Department of Anaesthesiology, Belgrade, Serbia

Background: Many studies have shown that preoperative addition of ketamine should prevent central sensitization and may improve postoperative pain relief.
The aim of the study was to present the advantages of pre-emptive dose ketamine in combination with spinal anaesthesia in patients undergoing foot joint surgery.
Methods: Thirty patients, aged 50-75 ASA II-III, undergoing scheduled foot joint surgery were randomly assigned in two groups. Group K (n= 15) patients received 0.15 mg / kg of ketamine after the spinal anaesthesia and before surgical incision. Group S (n=15) - spinal group patients received 10ml of normal saline before surgical incision after spinal anaesthesia.
All patients were premedicated with midazolam 0.07 mg/kg and also received spinal anaesthesia with levobupivacaine 0, 5% in dose of 2, 5 ml inter space L3-L4.
After the surgery, all patients were monitored in the postanaesthesia care unit (PACU) Postoperative analgesia was provided with ketorolac and tramadol. The pain severity and sedation were measured at 15-min intervals for the first hour and then at 4, 6 and 24 h after surgery. Pain was assessed using VAS. Recovery after arrival in PACU was evaluated by Post Anaesthesia Recovery Score (PARS) after admission, sedation quantity was measured by Ramsey Scale.
Results: During the first 6 h after the surgery, pain scores were lower ($p< 0.05$) in patients receiving ketamine before surgical incision, in comparison with placebo groups. The average period before the first request for analgesic was longer in K patients group (7,75h), while S group had (3,5h) ($p< 0.05$). The average keterolac consumption in the preincision group was 30mg, in the placebo group 90 mg. The average total tramadol consumption in K group was 30mg, in P group 300mg.
The recovery was better in K group. Arterial blood pressure and heart rate did not change after ketamine administration. No one complained of hallucinations or nightmares.
Conclusion: Small dose of ketamine before skin incision decreases postoperative pain, reduces analgesic agents' consumption, and delays patients' request for analgesia after spinal anaesthesia in patients with foot joint surgery.

14AP4-1

Evaluation of pain relief after sympathetic nerve block with neurolytic agents in cancer patients

Uchino H., Miyashita R., Miyamoto M., Matsuoka S., Fukui H., Oseto K.
Tokyo Medical University, Department of Anaesthesiology, Tokyo, Japan

Background and Goal of Study: The success of the neurolysis for sympathetic axis for cancer pain, despite different approaches and methods used, depends on adequate spread of the injectate in the target area. This retrospective study was conducted to evaluate both the patterns of alcohol spread and pain relief in patients with cancer or therapy-related anatomic distortion of the celiac and superior hypogatsric area and chronological changes of beta Endorphine (β -End) as a biomarker associated with neurolytic block which has a possibility to reflect the degree of pain.
Materials and Methods: This study was approved by the Ethical Committee of Tokyo Medical University. From 20 cancer patients(5 pancreas cancer and 5 gastric cancer :9 males and 1 female and 10 rectal cancer: 8 males and 2 females) who underwent computed tomography (CT)-guided needle neurolytic celiac plexus(CPB)(Th12-L1 level approach) and superior hypogatsric plexus block(SHGB) (L4-L5 or L5-S1 level approach) via a posterior approach. To evaluate CT patterns of neurolytic (mixed with contrast) spread, the celiac and superior hypogastric area was divided on the frontal plane into four quadrants and also measured the rostro-caudal spread of neurolytic agents along vertebral bone.
Patient assessment by visual analog scale(VAS) , change of the dosage of oral pharmacologic therapy and β -End as a biomarker were reviewed at 7, 30 and 90 days after block to evaluate the degree of pain relief.
Results and Discussion: Overall, four, three, two, and one quadrants with contrast were observed in 1(10%), 2 (20%), 5(60%), and 2(10%) patients with celiac plexus block, and 0(0%), 2(20%), 6(60%), and 2(20%), respectively. Maximal rostrocaudal spread of neurolytic agents were seen Th5-L3 with CPB and L4-S2 with SHGB.
Most of the patients showed Long-lasting pain relief (more than 30 days) with CPB and SHGB. Patient with contrasts less than two quadrants showed no long-lasting pain relief. VAS showed reduction in β -End showed marked increase after neurolytic block. Patients with pain relief showed success the reduction of oral pharmacologic therapy.
Conclusion(s): It also appears that not only a complete (four quadrants) but also three or two quadrants neurolytic spread in both celiac and superior hypogastric area can guarantee long-lasting analgesia. β -End showed the possibility to reflect the pain grade as a biomarker. We need further investigation.

14AP4-2

Involvement of EphB1 receptor/ephrinB1 ligand in bone cancer pain

Tan Z., Yan Dong, M.D.
Shanghai Cancer Center, Shanghai Medical College, Fudan University, Department of Anaesthesiology, Shanghai, China

Background: Eph/ephrin system was demonstrated to involve in inflammatory and neuropathic pain modulation.
The aim of the present study was to investigate whether EphrinBs/EphBs signaling was involved in bone cancer pain and the possible downstream mechanism.
Method: Mechanical allodynia was measured as the hind paw withdrawal response to von Frey hair stimulation in rats. Immunohistochemistry was used to detect the location of EphB1/ephrinB1 and immunofluorescence staining was used to detect the expression of EphB1/ephrinB1/neuronal nuclei or EphB1/ephrinB1/glial fibrillary acidic protein double label. EphB1/ephrinB1 expression was also determined by western blot. The mRNA levels of proinflammatory cytokines were detected by RT-PCR.
Result: Intrathecal injection of EphB1-Fc (Blocker of EphB1 receptor activation) suppressed mechanical allodynia induced by bone cancer. The protein expression levels of EphB1/ephrinB1 had different trend in spinal cord (SC) and ipsilateral dorsal root ganglion (IDRG). In SC, EphB1/ephrinB1 increased significantly, but in IDRG ephrinB1 decreased markedly at the same time points with the unchanged EphB1.
Immunofluorescence staining revealed that EphB1/ephrinB1 co-localized with the neuronal marker in SC and IDRG. Intrathecal injection of EphB1-Fc decreased the mRNA level of proinflammatory cytokines in spinal cord which up-regulated in bone cancer pain of rats.
Conclusion: EphB/ephrinB signaling plays a key role in the development of bone cancer pain. Proinflammatory cytokines might be a part of EphB/ephrinB signaling system in bone cancer pain.
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14AP4-3

Postoperative opioids consumption: A pharmacokinetic analysis

Proto P.L., Tognoli E., Piccioni F., Bartoli A., Morelli D., Langer M.
IRCCS Istituto Nazionale dei Tumori di Milano, University of Milan, Department of Anaesthesiology and Intensive Care, Milan, Italy

Background and Goal of Study: As the analgesic effect of opioids is concentration dependent, we found it interesting to analyse the postoperative opioids consumption from a pharmacokinetics point of view. The Aim of the study was to verify the performance of a PK model in a Patient-Controlled analgesia context.
Materials and Methods: We studied 5 pts. who underwent abdominal surgery. Analgesic therapy: Methadone administered by a PCA system (dose 2 mg, lock-out 12min.). To predict Methadone concentration, we used data recorded from PCA systems and the following equation:
$Cp = dose - K_{10}A_1 - K_{12}A_1 + K_{21}A_2/V_1$
entering the pharmacokinetic parameters proposed by De Vos(1). For each patient we performed two blood samples at different times in the first 48 postoperative hours. The measurement of Methadone plasma concentration was carried out at the Institute of Clinical Pharmacology, University of Pavia, with the HPLC method. The difference between predicted plasma concentration (Cp) and measured plasma concentration (Cm) was expressed as percentage error (PE) = [(Cp-Cm) / Cm] * § 100.
Results: Are summarized in Table 1. Our calculation systems underestimated the measured concentrations with an error that varied from a low of -5% to a maximum of -45%. Only at two points, the calculated value overestimated the measured value (+7,9, +112).
Conclusions: Our intention is to describe Postoperative opioids requirement in terms of concentration rather than dose consumption. The results show wide ranges of error variability, Therefore, we are looking for a way to analyse the performance of a PK model in a Patient-Controlled analgesia context, which we have not found in other literature so far.

PZ	Cp (ng/ml)	Cm (ng/ml)	PE
1	69	78,7	-12,3
1	100	180,5	-44,6
2	74	96,9	-23,6
2	49	45,4	7,9
3	56	75,5	-25,8
3	40	61,8	-35,3
4	76	83,9	-9,4
4	104	49	112,2
5	63	66,3	-5

[Table 1]

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14AP4-4

Intrathecal administration with roscovitine attenuates bone cancer pain and inhibits the expression of NMDA receptor 2B subunit in mice

Ma Z., Zhang R., Mei F., Zhang J., Zheng Y., Gu X.
Affiliated Drum Tower Hospital,Medical School of Nanjing University, Department of Anaesthesiology, Nanjing, China

Background and Goal of Study: Previous researches suggested that intrathecal administration with cyclin dependent kinase 5 (Cdk5) inhibitor roscovitine attenuated inflammatory nociceptive response by regulating the expression level of N-methyl-D-aspartate receptor 2B subunit (NR2B) and NR2B may contribute to the development and maintenance of cancer pain. In this study, we used a mouse model of bone cancer pain to investigate whether roscovitine could attenuate bone cancer pain by regulating the expression level of NR2B in spinal cord.
Materials and Methods: Twenty-four C3H/Hej mice were divided randomly into three groups (n=8): S group (sham+DMSO), C group (tumor+DMSO) and R group (tumor+Roscovitine). 2×10^5 osteosarcoma NCTC 2472 cells were implanted into the intramedullary space of right femurs of mice to induce ongoing bone cancer related pain behaviors. The sham mice were inoculated with α-MEM without any tumor cells. All mice were observed changes of pain behaviors, such as paw withdrawal mechanical threshold (PWMT) and paw withdrawal thermal latency (PWTL), before implantation and at days 3, 5, 7, 10, 14 after implantation. After tumor-invoked tactile allodynia and thermal hyperalgesia were assessed at day 14 after implantation, mice were assigned to intrathecal administration with 20μg roscovitine of 5μl (group R), DMSO of 5μl (group S and C). Tactile allodynia and thermal hyperalgesia were assessed before administration and at 1h, 6h, 24h, 48h and 72h after administration. RT-PCR was used to assess the expression of NR2B mRNA in the spinal cord after tumor cells inoculated to the bone.
Results and Discussion: Inoculation of tumor cells, but not the vehicle induced progressive thermal hyperalgesia and mechanical allodynia. And there was a marked increase in the expression of NR2B mRNA in the superficial dorsal horn after inoculation. Intrathecal administration with Cdk5 inhibitor roscovitine attenuated bone cancer-evoked mechanical allodynia and thermal hyperalgesia as well as the up-regulation of NR2B mRNA in the spinal cord.
Conclusion(s): These data indicated that intrathecal administration with roscovitine might relieve bone cancer pain, probably by reducing NR2B-dependent activity in spinal cord. These results also suggested that roscovitine might be a useful alternative or adjunct therapy for relieving cancer pain.

14AP4-5

Opiate titration in patients with moderate/severe cancer pain

Samolsky Dekel B.G., Tomasi M., Spinelli A.M., Vasarri A., Gori A., Di Ninoi G.
University of Bologna, Department of Anaesthesiology, Bologna, Italy

Background and Goal of Study: The management of moderate/severe cancer pain with opiates implies an essential stage of initial titration.(1) Literature provides no univocal guidelines for such stage; the use of immediate release morphine sulphate, administered every 4 hours with the double dose at night (2) is awkward because of management, pharmacokinetic and patients' compliance limitations. Aim of this study was to verify the effectiveness and applicability of a titration approach based on the administration of a combination of sustained release (SR) opiate and an immediate release (IR) opiate as rescue dose.
Materials and Methods: In this observational and retrospective study (hospital ethic committee notified) were included 98 consecutive inpatients with moderate/severe cancer pain (NRS>4), followed by the hospital pain management service in 2008-2009. Opiate titration in these patients consisted of the administration of oxycodone SR (OS-SR ≥ 5mg) twice a day and morphine IR (MS-IR, 30% daily dose of OS-SR) administered as ‚rescue dose', maximum four times daily. Measures: socio-demographic characteristics, initial OS-SR dose, initial MS-IR dose, initial and post-treatment pain scores, (NRSs, under static and NRSd, dynamic- conditions), number of rescue doses administered in the 24h, variations of OS-SR dose and side effects.
Results and Discussion: Titration approach was satisfactory in most patients: statistically significant and rapid decrease of pain were shown after 24h. In particular, pain intensity decreased from a median of NRSs=5 and NRSd=7 to NRSs=2 and NRSd=4, with scarce presence of side effects, along with high patient and caregiver satisfaction. In the following days OS-SR dose was hence stabilized.
Conclusion(s): The proposed titration approach can be considered as a valid alternative to that suggested in the literature; it guarantees: efficient and rapid pain control, improvement of the patients' quality of life and involvement in the therapy process, less opiates side effects, major patient and care giver compliance with the prescribed therapy, and rational use of opiates.
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14AP4-6

Pain control and chemotherapy induced nausea and vomiting (CINV) to patients undergoing cytoreductive surgery (CRS) with hyperthermic Intraperitoneal chemotherapy (HIPEC)

Vojinovic-Golubovic V., Cvetkovic A.D., Nikolic S., Milic-Rankovic J.
Institute of Oncology and Radiology, Serbia, Department of Anaesthesiology, Belgrade, Serbia

Background and Goal of Study: CRS and HIPEC are followed with high pain intensity and chemotherapy induced nausea and vomiting (CINV). The aim is to evaluate efficacy in pain and CINV prevention in the group of patients with epidural catheter (E group) compared to the group with subcutaneous applied Morphin (S group) in time intervals of 24, 48 i 72h after HIPEC.
Materials and Methods: Retrospective study on 23 female patients with Ca ovarii FIGO III and IV who underwent CRS and HIPEC with Cisplatina (50mg/m2) under general anaesthesia, between 2009 and 2010. Postoperative analgesia was performed using intermittent doses of morphine 2 mg/8-10ml 0.9%

NaCl and 0.25% bupivacaine/12h by epidural catheter in 13/23 patients and intermittent sc. application of morphine at a dose of 0.15 mg/kg at 4-6h in 10/23 patients, and in the breakthrough pain a sixth of the recommended daily dose of iv morphine was applied. For the prevention of acute emesis all patients received 30 min before HIPEC combination of ondasetron 8 mg iv and dexamethasone 8 mg iv once a day. Ondasetron, 8mg iv, was repeted after 12h. To prevent delayed emesis we used dexamethasone 8 mg once daily and metoclopramide 20mg/6h. Postoperative nausea and vomiting was measured by modified visual analogue scale for pain (VAS) and the pain intensity with VAS for pain, by anesthesiologist and nurses. Fisher's exact test and Wilcoxon rank sum test with continuity correction are used to test differences between groups.

Results and Discussion: All patients have average age 58.87 and average BMI 25, 31 - E group (56.52%), average age 59.1 and average BMI 25.08, S group (43.48%), average age 58.5 and BMI 25.61. The average duration of intervention was 275.9 min. Average value of pain expressed by the VAS scale in the first 24 hours in the E group vs S group was 3.08 vs. 5.1, $p < 0.05$. Pain in 48h E vs. S group was 2.15 vs. 4.1 with $p < 0.05$. Average value of acute emesis by VAS is E vs.S group 0 vs. 0.7 with $p < 0.05$. Delayd emesis from 24-48h E vs. S is 2.31 vs 4.5 with $p < 0.01$, while 48 -72h with 1.31 vs. 3.6 $p < 0.01$.

Conclusion(s): The pain was successfully treated during the entire period of 72h in E group compared to S group. Prevention of acute and delayed emesis and vomiting gave better results in E group.

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14AP4-7

Postoperative analgesia in patients undergoing total hip arthroplasty: A comparison of intravenous patient-controlled analgesia and patient-controlled femoral nerve analgesia

Nohel P., Aguilar J.L., Camboni M., Ševčík P.
Hospital Son Llàtzer, Department of Anaesthesiology and Pain Medicine, Palma de Mallorca, Spain

Background and Goal of Study: Patients undergoing total hip arthroplasty (THA) experience significative postoperative pain. Continuous peripheral nerve blocks provide superior pain control to opioids. Multimodal analgetic regimen featuring periferal nerve block and oral oxycodone was compared with intravenous PCA in patients undergoing THA.

Materials and Methods: 60 patients scheduled for THA were randomly divided into 2 groups: in the group PCA the pain relief was provided by intravenous patient-controlled analgesia with morfine, in the group F+O by patient-controlled femoral nerve analgesia and oral oxycodone. Pain scores using NRS (numeric rating scale for pain) at rest and during movement 24 and 48 hours after the operation, side effects and patients' satisfaction were recorded. Subsequently, data from the acute pain service registry of 452 patients who underwent THA were also analysed.

Results and Discussion: Patients in the group PCA reported on the first postoperative day NRS 0 at rest and 4 on movement, in the group F+O NRS 0 and 3 (median). On the second postoperative day the scores were 0 and 2 in both groups. Nausea and vomiting and sedation were less frequent in the group of femoral nerve analgesia. 86 % patiens in the group PCA and 93 % in the group F+O were satisfied with their postoperative pain therapy. From the analysis of the data of the 452 patients from the registry: NRS 4 on movement 24 hours after the operation in the group of intravenous PCA and NRS 3 in the groups of both epidural and femoral nerve PCA. The pain scores were 2.5 on movement on the second postoperative day in the group of intravenous and 2 in the groups of regional PCA.

Conclusion(s): Multimodal analgesic regimen featuring periferal nerve block provides better pain control on movement after THA and is associated with less opioid-related side effects.

14AP4-8

Is it necessary to perform paravertebral blockade for minor breast surgery?

Gil S., Pascual J., Sarabia R., Calatayud L., Mendiola A., Bernal G.
General Hospital of Ciudad Real, Department of Anaesthesiology and Intensive Care, Ciudad Real, Spain

Background: Paravertebral blockade (PVB) has been proposed as a useful technique for breast surgery, providing excellent pain relief and reduced incidence of postoperative nausea and vomiting. In this study we evaluated the analgesic efficacy and morphine consumption of the two techniques (general anesthesia vs PVB) after minor breast surgery.

Methods: We retrospective recorded 81 patients scheduled for minor breast surgery in a period between October 2008 and October 2009. Variables of efficacy were, intraoperative fentanyl, remifentanyl and NAIDs consumption, and postoperative pain measured on a modified scale (no pain: none, pain < 4 : 1 NAIDs, pain: 4-5: 2 NAIDs, pain: 5-6 minor opiates, pain >6: morphine).

Results: A total of 61 patients received general anesthesia (GA), and 20 patients were performed a BVP. No significant statistical differences in demographic characteristics were noted between the groups. Fentanyl consumption was significantly lower in the PVB group 157,5 vs 231,15($p = 0.032$). Intraoperative remifentanyl or morphine consumption were no differences between both groups. With respect to intraoperative NAIDs, the PVB group received significantly less than the GA group($p = 0.001$).There was no difference in postoperative analgesics requirements ($p = 0.339$). No complications were developed in both groups.

Conclusion: Although PVB resulted in better intraoperative anesthesia with less opiates consumption, no advantages over GA were found. A possible explanation for this finding might be postoperative pain after minor breast surgery was relatively mild. Although no complications were found, PVB has its failure rate and risk of complications. PVB should be an alternative technique considering the risk/benefit ratio.

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14AP4-9

Effects of Intra-articular dexmedetomidine vs bupivacaine on postoperative analgesia in patients undergoing arthroscopic knee surgery

Mujallid R.H., Almarakbi W.A., Elshahawy M.A., Alhashemi J.A.
King Abdulaziz University, Department of Anaesthesiology and Intensive Care, Jeddah, Saudi Arabia

Background: Dexmedetomidine is an alpha-2 agonist with sedative and analgesic properties. This study compared the postoperative analgesic effects of intra-articular dexmedetomidine with those of bupivacaine and saline.

Materials and Methods: After Ethics committee approval, 51 patients scheduled for arthroscopic meniscal surgery were randomized in a double blind fashion to receive either dexmedetomidine 1 $\mu g\ kg^{-1}$ (group D), bupivacaine 0.25% (group B), or saline (group S) intraarticularly (total volume 20 ml). All patients received a standardized general anesthetic with propofol, fentanyl, and sevflurane. Postoperatively, acetaminophen 500mg/codeine 30mg oral tablet was given every four hours, and tramadol 1 mg kg^{-1} IV was administered every 6 hours, as needed, for rescue analgesia. Visual analogue scale (VAS) scores (0-10), time to first analgesic request, and the total dose of postoperative analgesics were recorded. Repeated measures ANOVA were used to analyse VAS scores, whereas ANOVA was used to assess the other variables. Data presented as mean±SD and significance was defined as $p < 0.01$.

Results and Discussion: VAS scores were lower in groups D and B compared with group S ($P < 0.01$). Times to first analgesic were 343±27 vs.440±3 vs. 43±5 min for groups D, B, and S, respectively ($P < 0.01$). Total dose of rescue tramadol were 180±56 vs. 160±51 vs. 413±52 mg, respectively ($P < 0.01$).

Conclusion: Intraarticular dexmedetomidine provided comparable analgesia to bupivacaine 0.25% in patients undergoing arthroscopic knee surgery.

14AP4-10

Audit of the mode and efficacy of pain control in lumbar microdiscectomy

Kakkar G., Griffiths S., Mahalingam T., Bamber M.
Walton Centre of Neurosciences NHS Trust, Department of Anaesthesiology and Intensive Care, Liverpool, United Kingdom

Background and Goal of Study: The NHS plan has set a target that 75% of elective procedures should be performed as day cases. Suitability to perform a procedure as a day case includes analysis of operative, medical and social factors. Lumbar microdiscectomy is undertaken as a day case in centres throughout the world with good surgical outcomes, high patient satisfaction and low re-admission rates. Two important medical factors for same day discharge include pain control and management of postoperative nausea and vomiting (PONV).The aim of this audit was to assess current practice in these two areas, providing information to guide decisions on setting up a day case service for microdiscectomy in our tertiary care centre.

Materials and Methods: Over a ten week period between November 2008 and January 2009 the care of 40 patients undergoing elective single-level mi-

crodiscectomy was analysed. The anaesthetists in theatre recorded the pre-operative analgesic requirements and the intra-operative analgesic regimes used. Pain levels were assessed using a numerical rating scale on arrival and departure from the PACU and on the ward at 6-8 hours post-operatively. At this time patients were also asked would they be content to go home at their current level of pain and PONV. They were also asked to give their opinion and views on factors affecting same day discharge.

Results and Discussion: 100% received paracetamol, 28% had LA infiltrated by the surgical team intra-operatively. 78% received either paracoxib or diclofenac , 93% received morphine intraoperatively. 88% received morphine in PACU, Multimodal Analgesia - 98%. 100% patients had pain scores recorded in recovery. 100% patients had no more than moderate pain before leaving PACU. 55% received analgesia on the ward when reviewed at 6-8 hours. Incidence of significant PONV is 35%. Currently only 47% of patients would be content to be discharged on the day of surgery.

Conclusion(s): Balanced or multimodal analgesia combining intra-operative opiates, paracetamol, local anaesthesia and NSAIDs leads to lower pain scores and a lower incidence of PONV. All patients should have their pain assessed and treated so their pain scores are mild to moderate before leaving the postoperative care unit. Post-operatively on the ward all patients should take analgesics pre-emptively and regularly, starting before the effect of the peri-operative analgesics have worn off.

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14AP5-1

Post-operative pain relief following laparoscopic abdominal surgery: General anesthesia versus combination with regional anesthesia using intrathecal Morphine and Fentanyl

Segal D., Assalia A., Weissman A., Edry R.
Rambam Health Care Campus, Department of Anaesthesiology, Haifa, Israel

Background and Goal of Study: Laparoscopic surgery may be associated with severe postoperative pain. The aims of our current study were to assess the effect of combined general and intrathecal (IT) morphine + fentanyl on postoperative pain score, analgesia requirements and patients' satisfaction following laparoscopic procedures.

Materials and Methods: This is a prospective randomized controlled study. After IRB approval Thirty three adult patients underwent laparoscopic procedures were randomly assigned to receive intraoperative IV fentanyl [group 1, N= 16] or IV remifentanil+ IT morphine (0.3-0.6 mg) and fentanyl (15 mcg) [Group 2, N=17]. Intravenous morphine Patient Control Analgesia (PCA) was given to all patients for pain control during the recovery period. Postoperative pain scores were evaluated in post anesthesia care unit (PACU) every 30 minutes and at post operative day (POD) 1 and 2. Pain scores were assessed at rest and while coughing using visual analog scale (VAS) 0-10 scale. PCA requirements, additional analgesic medications, hemodynamic parameters, oxygen saturation, side effects and patient satisfaction were recorded as well.

Results and Discussion: Both groups were well matched with regard to demographic data and hemodynamic parameters. Total I.V postoperative morphine requirements were significantly lower in the group 2 compared to group 1 in the PACU (8.0 vs. 13.7), POD1 (7.86 vs. 31.18) and POD2 (4.55 vs. 20.2) mgs (p= 0.044, 0.003, 0.011 respectively). Postoperative VAS's were significantly lower in group 2 both at rest and while coughing in the PACU, POD1 and POD 2 . Patients in group 1 demanded significantly higher additional analgesics beside morphine: 84.6% compared to 15.4 % in group 2 (P< 0.001). Patients' satisfaction was significantly higher in group 2 (scale 1-10): 9.91 vs. 6.54 in group 1 (P< 0.0001). No significant side effects were noted in both groups.

Conclusion(s): Our findings demonstrated that intrathecal morphine and fentanyl combined with general anesthesia significantly reduces pain score and analgesia requirements in the postoperative period following laparoscopic surgery. Higher patient satisfaction in the Intrathecal group was significant as well.

This practice should be further evaluated and considered in selected laparoscopic surgery.

14AP5-2

Trans-abdominal plane (TAP) block analgesia for day-case laparoscopic gynaecological procedures: A prospective study

El Bayoumy R., Guirgis R., Guyer C.
Portsmouth Queen Alexandra Hospital, Department of Anaesthesiology and Pain Medicine, Portsmouth, United Kingdom

Introduction: The Transversus Abdominis Plane (TAP) block is a regional anaesthetic technique which has been utilised as an analgesic adjunct for a number of surgical procedures. We prospectively evaluated the efficacy of this technique in day-case laparoscopic gynaecological procedures: diagnostic laparoscopy, laparoscopic sterilisation, laparoscopic treatment of endometriosis & laparoscopic removal of an ovarian cyst.

We selected ASA 1 & ASA 2 patients for our study.

Methods: A consecutive cohort of 50 patients undergoing day-case laparoscopic gynaecological procedures had a bilateral TAP block under ultrasonographic guidance administered by a single anaesthetist following induction of anaesthesia. Post-operative pain scores were prospectively quantified in the recovery bay by nursing staff using a visual analogue scoring (VAS) system (range of 0-10). Patients were then phoned on Day 1 and Day 3 post-surgery and asked to quantify their pain using a visual analogue Score (0-10). These scores and clinical outcomes were compared with a contemporaneous control cohort of 50 patients who underwent laparoscopic gynaecological procedures without TAP block.

Results: There were no adverse events associated with the insertion of TAP block. Patients who underwent TAP block had significantly lower pain score in recovery (0.25 ± 0.07 vs. 0.94 ± 0.21; p = 0.01) and on day 1 (2.8 ± 0.2 vs. 5.8 ± 0.3; p = 0.0002) as compared with the control group. However by day 3 post surgery, the patients pain scores were not significantly different in either group (2.1 ± 0.2 vs. 2.9 ± 0.3; p = 0.16).

Mean morphine consumption per 24 hours on the TAP group was statistically-significant (6.21 ± 1.1 vs. 21.56 ± 2.3; p = 0.01) as compared with the control group.

Mean hospital stay overnight on the TAP group was as well significantly lower (3.41 ± 0.71 vs. 32.51 ± 5.1; p = 0.001) as compared with the control group.

Conclusion: The TAP block is a safe and effective technique which provides superior short-term analgesia for patients undergoing day-case laparoscopic gynaecological procedures.

It helps as well to cut hospital costs & reduce the risk of nosocomial infections due to shorter stay in the hospital wards.

14AP5-3

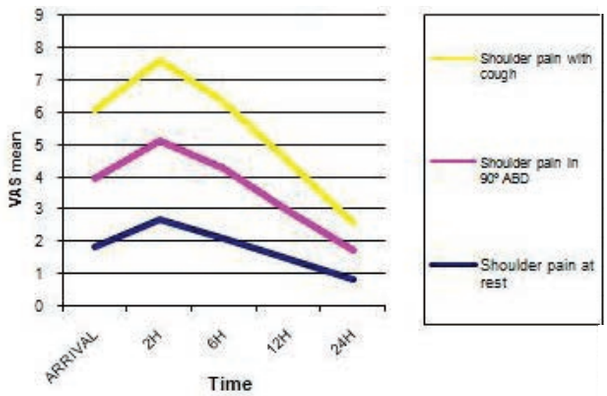
Shoulder pain after thoracotomy and videothoracoscopy: An approaching to this complication: Pilot study in La Princesa Hospital

Sierra M., Parrado D., Sierra E., Vallejo C., Morales R., Planas A.
Hospital La Princesa, Department of Anaesthesiology and Intensive Care, Madrid, Spain

Background and Goal of Study: The 21-97% of patients undergoing thoracic surgery suffers ipsilateral shoulder pain in the postoperative[1]. The objective is to determinate the incidence and characteristics of this pain in the first 24 hours after thoracotomy and videothoracoscopys (VATS).

Materials and Methods: Pilot epidemiology descriptive study. 20 patients undergoing thoracic surgery by thoracotomy or VATS were consecutively selected between April and May 2010. Anaesthesia technique followed a protocol. Inclusion criteria: informed consent agreement. Exclusion criteria: Previous ipsilateral shoulder pain, drug abuse, analogic visual scale (VAS) correctly understanding. Measures: Pain at ipsilateral shoulder pain was evaluated by VAS at wake up, 2, 6, 12 and 24 hours at rest, 90° shoulder abduction and cough. Rhythm, intensity and localization were registered at wake up, 12 and 24 hours. Statistical analysis was made using SPSS® v15.0.

Results and Discussion: Patients with ipsilateral shoulder pain at rest at wake up were 45% (VAS mean 2.1; 2.09-2.14 $CI_{95\%}$) and 30% (VAS mean 0.8; 0.63-0.97 $CI_{95\%}$) at 24 h. Mean VAS shoulder pain at rest, shoulder abduction 90° and cough are in graph 1.



[Mean Shoulder VAS according to time]

Rhythm, intensity and localization are at table 1.

Data are shown as number of patients and frequency									
	Rhythm		Intentsity		Localization				
	Con-stant	Inter-mittent	Conti-nuous	Change-able	Shoul-der	Scapula	Shoulder and Scapula	Shoulder and Clavicle	Shoulder, scapula and Clavicle
Wake up	6 (66,7%)	3 (33.3%)	3 (33.3%)	6 (66,7%)	2 (22.2%)	3 (33.3%)	1 (11.1%)	1 (11.1%)	2 (22.2%)
12 hours	4 (50%)	4 (50%)	2 (25%)	6 (75%)	2 (25%)	1 (12.5%)	2 (25%)	1 (12.5%)	2 (25%)
24 hours	5 (83.3%)	1 (16.7%)	1 (16.7%)	5 (83.3%)	1 (16.7%)	1 (16.7%)	1 (16.7%)	1 (16.7%)	2 (33.3%)

[Shoulder pain characteristics]

Although the pain frequency is high the intensity is low. Shoulder pain increase is bigger at cough than at 90° abduction. The size of the population sample limits our results.

Conclusion(s): Ipsilateral shoulder pain is a frequent complication in the thoracic surgery; it is not very intense and is related to movement and cough according to our results.

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14AP5-5

The combination of infiltrative bupivacaine with low pressure laparoscopy reduces postcholecystectomy pain

Domi R., Sula H., Beqiri A., Zaimi E., Petrela E.
UHC ‚Mother Teresa', Department of Anaesthesiology and Intensive Care, Tirana, Albania

Background and Goal of Study: Postoperative pain remains one of the major problems faced in postoperative period of laparoscopic cholecystectomy (LC). Several studies have reported different pain management strategies, but no previous study has specifically described the efficacy of low pressure pneumoperitoneum combined with local anesthetic infiltration.

This paper aims to describe the efficacy of infiltrative bupivacaine combined with low intraperitoneal pressure insufflation in reducing the postlaparoscopic pain in patients undergoing LC.

Materials and Methods: The study was performed at the Department of Surgery and the Service of Anesthesiology & Intensive Care of the UHC Mother Theresa in Tirana, Albania during the period 2006-2009. 473 ASA 1 and 2 patients scheduled to undergo general anesthesia for LC were included. The patients were divided in four groups: the first group with intraabdominal insufflation pressure 10-12 mmHg and no infiltrative bupivacaine (HPNBG), the second group with intraabdominal insufflation pressure 10-12 mmHg and with 5 ml infiltrative bupivacaine 0.5 % in abdominal minincisions (HPBG), the third group with intraabdominal insufflation pressure under 10 mmHg and no infiltrative bupivacaine (LPNBG) and finally the fourth one with intraabdominal insufflation pressure under 10-12 mmHg and 5 ml infiltrative bupivacaine 0.5 % (LPBG).After conventional induction, the CO2 insufflation and laparoscopic procedure started. Infiltration with 5 ml Bupivacaine 0.5 % (Astra-Zeneca) in each miniincision site was performed at the end of surgery.

Results and Discussion:

Paramethers	Intraabdominal pressure 10-12		Intraabdominal pressure under 10 mmHg	
	No bupivacaine	*With bupivacaine*	*No bupivacaine*	*With bupivacaine*
Patients number	120 patients	122 patients	110 patients	121 patients
Incisional pain VAS (1-10/10)	7.2 ± 1.8/10	5.5 ± 1.2/10	6.9 ± 2.1/10	4.8 ± 1.3/10
Shoulder-tip pain VAS (1-10)	7.4 ± 2/10	6.9 ± 1.4/10	5.7 ± 1.6/10	4.5 ± 1.5/10
Pain begining time (h)	2.3 ± 0.6 h	2.9 ± 1.1 h	3.2 ± 0.9 h	4.7 ± 0.5 h
Daily morphine consume (mg)	13 ± 1.5 mg	10 ± 2 mg	9.5 ± 1.5 mg	7.5 ± 0.5 mg

[Data recorded in four groups]

Conclusion(s): We recommend the combination of low pressure pneumoperitoneum and local infiltration, in order to longer the beginning time, and to reduce the intensity of the pain, as well as to decrease the morphine consummation during LC procedures.

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14AP5-6

The effect of the transverse abdominis plane block after laparoscopic cholecystectomy

Smaoui L., Bouaziz I., Zribi N., Ayedi M., Bouhlel R., Karoui A.
CHU - Habib Bourguiba Sfax, Department of Anaesthesiology and Intensive Care, Sfax, Tunisia

Background and Goal of Study: The transverse abdominis plane (TAP) block is a novel approach for blocking the abdominal wall neural afferents via the bilateral lumbar triangles of Petit. This prospective, randomized, and double-blinded study was designed to describe the landmark TAP block not only to evaluate the intra- and postoperative analgesic efficacy in patients undergoing laparoscopic cholecystectomy but also to eradicate curare under general anesthesia.

Materials and Methods: Forty patients undergoing laparoscopic cholecystectomy were randomized to receive standard general anesthetic either with (Group A, n=20) or without TAP block (Group B, n=20). Inclusion criteria were: age superior to 20 years and ASA physical status 1 or 2.

Patients were excluded if there was a history of relevant local anesthetics allergy, or if they had coagulation disorder or there was infection at the needle insertion site.

All patients received, before surgical incision, a bilateral TAP block which was performed using20 ml (50mg bupivacaïne isobar 0.25% +0.5μg/kg clonidine) or 20ml saline on each side.Visual analogic scales were recorded during 24 hours after surgery.Postoperative complications, including nausea, vomiting, urinary retention, sleep disturbance, respiratory depression were also checked

Results and Discussion: There were no differences between demographic characteristics and duration of the intervention. The TAP block significantly reduced the intraoperative use of rémifentanil (402.5+/-93.8 Vs 607.5+/-40.6, P< 0.001). Pain score early after the operation, the ratio of patient who used analgesic drug, and the frequency of its use are all decreased by performing the block. The use of curare was reduced between the two groups (x^2 =26.6; P< 0.001). Concerning the postoperative complications, the TAP block reduced only the risk of nausea and vomiting (x^2 =10.98; P< 0.001).

Conclusion(s): The TAP block can be utilized as a useful analgesic method during and after the operation after laparoscopic cholecystectomy. Also, it reduces the use of curare.

14AP5-7

Crucial role of multimodale analgesia for laparoscopic cholecystectomy

Gvozdenovic L.V., Milic S.D., Ivanov D., Pajtic V., Mancic N., Gvozdenovic N.V., Anaesthesiology
Clinical Centre of Vojvodina, Department of Anaesthesiology and Intensive Care, Novi Sad, Serbia

Background and Goal of Study: Intraperitoneal administration of local anaesthetic in combination with an opioid, for the relief of postoperative pain, has already been reported after laparoscopic cholecistectomy. This study was aimed at assessing the analgesic effect of the intraperitoneal administration of bupivacaine and morphine, in patients undergoing laparoscopic cholecystectomy.

Materials and Methods: A prospective, randomized, double blind study was undertaken with written informed consent which was obtained from all patients. The study group consistent of 90 patients scheduled to undergo elective laparoscopic cholecistectomy for cholelithiasis under general anaesthesia. At the end of laparoscopic cholecystectomy,one of the following injections was given intraperitoneally: Group 1 (n=30) received physiological sodium chloride 30 ml, intraperitoneally. Group 2 (n=30) bupivacaine 0,25% 30 ml intraperitoneally,. Group 3, (n=30) bupivacaine 0,25% 30 ml, intraperitoneally plus morphine 2mg. Patients postoperative pain was evaluated using a visual analogue scale and a verbal rating score. The postoperative analgesic requirement was assessed by the total dose of ketokonazol, administered by an i.v or i.m.route. Pain, vital signs, supplemental analgesis consumption and side-effects were recorded for all patients for 24h.

Results and Discussion: There were no significant differences between the three groups in relation to pain scores during the study except in the first 6h, in which pain was significantly lower (p< 0.05) in those patients receiving

intraperitoneal bupivacaine plus morphine. 26 patients of the Group 1 needed a rescue dose, of postoperative analgeic drags, in the first 6 h.
Conclusion(s): In the patients undergoing laparoscopic cholecystectomy, the intraperitoneal administration of bupivacaine plus morphine, reduced the analgesic requirements during the first 6 postoperative hours compared with the control group. However, the combination of intraperitoneal bupivacaine 0,25% and morphine was more effective for treatment of pain after laparoscopic cholecystectomy. This surgeons involved in the study continue to use this method of analgesia as part of their routine practice.

14AP5-10

Postoperative epidural analgesia in patients undergoing weight loss surgery: Does the addition of morphine to low (0.1%) or high dose (0.2%) levo-bupivacaine improve ambulation and bowel function?

Zotou A., Filos K.S., Siampalioti A., Georgiou P., Monantera G., Paridis L.
University of Patras, Medical School, Department of Anaesthesiology and Intensive Care, Rion - Patras, Greece

Background and Goal of Study: Up to date, not sufficient data exist regarding the post-op analgesic management of morbid obese (MO) patients (BMI>50 kg/m^2) undergoing open biliopancreatic diversion with Roux-en -Y (BPD-RYGBP) using epidural levo-bupivacaine (LB). Furthermore, the analgesic effects of low doses of opioids do not allow early ambulation after open surgery in MO patients.
Materials and Methods: In a prospective double blind randomized controlled trial, 72 ASA II-III MO patients undergoing open BPD-RYGBP, were randomly allocated to six groups (n=12 each). All pts received standardized general anaesthesia (GA) combined with thoracic epidural anaesthesia (EA). Epidural cath placement was before induction of GA between T5-T8. Gr. 1 patients received postop PCEA with 0.1% LB (dose 5ml, Lockout 10min) combined with a continuous epidural infusion of morphine (M) 0,2 mg/h, Gr. 2 received 1mg M and Gr. 3 received 2 mg M intra-op (45 min before end of surgery) and post-op the same dose compared to Gr. 1; Gr. 4-6 received PCEA 0,2% LB combined with a continuous EPI M infusion (0,2 mg/h); Gr. 5 additionally received 1mg M and Gr. 6 2 mg M intra-op, whereas post-op the same dose compared to Gr. 4.
Pain assessment at rest, mobilization and at cough was with VAS (10 cm), side effects, motor block and local anaesthetic consumption were recorded for 48h. Statistics was with two-way ANOVA and Fisher's Exact Test as appropriate.
Results and Discussion: VAS at rest and after cough did not differ between the Groups. (Table 1).

	Group 1	Group 2	Group 3	Group 4	Group 5	Group 6
VAS at rest (mm) 6 hrs	1.7±2.5	1.4±1.9	1.5±2.1	0.7±1.5	1.3±1.8	1,1 ± 1,2
Morphine (mg) 24 hrs	5.1±0.4	6.0±0.6	6.9±0.3	4.7±0.3	5.9±0.3	7.1±0.5
Morphine (mg) 48 hrs	10.3±0.7	10.9±0.4	11.9±0.4	9.8±0.7	11.0±0.3	11.9±0.3
L-Bupi mg) 24 hrs	130.5±63.9	167.9±105.7	161.3±77.9	290.8±156.5	195.8±92.4	204.2±129
L-Bupi (mg) 48 hrs	195.5±127.3	222.1±150.2	230.8±125.2	420±242.3	300.1±150.1	293.6±184.2
Time to first bowel sounds (h)	62.9±12.1	73.7±12.3**	70.0±17.7	58.9±11.0$^{\$\$}$	64.6±15.4$^{\$}$	64.3±12.6$^{\$}$
Time to walking out of room (h)	35,3±16,6	48,7±10,4***	44,3±11,3*	38,8±10,7$^{\$\$\$}$	46,3±14,7**	42,8±8,8

[VAS, morphine and LB doses used and outcome data]

Data are means ± SD.
*P< 0.05, **P< 0,01, ***P< 0,001 for comparison between group 1 vs groups 2,3, and 5 respectively.
$^{\$}$P< 0.05,$^{\$\$}$ P< 0,01,$^{\$\$\$}$P< 0,001 for comparison between Gr. 2 vs Gr. 4,5 and 6 respectively.

Conclusions: The increase in perioperative M dose led to prolonged time to bowel function whereas the increase in LB dose had negative effect on early ambulation. A daily EPI dose of ~ 5 mg morphine in MO patients with BMI > 50 combined with 0.1% of LB seems the most effective regimen regarding early mobilization and return of bowel function.

14AP5-11

Intraperitoneal analgesia compared with levobupivacaine 0.25% versus saline in laparoscopic bariatric surgery

Rodriguez Losada M., Barreiro Pardal C., Gonzalez Castro A., Sanduende Otero Y., Taboada Ben M.R., Raposeiras Roubin S.
Hospital Montecelo, Department of Anaesthesiology and Intensive Care, Pontevedra, Spain

Background and Goal of Study: To evaluate the postoperative analgesic efficacy of the intraperitoneal levobupivacaine 0.25% in patients with morbid obesity who underwent laparoscopic bariatric surgery.
Materials and Methods: A randomized prospective double-blind placebo-controlled trial. - 46 patients who underwent laparoscopic bariatric surgery and they were randomly divided into two groups: levobupivacaine 0.25% group (n=23) received 30 ml of local anesthetic intraperitoneal + 20 ml for infiltration of surgical wounds, and the control group (n=23) received 30 ml of saline intraperitoneal + 20 ml for infiltration of surgical wounds. The administration of intraperitoneal local anesthetic or saline was carried out at the end of intervention.Anesthetic maintenance was performed with remifentanil + sevoflurane.As rescue analgesia was administered 1 g paracetamol iv + 2 g metamizol iv + 10 mg of morphine iv, 30 minutes before the end of the surgery. Furthermore we administer antiemetic prophylaxis with 8 mg dexamethasone iv + 4 mg ondansetron iv.Postoperative analgesia using 1g paracetamol iv/8 hours alternate with 2 g metamizol iv, and iv morphine PCA with demand bolus of 1 mg every 10 minutes.The parameters that we sign up were age, sex, BMI, ASA classification, surgical technique, VAS (visual analog scale) every 2 hours during first 24 hours and 48 hours, and total consumption of morphine at 24 h and 48 h. We also recorded the existence of shoulder pain and PONV (postoperative nausea and vomiting) at the times indicated.The statistical analysis was made using SPSS 15.0.
Results and Discussion: In our study we observed that the use of intraperitoneal local anesthetic decreased morphine consumption at 24 h (6.5 ± 4.3 in the levobupivacaine group over 10.3 ± 6.4 in the control group; p=0.025), and at 48 h (3.5 ± 2.1 in the levobupivacaine group over 6.2 ± 5.6 in the control group; p=0.032).There were no significant differences between the two groups in terms of the other parameters studied.Most notable complications that occurred were atelectasis in 4 patients, without statistical relationship.
Conclusion(s): The administration of intraperitoneal local anesthetic at the end of the intervention, compared with administration of saline in patients undergoing laparoscopic bariatric surgery produces better pain control in the first 48 hours postoperatively and also reduces morphine consumption in this period.

14AP6-1

Comparison between analgesic effect of gabapentin and pregabalin in controlling delayed onset Post Dural Puncture Headache in non-pregnant patients

Moghaddam M.J., Mirkheshti A., Yahyavi P.
Shahid Beheshti University of Medicine, Department of Anaesthesiology, Tehran, Iran, Islamic Republic of

Background and Goal of Study: Post dural puncture headache is a complication of puncture of the dura mater. (1) The headache was related to excessive loss of cerebrospinal fluid (2) An epidural blood patch remains the standard treatment for a PDPH, pain relief from an EBP is often immediate.(2) Gabapentin (Neurontin; Pfizer) reported to be effective in treatment of spinal headaches. It has complications such as somnolence, ataxia, dizziness and visual disturbances.(3) Pregabalin is an anticonvulsant drug used for neuropathic pain and as an adjunct therapy for partial seizures.The treatment of oral gabapentin and pregablin, caused a significant decrease in headache severity(4,5).
Materials and Methods: In this study, Sixty ASA I-II patients who developed PDPH after spinal anaesthesia were enrolled. both patients group were randomised to receive either gabapentin (Group 1) or pregabalin (Group 2). Group 1 (n=30) received 900mg/day ,and Group 2 (n=30) received 150mg/day g orally .
Results and Discussion: Both groups have the same demographic findings. NRS (numeric rating scale) system used to evaluate analgesic property of drugs. NRS were significantly lower in Group 2 than in Group 1 . In first group NRS before treatment was 7.90 with SD=0.71 and 4.33 and SD=0.74 (p< 0.001) after receiving drug. In second group NRS before treatment was 8.1with SD=0.75 and 2.16 and SD=0.74 (p< 0.001) after therapy.
Conclusion(s): Administration of oral gabapentin and pregabalin in patients with PDPH is an effective and safe treatment to post spinal headache , but pregabalin is more effective than gabapentin.

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14AP6-2

Combined therapy of pain syndromes in diabetic neuropathy

Zagorulko O., Gnezdilov A., Medvedeva L., Samoylova N.
National Research Centre of Surgery Named after B.V. Petrovsky RAMS, Department of Anaesthesiology and Pain Medicine, Moscow, Russian Federation

Introduction: Neuropathy, as a syndrome, occurs in more than 400 diseases. Most often we are faced with diabetic neuropathy clinical manifestations of which are considered to date not as complications of diabetes but as its neurological manifestations. Treatment of neuropathic pain suggests an impact on the etiological and pathogenic processes, as well as all possible factors which contribute to the development or enhancement of pain.
Materials and Methods: Patients with neuropathic pain syndromes of various localization were divided into two groups. A control group of 20 people received conventional therapy (metabolic, including preparaions of thioctic acid, vitamins with antioxidant and neurotropic action; vasoactive therapy to normalize intraneural blood flow and eliminate the effects of hypoxia) for 20 days. Patients in the study group (n = 20) in addition to conventional therapy received non-pharmacological treatment: acupuncture analgesia, the surface acupuncture techniques, corporal acupuncture and auricular therapy. In marked pain syndrome reaching 4-5 points with the assessment on VAS (visual analogue scale), there were performed blocks with local anesthetics (neural, peripheral, in trigger points).
Efficacy criteria: pain intensity on VAS, the decrease in the manifestations of sensorimotor disorders, electroneuromiography data (speed of conduction of excitation in the motor fibers).
Results: Pain intensity on VAS before treatment in the study and control groups was 3.8 ± 1.6 and 3.9 ± 1.8 points, respectively. By day 20 pain intensity decreased in the study and control groups up to 1.8 ± 0.7 and 2.7 ± 0.5 points, respectively. The rate of conduction of excitation in the nerves before treatment was as follows: in the median - 41.3 ± 2.3 m/sec, in fibular - 36.4 ± 4.2 m/sec, in tibial - 36.0 ± 3.7 m/sec. By day 20 of treatment, in the group receiving combined therapy, an elevated rate of conduction: in the median nerve - 42.5 ± 2.4 m/sec, fibular - 37.1 ± 4.2 m/sec, tibial - 37.0 ± 3.7 m/sec. In the patients in the control group no significant change in the conduction rate was noted by day 20.
Conclusion: The use of complex therapy with addition of non-drug methods has a favorable impact on the peripheral nervous system in diabetic neuropathy, This allows not only reduce the severity of pain, but also significantly reduce the sensorimotor disorders.

14AP6-3

Occipito-cervical reflexes in controlling headaches

Medvedeva L., Gnezdilov A., Zagorulko O., Samoylova N.
National Research Centre of Surgery Named after B.V.Petrovsky RAMS, Department of Anaesthesiology and Pain Medicine, Moscow, Russian Federation

Background: There are relatively few methods of electrodiagnostic testing of nerve conduction at the level of C1-C4, although the lesions precisely in the cervical area of the spinal cord in humans lead to prolonged pain suffering. To evaluate nerve conduction in the cervical headaches in patients with cervical osteochondrosis and intervertebral hernia at the level of C2-C6, reflex electromyographic (EMG) responses in m.trapezius by stimulation of the occipital nerves were studied.
Methods: The study included 22 patients and 12 healthy people (aged 44-60 years). The investigation technique had been previously published (Syrovegin et al, "Bol'" (a Russian journal) 2004, № 3, 12-16). Stimulation of the occipital nerves was performed with single rectangular pulses, with duration of 0.2 ms and the force which presented a threshold for the pain sensation (14-18 MA). Averaged EMG activity was recorded bilaterally from the rostral part of m.trapezius (2-2000 kHz frequency filters, gain - 100 μV / cm sampling rate - 5000 Hz). The number of averaging was from 50 to 100. Temporal and amplitude parameters of the components of the EMG responses in patients were compared with the control data.
Results: The stimulation of the cutaneous projection of n.occipitalis minor evoked, in "norm", two early ipsilateral EMG responses designated R1i and R2i, with latency 11.0± 0.6 and 27.8 ±1.2 ms (mean ±SD). On the contralateral side there appeared only one R2s response with latency of 30 ±11.4 ms. The stimulation of the greater occipital nerve in the vertex area evoked a bilateral response with an initial latency of 28.8±11.2 ms and peak latency of 42.8±1.7 ms. Amplitudes of all components
significantly varied from 50 μV to 100-200 μV. In the patients all the components on stimulation of the small occipital nerve were bilaterally reduced to 10-20 μV, especially on the affected side. The latency sometimes increased up to 7 ms. On stimulation of the large occipital nerve, there were noted both relatively high-amplitude
bilateral components R2 and an additional component R3 with a peak latency of about 70 ms and low-amplitude responses of less than 10 μV. Response amplitudes directly depended on the magnitude of the cervical lesion.
Conclusion: Headaches accompanying lesions of the cervical spine may be controlled, based on the analysis of amplitude-time parameters of EMG reflex responses in m.trapeziuz caused by stimulation of the occipital nerves.

14AP6-4

Treatment radicular pain syndrome caused by pathologyin the lumbar spine in the acute period

Gnezdilov A., Zagorulko O.,Medvedeva L., Samoylova N.
National Research Centre of Surgery Named after B.V.Petrovsky RAMS, Department of Anaesthesiology and Pain Medicine, Moscow, Russian Federation

Introduction: Chronization of radicular pain syndrome (RPS) is most often due to ineffective anesthesia in the acute period. Prolonged erratic administration of analgesics at that time increases the likelihood of numerous drug complications (nephropathy, gastropathy, and etc.) without a clinical effect being achieved. Epidural introduction of anti-inflammatory drugs and particularly steroids seems to be most pathogenetically justified in RPS.
Methods: The study included 40 patients with RPS caused by protrusions or herniated discs at the lumbar spine confirmed by the findings of magnetic resonance imaging (in 57% of patients - at the level of L4-L5, in 40% - at the level of L5-S1, in 3% - at the level of L3-L4). The average age of patients was 38.4 ± 8.2 years. The duration of disease was no more than 3 weeks. Average pain intensity on a 10-point visual analogue scale was 6.75 ± 0.72 points. All patients were prescribed a 10-day medication course with ksefokam 8-16 mg per day, sirdalud 8-12 mg per day, dehydration therapy, group B vitamins, immobilization of the lumbar spine.
On the first visit, for pain relief, epidural analgesic block was used at levels of L3-L4- L5-S1 with 4.0-6.0 ml of 0.5% solution of markain combined with 1.0 ml of diprospan. From 1 to 4 therapeutic blockades with an interval of 3-7 days between them were performed.
Results: A positive effect of a single epidural block manifested itself clinically by a symptomatic relief of pain immediately after the blockade up to 0-2 points on VAS in 18 (45%) patients, up to 3-4 points in 21 (53%) patients. In 1 (2%) patient pain decreased by 2-3 points. After 6-8 hours (after the effect of the local anesthetic had stopped), in some cases the intensity of pain enhanced again, and only after 12-24 hours a significant reduction in its intensity was observed (due to the onset of the diprospan action). After the first epidural block a stable positive effect was achieved in 25 (62%) patients.
Seven days after the repeated blockade, a stable positive effect was achieved in 13 (32%) more patients. A moderately marked (1.5-2 points) pain persisted in 2 (6%) patients even after the third epidural block, which was attributed to stenosis of the cerebrospinal canal in these patients.
Conclusion: Epidural blockade with 0.5% solution of marcaine in combination with diprospan is effective pathogenetic treatment of RPS and allows to start active rehabilitation procedures earlier in patients with RPS.

14AP6-5

Trends in the consumption of opioid analgesics in Taiwan during 2002-2007

Lin T.C., Pan H.H., Lu C.C., Ho S.T.
Tri-Service General Hospital / National Defense Medical Center, Department of Anaesthesiology, Taipei City, Taiwan, Republic of China

Background and Goal of Study: The Taiwan National Health Insurance has been launched since 1995 and achieved an extremely high coverage (>99%)

of the 23-million population in 2007. The goals were to analyze the trends in the consumption of opioids in Taiwan during 2002-2007, to compare with the World Health Organization member countries, and to evaluate the associated economic impact.
Materials and Methods: After obtaining each specific code for every available formula of 3 strong opioids, morphine, fentanyl, and pethidine, and 2 weak opioids, tramadol and codeine, in Taiwan, all of the prescriptions were searched in the National Health Insurance Research Database, Taiwan between 2002 and 2007.
They were then calculated as Defined Daily Dose (DDD) by the International Narcotics Control Board for the consumption of opioids, in addition to payments and the associated diagnoses and treatments by International Classification of Diseases-9.
Results and Discussion: The opioid consumption increased 70%, from 382 DDD per million inhabitants per day in 2002, to 649 in 2007, which ranked as the 54th/181 countries/areas and was much lower than those of the US (1/66), Germany (1/32) and Denmark (1/27), according to the statistic data of 2005-2007, issued by the International Narcotics Control Board.
Among these opioids, the consumption of morphine (98 vs 166), fentanyl (187 vs 320) and tramadol (22 vs 89) increased remarkably from 2002 to 2007 and the total cost of these prescriptions increased by 60%, up to 9 million Euros for 23 million population in 2007.
Pethidine was predominantly prescribed for the patients without any diagnoses of cancers, near 80%, while morphine and fentanyl were inversely, near 20% and 10%, prescribed for those without cancer.
Conclusion(s): The increase of opioid consumption in Taiwan during 2002-2007 indicated improving acceptance of pain relief for chronic or acute pain. Pethidine was predominantly used in acute pain, while morphine and fentanyl were mainly prescribed for those with cancer.
The amount and cost of opioids in Taiwan are still far lower than those of the developed countries, needing further investigations for the impeding factors of opioid prescriptions and more educational programs on proper pain control.
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14AP6-6

Breakthrough pain associated with wound care in chronic pain: Efficiency preventive of oral fentanyl citrate

Penide-Villanueva L., Flores-Garnica L.M., Gomez-Agraz J.L.
Hospital Nuestra Sra de Prado, Department of Anaesthesiology and Pain Medicine, Talavera de la Reina, Spain

Background and Goal of Study: Breakthrough pain is an unknown entity but quite important for its frecuency and normally inadequately evaluated and treated.Particularly we can anticipate to treating breakthrough in wound care with the news administraction systems of oral fentanyl citrate.We investigate if could be efficient preventive method for control peaks pain in patients with habitually wound care.
Materials and Methods: Prospective ramdomized clinical trial in two groups with chronic pain associated to venous sores,limphedema,oncological diseases that need periodical wound care.Control group(N=20) did not previously treat with fentanyl citrate before wound care. Study group (N=17),200mcg to 400 mcg fentanyl citrate 20 minuts before wound care(according to the dose of opioid base).
In both groups the demographic characterists are similar,therefore comparable, Reporting VAS score pre and post wound care, hemodinamic parameters (TA,FC) and satisfaction.We investigate if preventive fentanyl citrate could be decrease the rescue opioids,number of peaks pain and better satisfaction of chronic pain.
Results and Discussion: With oraal fentanyl citrate preventive the mean breakthrough pain VAS score was reduced,the peaks pain and stress pre wound care was 43% less than control group.Satisfaction a long time was excellent or good in 84%.In four cases with mental disabilities news administraction systems of oral fentanyl citrate permitted an easy,secure and fast control hemodinamics parameters(TAS< 160 mmgH.FC sinusal< 120 lpm).
The need rescue opioid was 62% less than control group,therefore less nauseas and constipation.In thirteen cases of wound healing by vascular ulcer pain decreased by 68% before previous VAS but 26% of patiens had dizziness.
Conclusion(s): The oral fentanyl citrate is an ideal preventive breakthrough predictable independed of chronic pain etiology bacause its administraction is speed,safe,easy and comfortable to patients.
The importance of preventive control pain is essential for major satisfaction and less stress and fear to pain associated with habitually wound care and improves quality of life.

14AP6-8

Perceived social support and chronic pain

Serra J., Boixadós A., Pérez C., Clemente M.
Hospital Unversitari Mútua de Terrassa/University of Barcelona, Department of Anaesthesiology and Pain Medicine, Terrassa, Spain

Background and Goal of Study: Since the 1970s, theories of social support and its relationship to health and disease have seen considerable development. Abundant evidence suggests that social support is a prognostic factor in chronic diseases[1]. Data concerning the relationship between chronic pain and social support is controversial[2-3]. In our study we tested pain intensity and quality of life variables according in relation to different social support measurements. We present the results concerning perceived social support,
Materials and Methods: We included 108 patients .All patients were controlled for more than 12 months in our pain clinic. All the participants were over 18 and were recruited between February and April 2008. Data was collected in May 2008 by a team of social work students specially trained in the use of V.A.S. ,quality of life questionnaire SF36 and DUKE-UNC-11 perceived social support questionnaire[4]. Social and demographic data (age, sex, education level, income, work status), was also collected.
Results and Discussion:

	Low support Duke<32 (n=26)	Normal Support Duke>32 (n=82)	p value
VAS* (average and SD)	8,0 (4,0-10,0)	7 (5,0-8,0)	0,418
SF36**			
Physical summary (average and SD)	32,8 (7,9)	31,5(8,7)	0,481
Mental summary (average and SD)	25,6(12,8)	39,2(13,5)	0,001***

*T Student **U Mann Whitney ***significant

[vas and qol. Comparative between low and normal su]

	Duke: Confidential (7-35)	Duke: Affective (4-20)	Duke total (11-55)
	p value	p value	p value
EVA	0,34	0,491	0,287
SF 36			
Physical summary	0,841	0,295	0,531
Mental summary	0,001*	0,009*	0,001**

Rho's Spearman *significant

[Eva-sf36-vas correlation]

Perceived social support has only a significant relationship to mental health items from SF 36
Conclusion(s): Scales measuring perceived social support don't provide accuracy in assessing impact of social support in chronic pain patients.More comprehensive measures are neede
References:
1-Barth et al , Psychosomatic medicine.2010 ; 72, 229-238
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14AP6-9

Our endosonography-guided celiac plexus neuroliysis experiences

Ozgurbuz U., Alper E., Unsal B., Karahan N., Aran G., Özay R.
Izmir Ataturk Educational and Research Hospital, Department of Anaesthesiology and Intensive Care, Izmir, Turkey

Background and Goal of Study: Celiac plexus neurolysis (CPN) is an effective way to treating severe pain in some patients with pancreatic malignancy. Celiac ganglia can be visualized by endoscopic ultrasound (EUS) that allows direct injection into celiac ganglia for neurolysis. We present our pilot data and initial experience in patients with moderate to severe pain undergoing direct CPN for unresectable pancreatic carcinoma.
Materials and Methods: Twenty three patients with narcotic dependent pain who diagnosed pancreatic cancer were selected for EUS-guided CPN. EUS-guide CPN was planned after written informed consent was obtained from the patient. Pain assessment was performed before and after the procedure with visual analog scale. All procedures were performed under the sedation.

EUS-guided CPN was performed with 25 mg of 0.05% bupivacaine and 20 ml of 10% phenol alcohol with 19 gauge needle. On 1st, 15th, 30th and 60th day follow-up, patients rated their therapeutic response as either complete, partial or no response and VAS score.

Results and Discussion: Out of 23 patients were 13 male and 10 female. Two of the patients died before day 60. In 2 patients there was not any pain relief in 15 days after the procedure. In 12 patients there was complete pain relief in first 15 days but till the 30th day severe pain was redeveloped. On 30 day in 8 patients, there was a complete therapeutic response and they did not require any additional analgesics. On day 15, 30 and 60 complete treatment rates (without an additional drug) were 91%, 36,5% and 30%, respectfully. On day 30 and 60, partially treatment rates (with addition of tramadole) were 54,5% and 70%, respectfully.EUS allows for real-time imaging of the celiac space for CPN. EUS-guided CPN is simple to perform and avoids serious complications. In the literature, nearly 50% patients who underwent EUS-guided CPN experienced significant improvement in pain scores allowing for reduction in the pain medication. Also 40% and 30% of the EUS-guided CPN patients had continued benefit at 8 wk and 24 wk, respectively. In our experience, on day 60, complete and partial treatment rates were 30% and 70%, respectfully.

Conclusion(s): We confirm that EUS-guided CPN is safe and effective treatment method in providing pain relief in patients with pancreatic cancer. EUS-guided CPN should be considered as an adjuvant therapy in the management of pain in all patients with pancreatic cancer.

14AP7-1

Postoperative continuous spinal analgesia with levobupivacaine for postoperative pain treatment in orthopedic surgery

D'Ambrosio A., Cinnella G., Spadaro S., Cotoia A., Dambrosio M.
University of Foggia, Department of Anaesthesiology, Foggia, Italy

Background: Continuous spinal anesthesia (CSA) up to now has not been widely used for postoperative analgesia(1), mainly to avoid complications from subarachnoid injection(2). However, the recent introduction of low calibre CSA catheters (Spinocath®), allowed to decrease anaesthetics doses and solution volumes with good analgesia and reduced complications. Aim of this study was to evaluate handling and safety of CSA and to compare two different concentration and volumes of local anaesthetic solution for postoperative analgesia in patients undergoing elective major orthopaedic surgery.

Material and Methods: 32 patients under CSA were randomized to receive postoperative analgesia through the subarachnoid catheter at 1.25 mg/h of levobupivacaine plus Sufentanil 1 mcg/h over 48h. The catheter was inserted to L2-L3 interspace. Patients were randomized to receive two concentrations and volumes of levobupivacaine: 16 received 0.125%-1ml/h ($A_{0.125}$) and 16 received 0.0625%-2ml/h ($B_{0.0625}$). Postoperative pain (VAS score), sensitive and motor function (Hollmen and Bromage scores), hemodynamic and respiratory parameters were recorded for 48 hours after surgery. Side effects were recorded until 96 hours after surgery.

Results and Discussion: CSA provided good postoperative analgesia in both groups throughout the study period. VAS score was ≤30mm in every patient with the exception of 3 patients in Group $A_{0.125}$ and 4 patients in Group $B_{0.0625}$ (NS) who all had the catheter located at L3-L4 interspaces and needed supplementary dose of local anaesthetic at T_{7h}.

Conclusion: CSA with a total dose of 1.25 ml/h of levobupivacaine and opioid produced adequate postoperative analgesia, without significant side effects, independently from levobupivacaine concentration and solution volume.

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14AP7-2

Ultrasound guided popliteal sciatic nerve block vs. multimodal analgesia for postoperative pain control following calcaneo-stop surgery in children

Micic S., Horvat M., Komen Usljebrka H., Frkovic V., Azman J., Poldan Grabar N.
KBC, Rijeka Clinical Hospital Centre, Department of Anaesthesiology and Intensive Care, Rijeka, Croatia

Background and Goal of Study: Calcaneo-stop surgery can be performed with general anesthesia only or combined with sciatic nerve block at popliteal level. Numerous data suggest that ultrasound guided peripheral nerve blocks may improve postoperative pain control after orthopedic surgery.

The aim of our study was to determine whether sciatic nerve block at popliteal level offers better postoperative pain control and lower morphine consumption compared to multimodal parenteral analgesia approach after calcaneo-stop surgery in children.

Materials and Methods: Our study included 32, ASA I-II, aged from 8 to 12 years. Patients were randomized in two groups.

First group (block group, FB group; n=16) received ultrasound guided block of sciatic nerve at popliteal level performed with 0.35% levobupivacaine, 1mg/kg, with adrenaline 1:200 000, in each leg after general anesthesia was induced.

The second group (non-block group, PM group ; n=16) received paracetamol 15 mg/kg iv and morphine 0.1 mg/kg 15 minute before the end of surgery. Every child was premedicated with 0.3 mg/kg midazolam syrup and general anesthesia was induced with propofol 2-3 mg/kg and sufentanil 0.2 μg/kg followed by insertion of laryngeal mask. Anesthesia was maintained with sevoflurane and air (FiO2= 0.4). Numeric rating scale (NRS) was recorded 1, 6, 12 and 24 hours after surgery. If the pain score was 3 or more patient received diclofenac 0.5 mg/kg intravenously.; pain score was 6 or more morphine 0.05 mg/kg intravenously was added.

Results and Discussion: Patients in FB group had significantly lower ($p < 0.05$) NRS 1, 6 and 12 hours after surgery compared to non-block, PM group. There was no statistically significant difference in pain scores between groups 24 hours after surgery. Total twenty four-hour morphine and diclofenac consumption were statistically significantly lower in block group (0.012 mg/kg vs. 0.06 mg/kg and 0.670 mg/kg vs. 1.94 mg/kg).

Conclusion(s): Ultrasound guided popliteal sciatic nerve block markedly reduces the requirement for postoperative diclofenac and morphine consumption and results in lower pain scores during the first 24 hours compared to multimodal parenteral analgesia in children undergoing calcaneo-stop surgery.

14AP7-3

The effect of piroxicam on post-operation analgesia when is used pre-procedure on urology patients

Gani H., Kerci M., Ohri I., Naco M., Beqiri V.
University Clinical Centre ‚Mother Theresa', Department of Anaesthesiology and Intensive Care, Tirana, Albania

Background and Goal of Study: Treatment of acute post-operative pain needs to be multidimensional. Piroxicam is a non steroid anti-inflammatory drug with long half life, as a result preoperative use could improve post-operation analgesia. The Porpuse of this study is to analyze the effect of Piroxicam on post-operative analgesia and the difference on the need for post-operation pain killers when Piroxicam is given on different time periods.

Materials and Methods: After the Ethical committee approval. Patients are randomly and double blinded selected.The participant are 120 patients(pts) that had undergone urology surgery, ASA I-II with endotracheal (AE) anesthesia.

Pts. are divided on three groups and each group (G) has 40 pts. Two hours pre-operatively pts received 20mg piroxicam. Second group has 40 pts, the same time with the start of the anesthesia pts of this group received 20mg of Piroxicam. And the third group that has 40 pts received 20mg Piroxicam, one hour post surgery.

Results and Discussion: Pain was evaluated with VAS Pain scale and the pain score was significantly lower on the G 1 compared with G2 and G3(P,0.001) va2.71,vs4.32,vs 6.72. Group one needed analgesic for longer period of time compare with G2 and G3. G1 needed analgesic for 147min, G2 needed for 112 min and G3 needed for only 31min.Same pts from the three groups required analgesic more than the average, and they were 9pt from G1, 15pt from G2, and 16pt from G3.

No one from G1, G2 or G3 presented with side effect from Piroxicam.

Conclusion(s): Use of 20mg Piroxicam 2 hours pre-operation reduces pain score and the time that pts required analgesic post-operation compare with the use of Piroxicam starting the same time with anesthesia or one hour post-operation.

References:

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2. Journal ArticlePreoperative diclofenac sodium reduces postlaparoscopy pain, Lars E. Gillberg

14AP7-4

Continuous local anaesthetic wound perfusion provides adequate analgesia in ultra fast-track recovery after cardiac surgery

Soler M., Flo A., Santos L., Rodríguez M., Sariñena M.T., Moret E.
Hospital Universitari Germans Trias i Pujol, Department of Anaesthesiology and Intensive Care, Badalona, Spain

Background and Goal of Study: The aim of this study was to analyse if adjunctive use of nonopioid analgesics and local anaesthetic wound perfusion facilitates the immediate extubation in the OR, provides adequate analgesia and reduces the ICU length of stay after cardiac surgery.
Materials and Methods: A sequential study over a period of 4 months was performed with 171 patients scheduled for non-complex cardiac surgery: conventional without FT (G1) and ultra FT (G2). Premedication was performed with midazolam (10μg/Kg) and fentanyl (1-2μg/Kg) IV, inhalation induction with sevoflurane 2% and endotracheal intubation with rocuronium (0.6mg/Kg) IV. Opioid doses used were: in G1 fentanyl (900-1500μg) and in G2 remifentanil (0.15-0.3 μg/Kg/min) IV. At the end of ECC in G2 morphine (1-1.5mg/10Kg), dexketoprofen 50mg and metamizol 2g IV were administered and a multiperforated catheter was placed in the median sternotomy incision site; a 10ml bolus of bupivacaine 0.5% was administered at the end of surgery followed by an elastomeric infusion pump (rate of 5 ml/h of bupivacaine 0.375%) for 48h postoperatively. G2 patients were immediately extubated in the OR. G1 patients were moved under continuous propofol infusion to the ICU and were extubated according to ICU protocol. Chest pain was measured by using a numeric visual analogue scale (VAS), (0=no pain-10=worst pain) at different times. After extubation all patients received nonopioid analgesia and morphine bolus according to protocol if VAS>4. Opioid requirements and ICU length of stay were also recorded.
Results: 171 consecutive patients were included (G1=79 / G2=92). Both groups were comparable regarding demographics and comorbidities. Between G1 and G2 there was a statistically significant difference ($p< 0.05$) in postoperative intubation hours (7.5±4/0h) and length of ICU stay (83.6±81.9/47.4±34.5h). There was no statistically significant difference in VAS scores and in morphine requirements (1.3±2.5/1±1,9mg) during the following 48h between both groups except a statistically significant reduction in VAS 8 and 12h post extubation in G2.

VAS	Post-extubation	1st h	2nd h	3rd h	4th h	8st h	12th h	24th h	48th h
G1	4.2±3	3.2±2.7	2.9±2.3	2.4±2.1	2.5±2.3	2.6±2.3	2.4±1.9	1.9±1.8	1.6±2
G2	3.2±2.7	3.1±2.8	2.9±2.4	2.3±2.2	2.3±2.3	1.6*±1.8	1.3*±1.8	1.3±1.7	1.1±1.2

[Table 1]

Conclusion(s): The use of a continuous bupivacaine infusion of the median sternotomy incision site allows immediate extubation, provides adequate analgesia and decreases the ICU length of stay after adult non complex cardiac surgery.

14AP7-5

The transversus abdominis plane block versus spinal morphine for postoperative analgesia after caesarean delivery

Ayedi M., Smaoui L., Abidi S., Smaoui M., Jarraya A., Kolsi K.
Hopital Hedi Chaker, Department of Anaesthesiology and Intensive Care, Sfax, Tunisia

Background and Goal of Study: Spinal morphine is an effective analgesic technique for analgesia after cesarean delivery (CD) [1], but it is punctuated with side effects. Recently, the transversus abdominis plane (TAP) block has been studied for analgesia after CD and was effective compared to placebo [2]. The purpose of this study is to compare the analgesic efficacy of TAP block to spinal morphine after CD.
Materials and Methods: In this prospective, double-blind study, sixty women undergoing elective CD were randomized to undergo either subarachnoid morphine (group SAM; n = 30) or TAP block (group TAP; n = 30). Patients received bupivacaine spinal anesthesia combined with morphine 0.1 mg in group SAM and received saline in group TAP. At the end of surgery, bilateral TAP block was performed using saline in group SAM or using bupivacaine 0.25% in group TAP with 20 mL on each side. Postoperative analgesia for the first 48 hours consisted of scheduled oral paracetamol and rectal ketoprofen; IV nefopam were administered up on patient request. The primary outcome was the difference in visual analog scale pain scores at rest and on movement during the first 48 postoperative hours. Other outcomes assessed were first analgesic request, analgesic consumption, maternal satisfaction, and incidence of adverse effects.
Results and Discussion: The demographic characteristics were similar in both groups. The mean visual analog scale pain scores at rest and on movement until 48 postoperative hours were not different between the 2 groups. Median (range) time to first analgesic request was similar in both groups 24 (12-48) hours in group SAM versus 24 (2-48) hours in group TAP; (P>0.05). Median (range) of nefopam doses received in the first 48 hours was 40 (0-80) mg in group SAM versus 50 (0-80) mg in group TAP (P>0,05). The incidence of nausea and vomiting was significantly higher in group SAM than in group TAP (50% versus 15%; P=0.02 and 33% versus 3%; P=0.03 respectively). More patients developed pruritus in group SAM than in group TAP (40% versus 3%; P=0,01). There were no complications associated with the performance of the block.
Conclusion(s): As part of a multimodal analgesic regimen, the TAP block provided equivalent analgesic efficacy than spinal morphine up to 48 postoperative hours after CD, with fewer side effects.
References:
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14AP7-6

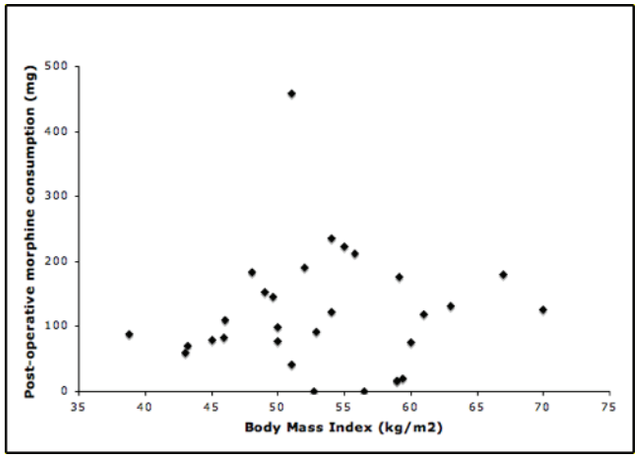
The effect of body mass index on post-operative morphine consumption following major abdominal surgery

Murgatroyd H., Ahmed U., Ismail K.
The Mid Yorkshire Hospital NHS Trust, Department of Anaesthesiology, Dewsbury, United Kingdom

Background and Goal of Study: Previous studies have suggested that because of altered pharmacokinetics and pharmacodynamics, obese patients have reduced morphine requirements following surgery (1). With this study, we aimed to determine whether the post-operative morphine requirement after major abdominal surgery was influenced by the patients BMI.
Materials and Methods: Thirty patients underwent open Roux-en-Y gastric bypass procedures. Postoperative morphine requirements were recorded using a patient controlled analgesia system (2). Postoperative hospital stay was also recorded. The relationship between BMI and morphine consumption was determined using the Pearson correlation. The patients were divided into two groups (BMI < 50 and BMI > 50) and hospital stay and morphine consumption were compared between groups using the Mann-Whitney U test.
Results and Discussion: As shown in table 1, no significant differences in morphine consumption or hospital stay were seen between the two BMI groups (median (inter-quartile range), α: p=0.88, β: p=0.93). The correlation between BMI and morphine consumption is shown in figure 1. The correlation coefficient was 0.03.

	BMI < 50	BMI > 50
N	9	21
BMI (kg/m2)	45.9 (43.2 - 48)	55.8 (52.7 - 59.4)
Morphine consumption (mg)	89 (79 - 146)	118 (41 - 179)α
Post-operative stay (days)	8 (7 - 9)	8 (7 - 9)β

[Table 1: Comparison of two BMI groups]



[Figure 1: Post-operative morphine consumption.]

Conclusion: Despite theoretical changes in morphine metabolism in the obese, we found no correlation between BMI and morphine use in major abdominal surgery.

References:

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14AP7-7

Epidural analgesia following posterior scoliosis correction surgery in adolescents: Double epidural catheter technique with patient controlled analgesia versus continue infusion

Akın Takmaz S., Başar H., Özgün Ç., Özdemir H.M., Sakaoğulları A.
Ankara Training and Research Hospital, Department of Anaesthesiology and Intensive Care, Ankara, Turkey

Background and Goal: Scoliosis correction surgery causes severe postoperative pain. In this prospective, randomized, double blind study patient controlled analgesia was compared to continue infusion in adolescents who had epidural analgesia with double epidural catheter technique following posterior scoliosis correction surgery.

Materials and Methods: 24 adolescents, aged 11-18 years, scheduled for posterior scoliosis surgery were included in the study. At the end of the operation two catheters were positioned in the epidural space with the tips directed to T4-6 and T12-L2 levels under direct vision by the surgeon. Following injection of a test dose, 4 and 6 ml loading doses of study solution (Bupivacaine 0.125%+ sufentanyl 0.2 mcg/ml) were injected into the both catheters for patients under and over 45 kg, respectively. Than the study solution was delivered for 48 hours as continue epidural infusion (5 ml/hr) in Group I and as patient controlled analgesia (Bolus dose; 5ml, lockout; 20 min) in Group II. Pain was assessed using VAS scale at rest (1,2,3,4,6,8,10,12,16,20,24,36,48 hours postoperatively) and at movement (24,36,48 hours postoperatively). Additional bolus dose and morphine requirement, bowel activity side effects, and patient-doctor satisfaction were noted.

Results and Discussion: VAS scores at movement were significantly higher in Group II at 24h and 36h postoperatively (p=0.037, p=0.001). Furthermore, maximum pain scores during at movement were significantly higher in Group II (2.75±0.45 versus 4.08±1.08,p=0.003). Total bupivacain (555.7±123.7 versus 1270.6±433.3,p=0.001) and sufentanyl (89.7±19.5 versus 198.3±76.8,p=0.001) consumption were lower in Group I. Flatus ratio was 83,100 and 100% in Group I and 91,100 and 100% in Group II at 24,36 and 48 hours postoperatively. Bowel movement rates at same times were 15,25 and 75% in Group I and 15,33 and 66% in Group II, respectively. Pruritis and sedation was seen in 1 patient and nause was seen in 2 patients in both groups. Vomiting was seen in 1 and 2 patients in Groups I and II, respectively. Doctor and patient satisfaction scores were higher in Group I (p=0.005,p=0.018).

Conclusions: It was concluded that double epidural catheter technique with continue infusion after scoliosis correction surgery in adolescents was an effective analgesia method which lowered local anesthetic and opioid consumption and which provided more analgesia quality at movement with high patient and doctor satisfaction.

14AP7-8

Oral morphine vs intravenous midazolam premedication for repair of proximal humerus fractures - prospective randomized trial preliminary results

Giuliani E., Ferrari G., Zuccarello L., Magni G., Montagnani G., Tassi A.
University of Modena and Reggio Emilia, Department of Anaesthesiology and Intensive Care, Modena, Italy

Background and Goal of Study: The repair of proximal humerus fractures (estimated at about 5% of all fractures), presents a challenge to the physician, reducing perioperative pain levels not only improves comfort but also helps in the management and care of the patient. The goal of this prospective randomized trial was to assess the impact on pain, measured by Visual Analogue Scale (VAS), of two different premedication protocols.

Materials and Methods: all patients undergoing proximal humerus fracture repair from November 2009 to May 2010 were enrolled, after having obtained proper written consent, to randomly receive one of two different premedication protocols: oral morphine (morphine group) at 0.3 mg/kg or intravenous midazolam at 0.1 mg/kg. All the patients received general anaesthesia. Postoperative analgesia relied on perineural interscalene cervical plexus catheter infusion of levobupivaciane 0.1% at 7 ml/h infusion rate for 72 hours and intravenous morphine Patient Controlled Analgesia infusion and non-steroidal-antiinflammatory-drugs.

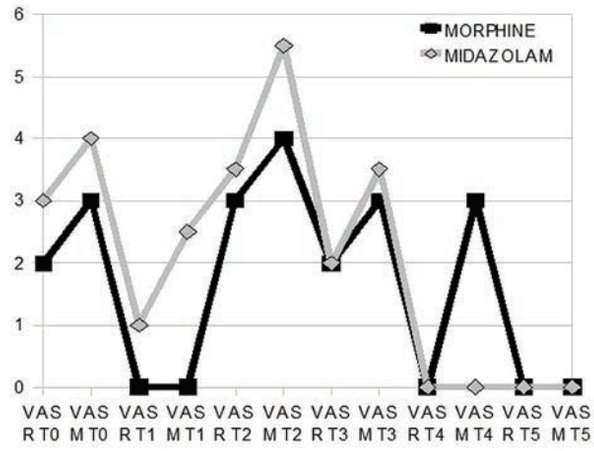
VAS at rest and during movement was measured immediately postoperatively at T0 and every 8 hours thereafter (T1, T2, T3, T4, T5).

Results and Discussion: 17 consecutive patients were included in the study, 9 were assigned to morphine group, 8 to midazolam. The groups were similar according to age, sex and American Society of Anesthesiology Physical Status score. Median VAS values at different time intervals are reported in figure 1. Mann-Whitney test was implemented to compare VAS values distribution in the studied cohorts: a statistically significant difference was reported at T0 at rest (p 0.0332) and at T0 and T3 during movement (p 0.0332 and 0.0263 respectively).

The small number of patients enrolled limits the power of this investigation, however premedication with oral morphine tended to grant a better pain control in the immediate postoperative period than intravenous midazolam as its pharmacological action might suggest, no statistically significant difference was found in the 40-hour follow-up apart from a small difference at T3, of limited clinical impact.

Conclusion(s): Oral morphine premedication can ease postoperative pain, but further research is necessary to measure this effect.

Figure 1 Median VAS values during the perioperative period in the morphine and midazolam groups. VAS R - at rest, VAS M - during movement



[Figure 1]

14AP7-9

Combined spinal versus epidural analgesia with remifentanil-based anaesthesia for colorectal surgery

Malenković V.M., Nedić O., Marinković O., Petković M.
KBC Bežanijska Kosa, INEP, Department of Anaesthesiology, Belgrade, Serbia

Background: The transition from remifentanil intraoperative anaesthesia to postoperative analgesia must be planned carefully due to the short duration of action (3-10 min) of remifentanil. The aim of the study was to evaluate the effect of perioperative administration of two doses of morphine and two types of regional techniques for postoperative analgesia after remifentanil-based anaesthesia.

Materials and Methods: The prospective, randomized study included 30 patients. All patients were scheduled for abdominal colorectal surgery lasting more than 2 h. Morphine in the dose of 0. 2mg with 2, 8 ml 0, 25% bupivacaine applied intrathecally (spinal group, n=15 patients) and 4 mg of morphine with 10 ml 0, 25% bupivacaine applied epidurally (epidural group, n=15 patients) were administered 10 min before induction of anaesthesia. General anaesthesia used remifentanil as the perioperative opioid (1 microg/kg as a bolus then, 0.5 microg/kg as a continuous infusion). In the post anaesthesia care unit, pain scores for patients were evaluated by using behavioural pain scores of 1-3, verbal pain scores of 0-3, and visual analogue scale scores of 0-10. Hormonal and metabolic response to stress were measured according to the serum concentration of cortisol, IL-6, IGF-I and glucose preoperatively, 3h after the end of operation and on the next morning in 8 h. Demographic and surgery characteristics were similar in both groups. The delay of the first demand of supplementary analgesia (NARD) was higher in spinal groups. In the epidural group, the behavioural pain score, the verbal pain score and visual analogue scale pain score were lower 30 min, 3, 12 and 24 hours after

the operation. Extubation time was similar in both groups (5-7 min after close of abdominal wound). The incidence of minor side effects was similar in both groups without postoperative respiratory depression. Hormonal response to stress was lower in epidural group. Hemodynamic stability was similar in both groups.
Conclusion(s): Hormonal and metabolic responses to stress are significantly lower and the recovery of patients undergoing colorectal surgery is notably faster with combined epidural and remifentanil-based general anaesthesia than with the spinal and general anaesthesia.

14AP8-2

Pain in patients with schizophrenia

Nakae A., Hashimoto R., Sakai N., Hagihira S., Shibata M., Mashimo T.
Osaka University Graduate School of Medicine, Department of Anaesthesiology and Intensive Care, Suita, Japan

Background and Goal of Study: Even in severe clinical situations, some schizophrenia patients remain less sensitive to pain. However, the mechanisms involved remain poorly understood. The purpose of this study was to compare pain perception between patients with schizophrenia and a control group.
Methods: A total of 44 patients with schizophrenia, who were diagnosed using DSM-VI criteria, as well as 46 healthy controls, were enrolled in the study. Four patients were excluded due to poor understanding of the required tests. Doses of antipsychotics and chlorpromazine equivalents were noted. A UDH-300 thermal stimulator was used to administer heat stimulation, and a Nipro PainVision pain quantification analysis system was utilized for electrical stimulations. Pain perception was assessed using a visual analogue scale, as well as a short-form McGill pain questionnaire.
Results: There were no differences in age or sex between patients and controls. Patients were less sensitive to warm ($P < 0.01$) and heat pain ($P < 0.005$) stimulation, as determined by Wilcoxon non-parametric tests (Fig). In addition, hot-burning pain sensation scores were significantly less in patients than in controls ($P < 0.0005$: Fig). In contrast, patients were more sensitive to electrical pain stimulations ($P < 0.05$) and electrical pain tolerance ($P < 0.005$). There was no correlation between pain threshold and anti-psychotic drug doses.

Discussion: "Pain" sensations are acquired following unpleasant experiences or through affirmation as a pain sensation from caregivers. Results showed that heat pain occurred under natural conditions, but electrical pain did not. Variations in pain sensitivity, as a result of experimental pain stimulation, could be due to differences in "pain" stimulation induced in conjunction with stimulation, as well as the emotional perspective of pain.
Conclusion: Schizophrenia patients exhibited varying pain sensitivity to experimental pain stimulation.

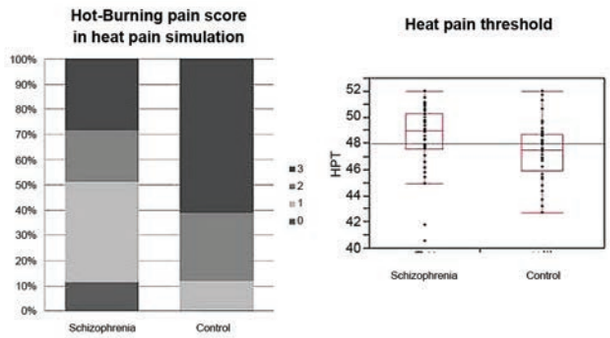


Figure 1. The differences of heat pain threshold and sensation between patients with schizophrenia and controls

[Figure 1]

14AP8-3

Central origin of pinprick hyperalgesia adjacent to a UV-B induced inflammatory skin pain model in healthy volunteers

Rössler B., Paul A., Schuch M., Schulz M., Sycha T., Gustorff B., Vienna Human Pain Research Group
Medical University Vienna, Department of Anaesthesiology and Pain Medicine, Vienna, Austria

Background and Goal of Study: The UV-B model is an up-coming human pain model. Beside primary hyperalgesia pinprick hyperalgesia has been described in a large area of non-inflamed skin adjacent to the sunburn (1). Though typical patterns of secondary hyperalgesia were found, the central origin of mechanical hyperalgesia has not been sufficiently demonstrated and remains controversial (2,3). We hypothesized that pinprick hyperalgesia around a circular spot of UV-B inflamed skin is not reduced by a superficial local anesthetic block and therefore underlies centrally-mediated mechanisms.
Materials and Methods: In 12 healthy volunteers the UV-B model was applied in this prospective, controlled, randomized, and single-blinded study. Before circular irradiation at both thighs a strip of continuous intradermal local anesthetic block (lidocaine) was established via microdialysis fiber perpendicular to one thigh, and compared with the contralateral control side without anesthetic block. Primary outcome was the area of pinprick hyperalgesia in the skin adjacent to the sunburn.
Results and Discussion: Large areas of mechanical hyperalgesia to pinprick surrounding the sunburn developed on both sides after 8 hours without any significant difference between the side of the anesthetic strip showing $7259 \pm 3968 mm^2$ (mean±SD) and the control side ($5910 \pm 2011 mm^2$), ($p = 0.305$).
Conclusions: In conclusion the development of mechanical hyperalgesia surrounding the sunburn was not influenced by continuous peripheral afferent blockade providing further evidence that the UV-B model offers secondary hyperalgesia in addition to its known primary hyperalgesia.
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14AP8-4

The analgesic effects of intrathecal administration with Ro 25-6981 on incisional pain in rats

Ma Z., Jiang M., Gu X., Zhang W.
Affiliated Drum Tower Hospital,Medical School of Nanjing University, Department of Anaesthesiology, Nanjing, China

Background and Goal of Study: Previous researches suggested that N-methyl-D-aspartate receptor 2B subunit (NR2B) may play an important role in the development and maintenance of cancer pain. The aim of this study was to investigate the analgesic effects of intrathecal administration with Ro 25-6981, a selective antagonist of NR2B, in a rat model of incisional pain.
Materials and Methods: Sixty SD rats were randomly divided into 4 groups ($n = 15$): control group (C), incisional pain group (I), intrathecal administration with Ro 25-6981 at the dose of 50.0μg/25μl group (R1), and intrathecal administration with Ro 25-6981 at the dose of 200.0μg/25μl group (R2). In group C and I, 25μl 5% DMSO solvent was injected intrathecally at the corresponding time. Rats model of incisional pain in the right hind was prepared after intrathecal injection in group I, R1 and R2. All rats were anesthetized with sevoflurane. Paw withdrawal mechanical threshold (PWMT) and paw withdrawal thermal latency (PWTL) were tested at 24 h before incision and at 2 h, 6 h, 24 h after incision to evaluate the behavioral changes. And the locomotor functions were also examined at the same time points.
Results and Discussion: Compared with group C and baseline, significant decreases of 50% PWMT and PWTL were observed at each time point after the incisional pain model was established in group I ($p < 0.05$). There were no significant differences in 50% PWMT and PWTL at each time point between group I and group R1. In group R2, significant increases of both 50% PWMT and PWTL were observed at 2 h after incision as compared with group I, ($p < 0.05$), while at 6 h and 24 h after incision there were no significant differences in 50% PWMT and PWTL between group R2 and group I. No significant differences in locomotor functions were observed before and after intrathecal administration in rats.
Conclusion(s): Intrathecal injection with Ro 25-6981 at the dose of 200.0μg, the selective antagonist of NR2B, has significant analgesic effects on incisional pain in rats without affecting their locomotor functions.

14AP8-5

Intranasal application of xenon reduces intra- and postoperative opioid requirement for major abdominal surgery

Holsträter T.F., Adolph O.
Federal Armed Forces Medical Centre Ulm, Department of Anaesthesiology, Ulm, Germany

Background: Both central sensitization after peripheral tissue injury and the development of opioid tolerance involve activation of *N*-methyl-d-aspartate receptors (NMDAR). At sub-anesthetic doses the NMDAR antagonist xenon supresses pain-evoked sensitization of pain processing areas in the central nervous system (CNS). While numerous studies describe the effect of NMDAR-antagonists on postoperative pain, clinical studies elucidating their intraoperative analgesic potency when applied in a low dosage are still largely missing.

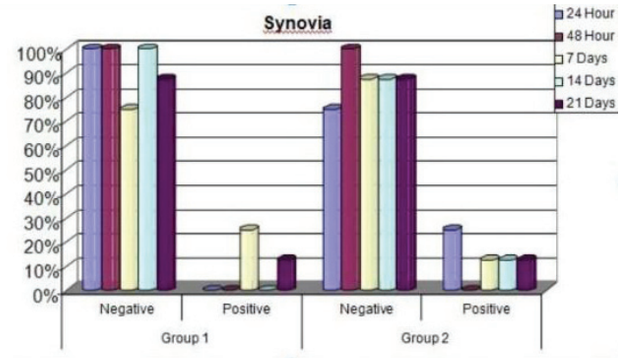
Methods: To analyze the analgesic effect of low dose xenon using new application methods, we tested nasally applied xenon as an add-on treatment for analgesia in 40 patients undergoing abdominal hysterectomy. Therefore we measured intra- and postoperative requirement of opioids within a randomized double-blind placebo-controlled study design. Additionally, we measured time courses of xenon concentrations in blood samples taken from the internal jugular vein to describe the pharmacokinetic of intranasal applied xenon in the cerebral compartment.
Results: Intranasal application of xenon significantly reduced intra- and postoperative opioid requirement without relevant side-effects and reduced patients' subjective feeling of pain evaluated by pain rating scores. Cranial blood concentrations of xenon reached a steady-state of ~500 nL/mL after 10 minutes suggesting an extraneural route for delivery.
Conclusions: Low dose xenon sufficiently reduces intra- and postoperative analgesic use and pain perception. Since NMDAR-antagonists supress central sensitization, prevent the development of opioid tolerance and reduces postoperative pain that cannot be alleviated by opiods, the intraoperative usage of NMDAR-antagonists within a concept of multimodal analgesia is strongly recommended to improve effictiveness and safety of pain management.

14AP8-8

Intraarticular injection of dexketoprofen in rats: Histopathologic assessment of cartilage and synovia

Ekici M., Ozyuvaci E., Akyol O., Sitilci T., Bozkurt E.
Istanbul Education & Research Hospital, Department of Anaesthesiology, Istanbul, Turkey

Background and Goal of Study: Intraarticular drug injection is consider to be a new therapeutic approach for the treatment of pain. Dexketoprofen trometamol is a water-soluble salt of the dextrorotatory enantiomer of nonselective nonsteroidal anti-inflamatory drug ketoprofen The principal effects of NSAIDs are peripheral and local application to the site of injury should produce analgesia while minimizing systemic side effects.. In this study we evaluate and compare the short and long term histopathological changes after direct injection of dexketoprotofen trometamol in the rat joint
Materials and Methods: Dexketoprofen 0.25 ml was injected into the right knee joint and 0.25 ml saline solution into the left knee joint as a control group of total 45 rats. Five rats were sham operated, groups of 8 rats were killed 1., 2., 7., 14., and 21. days after intraarticular injection. All joints were prepared and sectioned for histopathological examination according to the inflammation of articular cartilage, inflamatory cell infiltration, hyperplasia of synovial membrane, erosion of joint surface. Inflammatory changes in the joints were graded according to a five-point scale, histologically.
Results and Discussion: There were no statistically significant histopathologic differences between the saline and dexketoprofen applied joints on the 1., 2., 7., 14., and 21.days ($p < 0.05$). Grade 3 inflammatory changes occurred only in 2 rat joints, in dexketoprofen group at 2. and 14. day after injection.
Dexketoprofen has no inflammatory effect on synovia and cartiladge in the rat joint. Altough it is approved for intravenous and oral use, no toxicological data exist regarding intraarticular administration. Further studies need to be intraarticular usage in humans with safety.
Conclusion(s): We conclude that absence of inflammatory effects after dexketoprofen injection can lead its clinical usage possible for chronic pain management.



[Synovia]

14AP8-9

On the assessment of the area of mechanical hyperalgesia in human pain models

Thaler U., Rössler B., Gustorff B., Vienna Human Pain Research Group
Medical University Vienna, Department of Anaesthesiology, Vienna, Austria

Background and Goal of Study: Experimental pain models are essential to get a better understanding in the pathophysiology and treatment of pain. Different models have been used to induce a cutaneous field of mechanical hyperalgesia., e.g. topical Capsaicin or UV-B exposure. Adjacent to the site of injury, a field of secondary hyperalgesia develops. For the measurement of this field the surrounding skin is pricked with slightly painful pins along radial spokes. Authors differ in methodology concerning the amount of spokes (4 or 8). Pricking along eight spokes is time consuming and possibly not necessary in order to get reliable data for the area of hyperalgesia. In our study we compared different methods of measurement (8 spokes octagon with circle segment, 4 spokes circle, 4 spokes ellipse and circle from a single radius) to test the primary hypothesis that the measurement with a circle of a single radius does not lead to significantly different results compared to the 8 spokes method.
Materials and Methods: This study was performed as a retrospective analysis of 2 former trials previously conducted by the authors (EudraCT numbers 2008-008475-34 and 2009-015780-14). Measurements were conducted after UV-B exposure of the volunteers' thigh in the dermatome L3 using pinprick stimuli (256 mN) on 8 radial spokes. The area of hyperalgesia was identified by a change of percepted stimulus intensity.
Results and Discussion: The area of secondary hyperalgesia showed a size of 8952,95 ± 3177,50mm^2 (mean ± SD) when calculated with a circle from a single radius and a size of 7997,19 ± 2809,72mm^2 using the 8 spokes method ($p < 0,01$). Results from the single radius method did not agree with the 4 spoke circle (8238,19 ± 2853,06mm^2, $p < 0,015$) or the 4 spoke ellipse (8055,63 ± 2915,32mm^2, $p < 0,01$), whereas the 8 spokes and 4 spokes methods showed no significant difference.
Conclusion(s): The most simple and least time consuming method of describing the size of secondary hyperalgesia using a circle calculated from a single radius seems to overestimate the size of the area and is not suitable for general use. The 8 spokes method can be replaced with either a circle or an ellipse calculated from 4 spokes. This will reduce the time of the examination and may help to reduce bias.

Education, Research and Presentation

15AP1-1

European diploma of anesthesiology: The Madrid training center experience

Brogly N., Alsina E., Dominguez A., Gilsanz F.
Hospital Universitario La Paz, Department of Anaesthesiology, Madrid, Spain

Background and Goal of Study: Since 2008, a training for the first part of the European Diploma of Anesthesiology (EDA1) was organized in Madrid with the goal of familiarizing anesthesiologists with this kind of MCQs and prepare them. This observational study was realized to measure the impact of the training on the results of the EDA1 for the course 2010-11.
Materials and Methods: All the participants of the training were included in the study. Stage of practice in anesthesia and geographic origin of the students were noted. In every thematic session, before a didactical correction of the exam sample, participants were asked to answer the MCQ's in the official sheet of the EDA. The results were anonymously analyzed. At the end of the year, we asked for a feed back on the results of the EDA1 in candidates of the training.
Results and Discussion: Forty seven anesthesiologists were inscribed to the training of whom 31(66%) residents (R) and 16(34%) graduated anesthesiologists (GA). 40(85,1%) came from university hospitals, 4 (8,5%) from peripheral hospitals, and 3(6,4%) from other region hospitals. Eighteen (38,3%) anesthesiologists participated to 3 or more sessions (10 (32,3%)R; 8 (50%)GA; p=0,19) and were considered approved for the training.
The scores of the sessions were respectively 59,5 [17;79]%, 69,2 [54,4; 88]%, 62,4 [47,2; 76]%, 70,4 [69,6; 81,6]%, 70,4 [58,3; 79,1]% in physiology and anatomy, pharmacology, physics, general anesthesia and specialized anesthesia (p< 0,0001), with greater scores in pharmacology, general anesthesia and specialized anesthesia compared to the others. Setting a pass mark at 70%, the ratio of approval would be 14,7%, 46,4%, 11,8%, 33,3% and 53,8% in each topic.Eleven student of the training who presented to the EDA 1 exam in Madrid gave us their result, and 8 passed (72,7%). These results tend to be higher than those of the rest of candidates in Madrid (41,5%) (p=0,07) and might be better than the overall European pass rate (58%).
Conclusion(s): Spain does not dispose of a final theorical exam to check anesthesiologists' knowledge. The organization of a training for the EDA1 seems to be an efficient way to prepare candidates to the exam. This effort is expected to promote an increasing number of candidates with higher scores and pass rate in Spain in the next years. The final results compared with the European pass mark are probably overstimated due to a low rate of answer from candidates to the post-EDA1 survey.

15AP1-2

Looking for the ideal anaesthesiologist: 3 different points of view

de Paz Rodríguez S., Moret E., Monerris M., Franco T., Canet J.
University Hospital Germans Trias I Pujol, Department of Anaesthesiology, Badalona-Barcelona, Spain

Background and Goal of Study: Professionalism is a combination of knowledge, skills and attitudes. The aim of this study was to analyse the different points of view of surgeons, nurses and anaesthesiologists about the global attributes that the ideal anaesthesiologist should have.
Materials and Methods: We surveyed 50 anaesthesiologists, 50 surgeons and 50 nurses of all grades at our tertiary university hospital by using a voluntary and anonymous questionnaire. Participants were asked to rank from 10 to 1 the ten most important attributes of the ideal anaesthesiologist out of 13 choices previously defined by the authors. Additional suggested attributes or comments were also encouraged to be added.
Results and Discussion: 150 questionnaires (50 in each group) were recorded and analysed. The following table shows the global top five, most popular answers in means of responses:

	Surgeons N=50	Nurses N=50	Anaesthesiologists N=50	All Responses N=150
Keeping calm under pressure	7.62	7.02	7.28	7.31
Teamwork	7.08	7.56	5.68	6.77
Technical skills	7.02	5.90	6.50	6.47
Methodological/systematic working	6.06	4.64	7.42	6.04
Update of clinical knowledge	5.02	4.64	6	5.22

[Top 5 anaesthesiologists' attributes]

The top five attributes were common among surgeons and nurses, but anaesthesiologists considered "knowing their own limits" to be more important than "teamwork". The 3 attributes with the global lowest scores were "taking into consideration the patients' opinion", "to be a leader" and "residents and students education". Additional comments added were to have more empathy among the staff members, as well as to be present during the whole surgery and to have more silence in the OR. Nurses wished to be more involved in taking decisions.
Conclusion(s): The survey was very well accepted and generated much discussion amongst our colleagues. The 3 most valuated global attributes of the ideal anaesthesiologist were keeping in calm under pressure, teamwork and technical skills. Surgeons showed a more homogeneous opinion in terms of anaesthesiological professionalism compared to nurses and anaesthesiologists.
Acknowledgements: We would like to thank all colleagues at HUGTiP for participating in this survey.

15AP1-3

Factors associated with burnout syndrome amongst anesthesiologists

Libert N., Mion G., Doppia M.A., Journois D.
HIA Val de Grace, Department of Anaesthesiology and Intensive Care, Paris, France

Background and Goal of Study: Burnout occurs frequently amongst healthcare professionals. Recent works have shown an association between burnout and suicidal ideations, decreased quality of life and increased medical errors. For anesthesiologists, data are poor. To improve our knowledge in our specialty, we investigated factors associated with burnout among anesthesiologists.
Materials and Methods: Practitioners recorded at the French Society of Anesthesia and Intensive Care (SFAR) were invited by mail to answer a survey published on the website of the SFAR in 2009 (www.SFAR.org). It collected demographic data, data on workload and the rest for safety, a burnout score (Maslach Burnout Inventory with 3 dimensions: emotional exhaustion, depersonalization and reduced personal accomplishment), data on mental and physical health, items related to the experience of work and personal life. The diagnosis of severe burnout was retained if 1 of the 3 dimensions' score was high. Variables with p≤0.1 were included in logistic regression (1 for global burnout and 1 for each dimension). This was completed with factorial analysis.
Results and Discussion: 1014 anesthesiologists completed the questionnaire. The median age was 49, 63% were male and 37% female, 40% worked in a university hospital, 36% in a private institution, 15% in a general hospital. 60% where in burnout for at least 1 dimension. 36% had poor accomplishment, 36% severe depersonalization and 22% severe exhaustion. In logistic regression, burnout was associated with evaluation of private life, of work, of fatigue and feeling guilty to take rest for safety. Poor accomplishment was associated with age, being divorced, evaluation of work and private life, entertainment and being guilty to take rest for safety. Severe depersonalization was associated with non clinical activity instead of rest for safety, evaluation of work, coffee consumption, self-evaluation of fatigue, feeling guilty to take rest for safety, positive depression screening and having being sued. For exhaustion, being divorced, being married, evaluation of work, hobbies, age, self-evaluation of fatigue, anxiety, positive depression screening, being Pr and suicidal ideations were associated with burnout.
Conclusion: In our speciality, burnout is associated with several factors. Factorial analysis identified 5 profiles of anesthesiologists: quiet, tonic, married to work, stressed and on the brink of the abyss.

15AP1-4

Are we at risk of burnout? A study among anaesthesiologists of a Portuguese hospital

Pereira M., Cavaleiro C., Sá S., Frada R., Aragão I.
Centro Hospitalar do Porto, Department of Anaesthesiology and Intensive Care, Porto, Portugal

Background and Goal of Study: Burnout defines a state of physical and mental exhaustion commonly seen in health care professionals. It can be measured by Maslach Burnout Inventory (MBI) questionnaire (three subscales: emotional exhaustion (EE), depersonalization (DP) and reduction of personal accomplishment (RPA)). Burnout was already studied among Portuguese anaesthesiologists, with unexpected high scores. The aim of this study

was to assess the risk of burnout among anaesthesiologists of our hospital and to identify the main drivers of the three dimensions of the syndrome.
Materials and Methods: We used self-reporting questionnaires to assess burnout syndrome and personal, work, organizational and social characteristics of a group of anaesthesiologists. The relationship between analysed variables and burnout syndrome was measured using the Pearson's correlation test. Cronbach's Alpha was calculated to evaluate internal consistency. We considered statistical significance for $p < 0.05$.
Results and Discussion: The population was 95 anaesthesiologists. The participation rate was 99% (n=94). We found correlation between EE and the number of hours after which people feel tired (-0,246; p=0,019); satisfaction with work conditions (-0,419; p=0,001); conflicts with surgeons (0,258; p=0,013); health status (0,324; p=0,02); have been sick the previous year (0,304; p=0,003); felling depressed (0,506; p< 0,001); practicing sports (0,295; p= 0,004) and not having an hobby (0,229; p=0,028). DP was correlated with age (-0,209; p=0,046); not doing urgency service (-0,232; p=0,026) and taking sedatives or antidepressant drugs (0,255; p=0,014). RPA was correlated with satisfaction with work conditions (0,242; p=0,020); practicing sports (0,228; p=0,029) and not having an hobby (- 0,221; p=0,035).The mean values for EE, DP and RPA were 19,67 (SD 9,46); 6,61 (SD 5,62) and 36,18 (SD 6,75). The mean value of MBI was 62,72 (SD 13,05).The highest level of EE, DP and RPA was observed in 26%, 18% and 19% respectively. Of all the studied population, 41% scored high grade in at least one of the dimensions and 3% scored high grade simultaneously on all three subscales of MBI. The values of Cronbach Alpha were 0,89 for EE; 0,80 for DP and 0,83 for RPA.
Conclusion: In significant contrast with data already published concerning Portuguese anaesthesiologists, we found a reduced percentage of EE, DP and RPA. Our study main strength is its high rate of responders and internal consistency.

15AP1-5

Anesthesia employees' satisfaction after three years of continuing optimization of the intrahospital pain management

Bornemann-Cimenti H., Wejbora M., Michaeli K., Foussek C., Maier C., Sandner-Kiesling A.
Medical University Graz, Department of Anaesthesiology and Intensive Care, Graz, Austria

Background and Goal of Study: Since 3 years, the Medical University of Graz runs a project for optimizing its intrahospital pain management. During this project, two surveys were conducted for assessing the anesthesia employees' satisfaction with this optimization.
Materials and Methods: From September to November 2009 and 2010, the same questionnaire was sent to anesthetists and nurses working in the post-anesthesia-care unit at the Department of Anesthesiology of the Medical University of Graz. Participants were asked to evaluate their abilities in pharmacological and non-pharmacological pain management, the knowledge of the other profession, the communication within and between the two professions, the satisfaction with offered training-programs, and their over-all-satisfaction with the optimized pain management. The answers were given on a 6-point Likert-scale, with 1 = excellent and 6 = insufficient.
Results and Discussion: In 2009, the return rate was 75% (n=31) for the nurses and 89% (n=41) for the anesthetists. In 2010, the return rate was 100% (n=14) for the nurses and 75% (n=33) for the anesthetists.
Nurses rated all categories between excellent and good. In contrast, anesthetist rated all categories between good and average. Noticeable were the low values for the knowledge in non-pharmacological pain management (2.9±1.1), and for the satisfaction with training and education (2.8±1.3). In both groups, there was no significant change between the two surveys.
Conclusion: Our results showed that anesthetists feel more unsatisfied with the pain management than nurses. Strategies for optimizing pain management applied during one year between the two surveys failed in increasing the physicians' satisfaction.
Potential reason for these disappointing results could be that the optimization period of one year was to short, considering that our clinic contains 150 anesthetists and 120 nurses. An other reason could be that anesthetists hesitate to get too involved in this project being afraid of loosing their liberty to make therapeutic decisions.

15AP2-1

Quality of anaesthesiology-related information on the Internet: A systematic review

de Boon W.M.I., ter Horst K.W.
Academic Medical Center (AMC) at the University of Amsterdam (UvA), Faculty of Medicine, Amsterdam, Netherlands

Background and Goal of Study: Up to 50% of anaesthesiology patients use the Internet to search for medical information [1,2]. The majority of this group (>95%) rates online information as average to good [1,2]. We aimed to describe the quality of anaesthesiological information on the World Wide Web.
Materials and Methods: Until May 2010, MEDLINE and EMBASE entries were identified by keywords ‚internet' and ‚anaesthesia' and ‚resource' or ‚information' or ‚consumer health information' or ‚knowledge' or ‚health education'. Studies (n=214) were evaluated by two reviewers independently and included only if they described original data and used quantitative Quality Scores for online information. Methodological quality was assessed using two scales (EBLIP and [3]). Information on methodology, Quality Score and results were extracted.
Results and Discussion: Seven studies (conducted between 2003 and 2008) were included, evaluating a total of 793 websites. Methodological quality of the studies ranged from insufficient to good. Overall, quality of information was rated bad. None of the studies rated >25% of websites as good. All studies did recognize at least one quality website. We could not pool data due to lack of methodological quality of some studies and the use of different Quality Scores for website assessment. As Internet content is frequently updated, our findings may not represent current quality status. Nevertheless, we believe these findings should alarm physicians and researchers to pay attention to patients' Internet use.
Conclusion: Available evidence suggests that quality of anaesthesiology-related information on the Internet is bad, whilst the majority of patients believes it to be average to good. Further research is needed to assess quality of information for non-English speaking patients as well as the effect of Internet information on patients' decision making. Physicians should discuss patients' Internet findings and recommend websites with good quality information.
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15AP2-2

Is Fraud detection in scientific anaesthesia papers possible by using a method of financial auditors?

Hein J., Schuepfer G.K., Konrad C.
Kantonsspital Lucerne, Department of Anaesthesiology and Intensive Care, Lucerne, Switzerland

Background and Goal of Study: Problems of fraud in science are attracting increased attention, but they have always been with us. Scientific fraud is a disastrous phenomena that also has reached the anaesthesia community. The borderline between subconscious selection of data and out-and-out distortion is a fine one.
Detection of falsificated data remains important for real scientific progress.
Materials and Methods: 21 articles of Scott Reuben (SR) were retracted by the editors due to proven falsification. In the field of financial auditing statistical methods are used to detect fabricated data or fraud. 15 of 21 of the retracted articles were available for analysis using the Benford distribution of numbers (Benford's law). This procedure is well accepted as a screening tool for possible fraud in accountancy and bookkeeping. The aberrance form the expected frequencies for numbers as defined by the application of Benford's law was assessed by using a chi2 test.
Results and Discussion: Data of 15 falsificated data of SR were included. When assessing for aberrance of the expected frequencies of the first and the second digit the following results were obtained:
First digit: 4 /15 differed statistically significant from the expected distribution
Second digit: 14/ 15 differed statistically significant from the expected distribution. Combining the two analysis all but 1 article were suspicious for inconsistency with Benford's law when the articles where analysed seperatly. In summarised analysis of all 15 articles the first digits (a total of 2415 digits) were not statisticaly significant from the Benfords distriubation of numbers, but the seconds digits (n=1340) deviated significantly from the expected distribution as discribed by Benford (p< 0.001). 13 of 15 articles violated the probabitlies

for paired digits also!
Conclusion(s): Applying Benford's on the assessment of the presented digits (numbers) in the retrieved articles known as fabricated and therefore withdrawn by the editors, resulted in a astonishing evidence for falsification when the financial auditing method by using Benford's law was applied. Further studies are needed to evaluate the power of this method to detect fabricated data in the field of medicine. To our knowledge, this is the first time that results of this method for anaesthesia research papers are reported.Fraud detection using statistical methods is a post hoc strategy, being applied after fraud prevention has failed.

15AP2-3

Evaluation of the BreatheSafe scope trainer

Bell S.F., Davies N., Wilkes A.R., Lim M., Stacey M.R., Hodzovic I.
Cardiff University, Department of Anaesthetics, Intensive Care and Pain Medicine, Cardiff, United Kingdom

Introduction: Simulators are a recognised fiberoptic scope training tools[1]. The BreatheSafe Scope Trainer is a ‚choose a hole' trainer that consists of either seven or nine 6cm long segments, each containing an aperture for endoscope passage. The difficulty of the task is varied by manipulating the position of the holes and the overall three dimensional shape of the trainer. There is no data available that relates trainer shape and hole position to endoscopy difficulty. This study aims to evaluate four trainer positions in order to rank the task difficulty.
Method: We invited 48 anaesthetists to take part in this randomised crossover study. Four BreatheSafe scope trainers were set up in an S-shape to simulate the airway contour. In order to alter the difficulty of the task we varied the alignment of the internal holes for each trainer. Task completion time was defined as the time taken to pass the fiberscope through all the segments of the trainer. A failure was defined as the task completion time > 300s. Participants were asked to grade the ease of each task on a visual scale (0 mm = extremely difficult, 100 mm = extremely easy) and select the task they found the hardest. Repeated measures ANOVA and Friedman test were used to analyse continuous data, Chi Squared and Cochran Q test to analyse categorical data (SPSS v 16).
Results: Forty-eight anaesthetists took part in the study. The median [range] anaesthetic experience was 10 [1 - 26] years. The main findings are summarised in the table. V*alues are mean (SD), median [IQR] and number (%) as appropriate.* n = 48.

	Task 1	Task 2	Task 3	Task 4	p value
Task time (s)	82 [56 - 113]	98 [70 - 119]	108 [87 - 166]	204 [176 - 248]	<0.001
Success	45 (94%)	46 (96%)	40 (83%)	19 (40%)	<0.001
Ease of use (mm)	61 (21)	58 (23)	47 (23)	20 (17)	<0.001
Hardest task	2 (4%)	2 (4%)	4 (8%)	40 (84%)	<0.001

[Evaluation of the BreatheSafe Scope Trainer.]

Discussion: Our findings suggest that four specific orientations of the internal holes within the BreatheSafe scope trainer can be used to grade the level of task difficulty. This information can be used to rationalise training with this device and assess fiberoptic manipulation skills. More research is planned to determine if this training approach translates effectively to the clinical environment.
Reference:
1. Naik VN et al. Anesthesiology 2001; 95: 343 - 8.

15AP2-4

Non-technical skills in a technical era: Are we ready to "evolve"? An analysis of anesthetists' perceptions of NTS

Gasperini C., Chiaramonte G., Burgio G., Piazza M., Torrini M., Bressan F.
University of Florence, CESPRO, Florence, Italy

Background and Goal of Study: Experts believe that non-technical skills (NTS) play a crucial role in health care quality and safety. However, they are often disregarded in medical education in Italy. Safety climate questionnaires can be useful in identifying areas of major inadequacies. We prepared a questionnaire to be given to anesthetists attending a national course on NTS applied to critical medical settings, in order to investigate anesthetists' perceptions of how NTS are applied in their everyday medical activities.
Materials and Methods: The questionnaire was designed from examples of safety climate investigating methods (1,2), focusing attention on non-technical skill areas, such as situation awareness/safety attitude (SA: 8 items); team working (TW: 10 items); leadership attitudes (LA: 7 items); and communication/feedback (CO: 5 items), as described in the Anesthetists' Non-Technical Skills (ANTS) System. The questionnaire was given before the course. The Likert Scale was used to score each of the 30 items.
Results and Discussion: We collected 230 questionnaires from anesthetists from 7 Italian regions. Data were analyzed according to years of work-experience (>5yrs, 5-15yrs, >15yrs). Data analysis showed strong agreement between anesthetists on TW and CO items. There was greater variability regarding answers to SA and LA items. This suggests different ways of perceiving and practicing leadership, and an incomplete knowledge of the impact that situation awareness has on crisis management. Separate analyses of single items among different levels of work experience revealed statistically significant differences ($p < 0,05$) between the < 15 and >15 years-of-work-experience groups in SA items 1, 6, and LA items 1, 2 & 6.
Conclusion(s): This study shows that Italian anesthetists are not fully aware of the crucial role played by NTS in critical settings. Different levels of work experience still influence attitudes towards NTS, particularly regarding SA and LA, while CO and TW are perceived more homogenously. Improvement is needed and could perhaps be achieved through NTS education plans in medical schools and residency programs.
References:
1. Jackson J, Sarac C, Flin R. Hospital safety climate surveys: measurement issues. Curr Opin Crit Care. 2010 Sep 4
2. Sexton JB et al. The Safety Attitudes Questionnaire: psychometric properties, benchmarking data, and emerging research. BMC Health Serv Res. 2006 Apr 3;6:442

15AP2-5

Effect of feedback on novices learning in-plane technique for ultrasound guided interventional procedures

Sultan S.F., Mccarthy D., O'donnell B., Iohom G., Shorten G.
Cork University Hospital, Department of Anaesthesiology and Intensive Care, Cork, Ireland

Introduction: The key requirement for successful regional anaesthesia is to ensure optimal distribution of local anaesthetics around nerve structures. This is most effectively achieved under sonographic (US) visualization. US imaging requires the acquisition of an entirely new set of skills.
Objective: Our goal was to evaluate the effect of two levels of feedback on novices learning in-plane technique of US guidance; to check for retention of skills and to identify factors and behaviors that can help structure US guided training programmes.
Methods: This was a prospective, randomized, comparative, interventional study. All participants received a didactic tutorial on the US machine and the tasks in the form of a video. They were randomized to 3 groups: No Feedback (control), KR (Knowledge of Results) and KP (Knowledge of Procedure). Participants were asked to perform a series of tasks 5 consecutive times on a gelatin model with an embedded target structure

1. Orientation of probe
2. Identification of the target and the depth of target in the model
3. Color-flow analysis to rule out a blood vessel
4. Insertion of a needle using in-plane technique towards the target, keeping shaft and tip of needle in view at all times
5. Aspiration and injection of fluid around target under direct vision
6. Advice(KP) was given in the form of a video, following each error

Non-orientation of the probe

- Wrong orientation of the probe
- Needle being advanced while not visualized in the US image
- Insertion of the needle out of plane of the US beam
- Failure to recognize the needle had contacted the endpoint
- Failure to aspirate before injection
- Inappropriate spread of injectate
- After a time interval of 24 hours the students were videotaped performing the same set of tasks twice. Two blinded assessors marked the videotapes. Outcome measures included imaging time (IT), needling time (NT) and performance time (PT) in seconds and error rate (ER).

Results: Out of the 30 planned, 15 students were recruited to date, 5 in each group.The video assessments are ongoing.Table 1

End of Learning Phase Results	Control	KR	KP
IT	69.25	38.75	47.2
NT	99.75	36	83.6
PT	169	74.75	130.8
ER	18	24	1

[Table 1]

Conclusion: The KR group had a decrease in PT but no decrease in ER, the KP group has a decrease in PT and ER when compared with the control p=0.0023 and KR p=0.0025.

15AP2-6

Evaluation of clinical skills in basic life support 12 months after taking a course

Fontanals J., Magaldi M., Carrero E.J., Montserrat T., Tercero F.J.
Hospital Clinic de Barcelona, Universitat de Barcelona, Department of Anaesthesiology and Intensive Care, Barcelona, Spain

Background and Goal of Study: Evaluation of the clinical skills acquired in basic life support (BLS) one year after taking a course.
Materials and Methods: Eighty doctors/ nurses received a theoretical - practical course both on BLS and automated external defibrillation (AED), accredited by the Consell Catala de Resuscitacio and the European Resuscitation Council (ERC), and included in a Critical Care Master Course at Barcelona University School of Medicine. Twelve months after the course we evaluated the acquired BLS clinical skills by 36 randomly selected master attendants. Evaluation of both the BLS sequence and clinical skills were made during a simulated 2 reanimators cardio respiratory arrest of a primary cardiac origin. Evaluation was made by the same instructor both during the simulation and analyzing each individual item along a recorded film of each case.
Results and Discussion: One out of 18 groups made the whole BLS sequence and manoeuvres in the right way. In the rest of the groups the main errors were:
1) 95,5 % did not evaluate the security of the situation;
2) 66,7 % did not make the call for immediate help;
3) although 100% called 112, 50% did it before assessing the cardiopulmonary arrest;
4) 33.3 % did not open the airway or did not establish an adequate ventilation.
The rest of the items and clinical abilities in the sequence were correctly performed in 90% of the cases.
Conclusion(s): The skills involving the BLS not correctly performed one year after taking a BLS course were related to the calls for help, the security and the airway management. These results suggest that annual recertification is strongly necessary for participants in BLS courses.

Patient Safety

17AP1-1

Patients' awareness of anaesthesia: Is it qualitative and comprehensive?

Usas E., Macas A., Paplauskaite K., Silinskyte L.
Lithuanian Health Sciences University Hospital, Department of Anaesthesiology, Kaunas, Lithuania

Background and Goal of Study: The preanaesthetic visit by an anaesthesiologist, respect for patient and face-to-face interview is a simple and effective way to determine patients' expectations of appropriate, safe and high quality medical service. Goal of the study was to evaluate whether information provided about anaesthesia is comprehensive and of good quality and to assess how patients perceive knowledge gained about the most important details of anaesthesia.
Materials and Methods: Anonymous questionnaire consisted of 14 closed and 6 open questions for quality assessment of patients' information gain after the preanaesthetic visit. In this study, the quantity of information provided to patients and their knowledge regarding anaesthesia were evaluated. The study included patients who were scheduled to undergo elective surgery with endotracheal, spinal or intravenous anaesthesia. The analysis of open questions did not involve the patients to whom spinal anaesthesia was applied. For data analysis, PASW® Statistics 18 software was used.
Results: 367 (89.5%) patients were enrolled into study: 200 women (54.5%) and 167 men (45.5%). Patients reported having been informed of the following: 278 (75.7%) - the type of anaesthesia, 267 (72.8%) - how the procedure will be performed, 216 (58.9%) - the duration of anaesthesia, 237 (64.6%) - possible complications, 233 (63.5%) - postoperative period. The mean duration of preanaesthetic visit was 9.8±4.8 min. The patients whose anaesthesiologist visit took longer than 5 min considered that more comprehensive information was provided to them (p=0.005). 59.2% of the patients were not aware of postoperative pain, 56.3% - awakening after anaesthesia, 54.2% - why they could not eat and drink before anaesthesia, 53.4% were not able to mention any possible complications related to anaesthesia. 207 (87%) patients were satisfied with anaesthesia care and would not like to change it, 31 (13%) patient would like to get more information about applied anaesthesia.
Conclusion: The quantity of provided information about anaesthesia and its perception directly depend on the duration of preanaesthetic visit. Most of the patients lack knowledge about the awakening after anaesthesia, postoperative pain and complications related to anaesthesia, despite that, from their point of view, the awareness of anaesthesia is qualitative and the improvement of anaesthesia care is not required.

17AP1-2

Quality of handover of patients to the postanaesthetic care unit staff

Nagdeve N., Kada Venkata K.
Antrim Area Hospital, Department of Anaesthesiology and Intensive Care, Antrim, United Kingdom

Background: Postoperative handover involves transfer of information of patient's state & care by anaesthetist to postanaesthetic care unit (PACU) staff. Effective handover is essential for continuity, quality and safety of patient's care.
However failure to transfer essential information to PACU nurse is not uncommon. Kluger et al[1] observed 14% adverse events in the recovery were related to handover failure. The aim of the present audit was to assess the quality of the handover by the anaesthetists to PACU nurses.
Materials and Methods: After local ethic committee approval, a prospective audit was conducted over 2 weeks period without the knowledge of anaesthetists in the department. After postoperative handover, PACU nurses completed a questionnaire about quality of handover. The relevant points of information expected were based upon preoperative health, intraoperative care and postoperative plan.
Results and Discussion: Total 70 handovers were assessed. The patients' age range was 3 -77 years. There were almost equal proportions of ENT, gynaecological and general surgical procedures. The relevant information handed over by anaesthetist is as shown.

Type of verbal information	Yes %
Preoperative medical condition (if applicable)	62
Allergy status (if applicable)	70
Which theatre patient came from?	9
Surgical procedure	78
Anaesthetic technique	71

[Type of verbal information given by anaesthetist]

Anaesthetist is the ideal person for planning of analgesia, antiemetic and intravenous fluid in recovery and 24 hour postoperative period. We assessed these by reviewing ward prescription chart taking into consideration of the type of surgical procedure. The result shown in following table.

Components of postoperative care	Yes %
Prescription of postoperative analgesia	76
Prescription of postoperative antiemetic	67
Plan for intravenous fluid	90

[Postoperative care]

Overall we identified factors that need attention to improve the quality of handover. We also suggest that PACU handover should be a formal and standardised procedure with appropriate documentation such as handover protocol.
Conclusion: The present audit identified that the postoperative handover is often incomplete & there is a need to standardise the procedure.
References:
1. Kluger MT, Bullock MF. Recovery room incidents: a review of 419 reports from the Anaesthetic Incident Monitoring Study (AIMS). Anaesthesia. 2002;57:1060-8

17AP1-3

A prospective audit of multidisciplinary handover (MDHO) of responsibility for patients in the post anaesthetic care unit in a district general hospital (DGH): Patient safety perceptive

Anumakonda V., Doijode S., Bhaskaran S.
Stafford General Hospital NHS Foundation Trust, Department of Anaesthesiology, Stafford, United Kingdom

Background and Goal of Study: "A prospective audit of MDHO of the patients by anaesthetists in recovery units (RU)", at a DGH. This audit was designed to determine compliance to Association of Anaesthetists (AOA) guidance that ‚the anaesthetist must formally hand over care of patients to RU nurse or other appropriately trained member of staff.'
Often the handover (HO) is an informal process.[1,2,3,10] With the introduction of shift-working patterns, HO between doctors and multidisciplinary team members(MDTM)[4,5,6] is pivotal for patient safety and standardisation of information transfer between healthcare professionals.
Materials and Methods: A prospective analysis of 100 anaesthetised patients transferred to the RUs from the theatres between September-December, 2010.The data collected included patient demography, source of admission to RU, operation performed, underlying medical disorder, allergy status, anaesthetic technique, peri-operative course and complications, availability of appropriate drug chart, post operative prescription(analgesic, anti-emetic), documentation of post-operative plan and HO. These data were cross referenced with the electronic HO database from the operative theatres by two anaesthetists. SPSS 16 was used for the data analysis.
Results and Discussion: All patients including day cases had appropriate drug charts accompanied with them to RU (100% compliance)(see Table.1). Surprisingly, only 91% of patients had their allergic status handed over to nursing staff by an anaesthetist. There were more lapses in HO in the afternoon session and those done by junior doctors.
Conclusion(s): This audit highlights over all good quality of HO in post operative RU[9]. However there were short falls in practice which needs to be addressed. HO of allergic status of patients is one of them which can significantly impact patient safety. There is scope for improvement of HO regarding operative details, theatre details, underlying medical disorder, peri-operative course and complications. IsoBAR[7,8] (Identify, situation, observation, background, assessment & recommendation) approach for anaesthetic HO had improved compliance with AoA guidance and standard of patient safety[11]. Dedicated training sessions being organised to ensure a hundred % compliance with the guidelines. We intend to re-audit after 3 months after implementing these changes in the trust.
References:
1). A.FSmith.et.al. Br.J.Anaesth.(2008)101(3):332-337.
2-11) listed

17AP1-4

Implementation of a surgical safety check list increases patients' perioperative safety also from staff's perspective

Böhmer A.B., Wappler F, Tinschmann T., Schwanke U., Bouillon B., Gerbershagen M.U.
Hospital Cologne-Merheim, University Hospital of the Witten/Herdecke University, Department of Anaesthesiology and Intensive Care, Cologne, Germany

Background and Goal of Study: Anaesthesiologists as well as surgical staff, find themselves in a permanent conflict between scarcity of resources, process optimization, and compliance with the necessary safety measures for each individual patient. In recent years, methods have been developed to obtain safety-relevant facts in the operative setting in a standardized manner. The implementation of the "Surgical Safety Check List" caused a significant reduction in the incidence of complications and mortality among patients undergoing surgery (1). A systematic analysis concerning staff members' evaluation has not been carried out to date. The aim of the present study was to evaluate perioperative safety standards and the quality of interprofessional cooperation before and after the introduction of a safety check list from staff members' point of view.
Materials and Methods: A 19-item-questionnaire concerning safety-relevant aspects of the perioperative period, work processes and quality of interprofessional cooperation was developed. Employees' attitude was surveyed before and three months after introducing an adapted form of the "Surgical Safety Checklist". Data were analyzed with students' t-test and are presented as mean values and standard deviations.
Results and Discussion: A total of 71 staff members from both departments completed the questionnaire. After implementation of the check list the cognizance of the names and functions of the individual OR staff members had improved (3.30 ± 0.95 vs. 3.86 ± 0.87; P=0.008). In addition, verification of the patient's written consent for surgery (2.57 ±1.44; 3.91 ± 1.02; P< 0.001), indication for antibiotics before the surgical incision (3.09 ± 1.02 vs. 3.54 ± 0.91; P= 0.04), the quality of interprofessional cooperation (2.66 ± 0.87 vs. 3.40 ± 0.83; P< 0.001) and communication about intraoperative complications (3.24 ± 0.83 vs 3.92 ± 0.76; P= 0.03) were rated more positively. Surgeons were more convinced that all artefacts had been removed (2.26 ± 0.99 vs. 4.39 ± 1.11; P< 0.001).
Conclusion(s): Our attitude surveys demonstrate that from the OR staff's perspective, in the perioperative setting safety-relevant factors can be handled significantly better and with greater awareness by implementing a safety check list as proposed by the WHO.
References:
1. Haynes et al. A surgical safety checklist to reduce morbidity and mortality in a global population. N Engl J Med 2009 Jan 29;360(5):491-9. Epub 2009 Jan 14.

17AP1-5

Are patients too often inappropriately labelled as drug ‚allergic,' and does this change the way we prescribe for our patients?

Laver K., van der Pol J.
Good Hope Hospital, Department of Anaesthesiology and Intensive Care, Birmingham, United Kingdom

Background and Goal of Study: Drug allergies have been a popular recent topic in the media, with focus mainly on accurate recording in medical notes. However, research has yet to look into accurately distinguishing between a drug allergy and drug side effect and the consequences of this on patient prescribing. Drug allergy can be defined as ‚an immunologically mediated reaction, characterised by specificity, transferability by antibodies or lymphocytes, and recurrence on re-exposure' [1], and side effect can be defined as an adverse or secondary effect. The hypothesis for this study was that patients are often incorrectly labelled as drug ‚allergic' when in fact they suffer a side effect, and that this is due to a lack of healthcare professionals' knowledge surrounding the definition of allergy.
Materials and Methods: Anonymous patient and healthcare professionals questionnaires were distributed and re-collected on wards at Good Hope Hospital, Birmingham, UK. Doctors and nurses, and patients having had a previous reaction to a drug were targeted. Questionnaires related to information surrounding the patient's supposed previous drug reaction and healthcare professionals' views on patient allergy labelling.
Results and Discussion: 65% of healthcare professionals felt patients were inappropriately labelled drug ‚allergic', mainly due to lack of awareness surrounding definitions. 43% of patients' ‚allergies' were actually side effects, according to definition. To fully establish the nature of a reaction patients should be immunologically tested, e.g. blood tryptase levels, and undergo drug re-exposure but this is unrealistic due to a lack of resources and time. We therefore rely on the clinical picture of a drug reaction, which is unfortunately both subjective and variable.
Conclusion(s): Patients are often given an incorrect label of being drug ‚allergic' when in fact they suffer with a recognized drug side effect. This has implications on patient prescribing by widening the availability of drug choice in previously diagnosed ‚allergic' patients, further education to improve healthcare professionals' awareness of definitions, and selective immunological testing of patients with likely true drug allergies.
References:
1. Vervloet D, Durham S. Adverse reactions to drugs. BMJ. 1998; 316(7143): 1511-14.

17AP1-6

The change in safety culture associated with the introduction of the five steps to safer surgery

Hill M.R., Gale T.C.E., Alderson L., Roberts M.
Plymouth Hospitals NHS Trust, Department of Anaesthesiology, Plymouth, United Kingdom

Background and Goal of Study: Safety culture has been recognized as an important component in efforts to improve patient safety. The WHO Surgical Safety checklist became mandatory in the UK in February 2009. In the paper by Haynes *et al* (1) the authors hypothesise the checklist will improve patient safety by improving the process and by a change in culture. They note parts of the checklist were omitted and yet there was still an improvement in morbidity and mortality. This raised the question of whether an improvement in culture was the important driving factor underpinning the improvement in patient outcomes. The authors did not assess the culture.

We aimed to assess if there was a significant change in the safety culture associated with the introduction of the five steps to safer surgery, in the orthopaedic theatres of a large teaching hospital.
Materials and Methods: We measured the safety culture of the orthopaedic theatres using the Safety Attitude Questionnaire - Operating room version (SAQ-OR) (2). This was administered using opportunistic sampling before the introduction of the five steps to safer surgery and repeated a year later. The survey was administered to all staff groups within the theatres.
Results and discussion: The response rates were 60 from 75 (80%) and 53 from 72 (74%) before and after the introduction of five steps to safer surgery respectively. The introduction of the five steps to safer surgery had a statistically significant effect ($p < 0.001$) on 5 of 6 domains of the SAQ-OR.

Safety Domain	Pre-intervention 2009		Post-intervention 2010		Statistical significance
	Mean	Standard deviation	Mean	Standard deviation	
Teamwork climate	58.4	17.3	70.9	14.5	p<0.001
Safety Climate	55.8	14.8	67.4	13.8	p<0.001
Job satisfaction	48.8	21.2	64.4	18.1	p<0.001
Stress recognition	77.0	20.9	67.8	23.2	p=0.986
Perception of management	31.4	17.7	45.1	18.5	p<0.001
Working conditions	43.0	22.9	63.5	17.4	p<0.001

[Table 1: Pre- and post-intervention scores]

Conclusion(s): There has been an improvement in the safety culture of the orthopaedic theatres associated with the introduction of the five steps to safer surgery. We are now attempting to demonstrate improved patient outcomes associated with the improved safety culture.
References:
1. Haynes et al A surgical checklist to reduce morbidity and mortality in a global population. NEJM 2009; 360 (5): 491-499.
2. Sexton et al. The Safety Attitudes Questionnaire: psychometric properties, benchmarking data, and emerging research. *BMC Health Services Research 2006;* 6: 44.

17AP1-7

The risk of performing surgical procedures at night

Tordecilla Y., Bartolome A., de las Casas G., Velasco M., Millon M.I., Gomez-Arnau J.
Hospital 12 Octubre Universitario Fundaciòn Alcorcòn, Department of Anaesthesiology, Alcorcòn, Spain

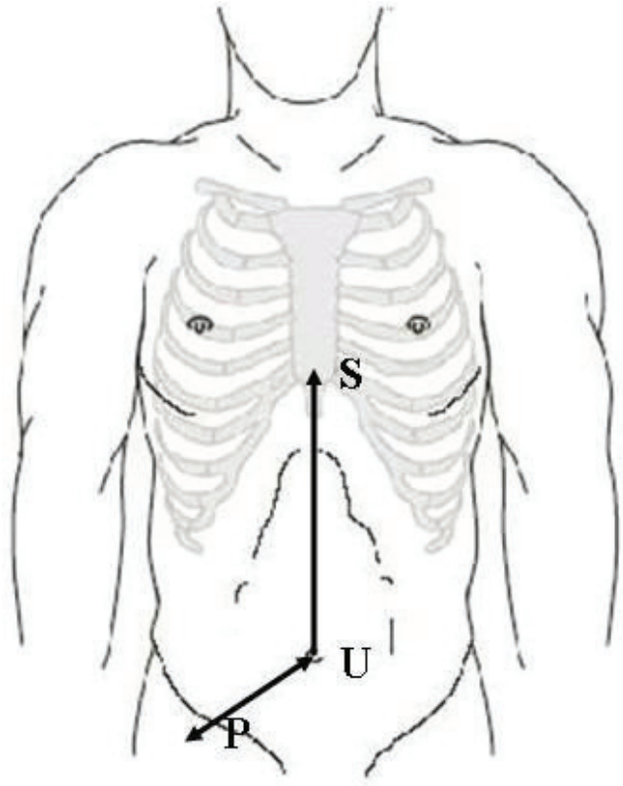
Background: The incidents group initiative aimed at promoting a safety culture in anesthesiology, reanimation and pain treatment settings in Spain belonging to the University Hospital Fundación Alcorcón created a system to communicate and analyze critical incidents in anesthesiology defined as: any incident or event which has caused or could have caused an adverse outcome for a patient.
The hospital`s anesthesiology unit critical incidents` self-report system "SENSAR" keeps records of more than 900 such events in ten years.
Goal of Study: To study the relationship between surgical procedures done at night and critical incidents occurrence.
Materials and Methods: The data on surgery day time of all surgical procedures performed in the hospital from January 2002 to December 2006 were extracted from the general surgical database and the data on critical incidents day time from the SENSAR database.
The number of critical incidents occurred at night were compared to those occurred during day time. A contingence table was drawn to compare surgical procedures with critical incidents to those with no events at night and at day time to obtain odd ratios. Statistical analysis was done with software EpiData 3.1, Chi^2 was used to test statistical significance, a p -value of 0.05 was considered significant.
Results and Discussion: 16378 surgical procedures were performed during the study period and 632 critical incidents were reported. 16038 surgical procedures were done at day time and 340 at night.
There were 576 critical incidents at day time 3.5% and 56 at night 16.4% ($p=0.000$). There was a higher probability of having a critical incident at night OR 5.2 ($p=0.000$).
Conclusions: There is a clear higher number of critical incidents in our hospital when surgical procedures are done at night and although an OR of 5.2 would suggest a higher probability of having such an event at night, no conclusions can be drawn out of these results if a more rigorous statistical analysis is not performed making adjustments for all potential confounders with multivariate methods, however, the anonymous nature of the SENSAR database renders unable to carry out such an analysis.
This is the first approach to analyze our large database and the evidence of the occurrence of more critical incidents in surgeries done at night warrants further investigation.

17AP2-1

Anthropometric estimation of femoral venous cannula length for cardiovascular surgery

Lee Y.-J., Sung T.-Y., Kim D.-K., Kim S.-H.
Konkuk Uinversity Medical Center, Department of Anaesthesiology and Pain Medicine, Seoul, Korea, Republic of

Background: Femoral vein cannulation is an alternative method for central cannulation. However, no clinical guidelines have been established for optimal insertion length of femoral venous cannula.
The purpose of the present study was to evaluate the correlation between the insertion length of femoral venous cannula (L), and the sum of the length from femoral artery (FA) puncture site to umbilicus (P-U) and the length from umbilicus to lower border of the sternum (U-S) as an anthropometric estimation for adult patients undergoing cardiovascular surgery using femoral vein cannulation. We also attempted to determine the insertion length of femoral venous cannula by the patient's height and weight.
Methods: P-U and U-S were measured after anesthesia induction. L was measured after femoral venous cannula tip was positioned at the junction of inferior vena cava and right atrium using transesophageal echocardiography. The relationship between the sum of P-U and U-S (P-U-S), and L was analyzed by Pearson's correlation analysis. Bland-Altman analysis was used to compare the agreement between P-U-S and L. Multiple linear regression analysis was performed to identify the height and weight factors capable of predicting L.
Results: One-hundred study patients were enrolled. P-U-S was highly correlated with L ($r = 0.95$). The bias and precision were -2.60 ± 8.57 mm. L was predicted from height and weight: L (mm) = $0.82 \times$ height (cm) + $1.18 \times$ weight (kg) + 188.46.
Conclusions: P-U-S can be used as a reliable anthropometric estimation of L during adult cardiovascular surgery using femoral vein cannulation.



[Figure 1]

17AP2-2

Anaesthetists' peri-operative knowledge and management of patients with pacemakers, implantable cardiac defibrillators and those requiring external emergency pacing

Schonborn J.L., Hinde T., Gale T.
Derriford Hospital Plymouth, Department of Anaesthesiology, Plymouth, United Kingdom

Background and Goal of Study: Pacemakers and implantable cardiac defibrillators are complex devices which are increasing in diversity and frequency of implantation for expanding indications.
Following peri-operative critical incidents locally and nationally relating to the devices, we completed an audit cycle assessing anaesthetists' knowledge and management of this patient group in September 2007 and July 2010.
The aim of the baseline audit was to promote the MHRA guidelines[1], increase patient safety through identification of generic and specific knowledge gaps and improve competence and confidence in patient management.
The aim of the re-audit was to compare anaesthetists' current knowledge and practice with the initial findings, reflect on the efficacy of our previous implementations and introduce new strategies to improve patient safety.
Materials and Methods: We performed cross sectional surveys in a structured interview format. We based our questionaire on the MHRA guidelines and our objective was to interview face-to-face all anaesthetists in our hospital. Two investigators performed the interviews and answers were stratified according to grade of anaesthetist. The 2007 results were presented both locally and nationally and the 2010 results locally.
Results and Discussion: Our response rate was 74/120 (62%) interviewees in 2007 and 65/102 (63%) interviewees in 2010. 52% of interviewees were aware of our departmental guidelines following their implementation in 2007. These are based directly on the MHRA guidelines. In addition 75% of interviewees were aware of our laminated external pacing instruction sheet. We demonstrated considerable improvements in knowledge gaps across all grades of anaesthetist regarding MHRA recommended management of patients with implanted cardiac devices in 2010 when compared with 2007 and an overall improved confidence and competence.
Conclusion(s): We found evidence of increased knowledge of the 2006 MHRA guidelines following our local guideline implementations and educational sessions. We identified a need for easier access to device information and aim to further increase patient safety with the creation of a patient database and peri-operative pathway sticker.
References:
1. Medicines and Healthcare products Regulatory Agency. Guidelines for the perioperative management of patients with implantable pacemakers or implantable cardioverter defibrillators, where the use of surgical cautery/electrocutery is anticipated.2006.

17AP2-3

Central venous catheter tip position following introduction of a pictorial aid in a structured care proforma

Krzanicki D., Ramachandran N., Kaur K., Poland A., Walker D.
University College London Hospital NHS Trust, Department of Anaesthesiology, London, United Kingdom

Background and Goal of Study: Sub-optimal placement of central venous catheters (CVC) has been linked with a number of complications including catheter associated thrombosis, vessel perforation and cardiac arrhythmia[1]. A retrospective audit from our institution confirmed sub-optimal line placement by radiographic criteria, in 26% of routine CVC placements. As part of a quality care improvement initiative we introduced a novel ‚CVC care pathway', which included a simple visual cue to aid acceptable CVC tip position.
We repeated our audit to identify the impact of this simple intervention on ultimate line position.
Materials and Methods: A diagram clearly identifying optimal CVC position was included in a ‚CVC care pathway proforma' developed as part of a wider programme of care quality improvement. Operators were advised to "review chest x-ray after line insertion". We selected 30 chest radiographs (CXR) at random for review after the introduction of the guideline. A Consultant radiologist independently reviewed both retrospective and prospective audit data and assessed whether lines were optimally placed by a predefined placement criteria. Where sub-optimal placement was identified the case notes were reviewed to assess
Results and Discussion: 6/30 (20%) of the proforma group had misplaced lines by chest radiography, of which on case note review (n=4) 2 underwent repositioning. Although no further CXR was performed we inferred proper positioning was achieved thereafter, resulting in 87% of lines being optimally placed. This compares with a acceptable position in 74% of lines in the historical audit group. ($p=0.19$, χ^2).
Conclusion(s): This audit identified a historical CVC's malposition rates of 26%, which expose our patients to significant risk of harm. In our small case series there is an obvious trend towards lower malposition rates when CVC's are positioned with the aid of visual cues (a 50% reduction in suboptimal positioning). The intervention is simple and effective and could be utilised by any group engaged in CVC insertion. Our Institution mandates that all anaesthetists use the CVC proforma in the pursuit of improved CVC management.
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17AP2-4

The potential interference of magnets from a surgical magnetic drape with cardiac pacemakers

Zaphiratos V., Donati F., Drolet P., Benzaquen B., Lapointe J., Fortier L.-P.
Université de Montréal, Department of Anaesthesiology, Montreal, Canada

Background and Goal of Study: In the operating room, surgeons frequently use a sterile magnetic drape to hold their metal instruments while they operate. Magnetic fields may interfere with the function of cardiac pacemakers and implantable cardioverter-defibrillators. We conducted a clinical study to evaluate the potential magnetic interference of the magnetic drape with cardiac pacemakers.
Materials and Methods: A magnetic drape with 70 magnets was placed on 50 patients during their visit at the pacemaker clinic. In those who demonstrated magnetic interference, the drape was pulled caudally in 3 cm increments until the interference ceased. If there was no interference, the drape was folded in two over the pacemaker. The number of magnets necessary to cause magnetic interference with the pacemaker was also tested.
Results and Discussion: Magnetic interference was observed in 94% of patients: 64% with the simple drape and 30% with the drape folded in two. Patients in whom the magnetic drape needed to be folded, had a weight and body mass index that were significantly larger than the patients in the simple full magnetic drape group ($p = 0.0163$, $p = 0.0209$, respectively). Magnetic interference ceased when the drape was pulled 3 cm caudally in 54% of patients and at 15 cm, 100% of patients ceased having magnetic interference.
Conclusion(s): Magnetic drapes used in the operating room may cause magnetic interference with cardiac pacemakers and this interference ceases at a caudal distance of 15 cm. Magnetic interference is greater in patients with lower weight and body mass index.

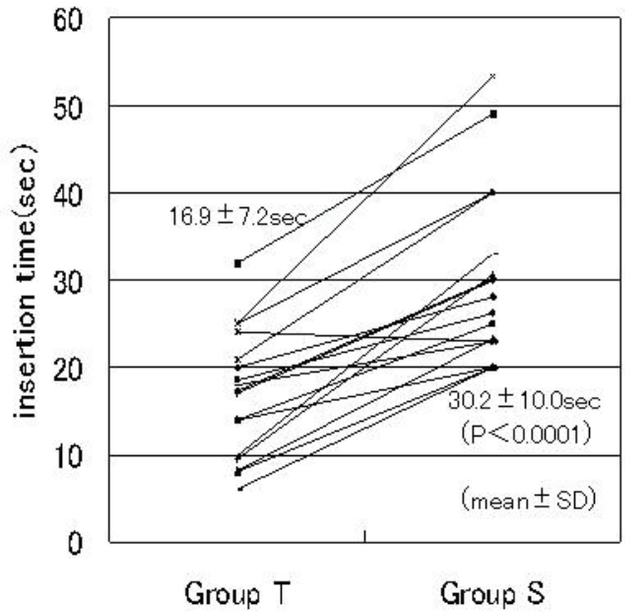
17AP2-5

The efficacy of guidewire preset technique for internal jugular vein puncture and insertion of guidewire as compared to conventional technique

Irie S., Katoh T., Makino H., Yu S., Sato S.
Hamamatsu University School of Medecine, Department of Anaesthesiology and Intensive Care, Hamamatsu, Japan

Background and Goal of Study: During internal jugular vein (IJV) catheterization, a guide wire sometimes is not inserted though the puncture needle, although blood flows backward from the needle. The most convincing explanation is the tip of the puncture needle is moved unintentionally before inserting the guidewire. We reported vertical drift of needle tip with conventional technique is so large that a needle may sometimes penetrated IJV and guidewire preset technique reduced the drift to less than half by a 3 D motion capture in the previous simulator study. In the present study, we measured efficacy of the guidewire preset technique as compared to conventional technique in clinical situations.
Materials and Methods: In each of seventeen cardiac anesthesia patients, two guidewires were inserted for central veinous and pulmonary arterial catheterization via right IJV using real-time ultrasound echo image guidance. We compared time required for successful guidewire insertion after blood flew backward from the puncture needle and incidence of needle tip moving out from IVJ between conventional technique and guidewire preset technique.
Preset technique; guidewire was inserted into the puncture needle in midway before puncture. Needle puncture was performed with hand dominance, and guidewire was advanced with hand non-dominance.(Group T)
Conventional technique; needle puncture was performed with hand dominance and after that guidewire was attached and inserted into vein though the needle.(Group S)
Results and Discussion: Time required for successful guidewire insertion were 16.0±7.2 sec and 30.2±10.0 sec for group T and S, respectively (Fig.1,$P < 0.0001$). Incidence of needle tip moving out from vessel were 3/17 and 6/17, respectively(N.S.).

Conclusion(s): With real-time ultrasound echo image guidance, guidewire was inserted into IJV more quickly using preset technique than conventional technique. Preset technique may reduce incidence of puncture needle tip moving out from IJV.



[Fig. 1]

17AP2-6

Infusion pump audit for continuous drug administration in a university hospital

Moret E., Muntané E., Ricart P., Andreu A., Bonafont X.
University Hospital Germans Trias i Pujol, Department of Anaesthesiology and Intensive Care, Badalona-Barcelona, Spain

Background and Goal of Study: In any hospital it is necessary to warrant a correct use of infusion pumps for continuous drug administration in order to reduce medication errors. The aim of this study was to analyse the real infusion pump situation at our hospital, to evaluate nursery staff satisfaction with the pumps and to design improving actions related to the pump use.
Materials and Methods: Observational, descriptive study based on a structured questionnaire to fill in by supervision nursery staff from our hospital. The collected variables were: number, type, maintenance, calibration of pumps in each department of the hospital, drugs preparation and administration protocols, pump use staff formation, global staff satisfaction with the pumps and suggested improving measures.
Results: The whole supervision nursery staff from 26 different hospital departments filled in the questionnaire. A total of 427 pumps were calculated in our hospital; infusion pumps were available everywhere but syringe pumps only in emergency, critical care and OR. There were 9 different pump types from 4 different supplying companies. 30% of the supervisors declared that pump calibration didn't take place at all, in 24% of the cases the company did it; only in 10% of the departments a substitution pump was available during calibration or reparation.75% of the departments presented preparation protocols in clinical practice, but there were significant differences among them. 30% of them didn't have any at all; in 60% there was no supervision during drug preparation; around 17 different common used IV drugs were notified. 65% of the responders didn't receive any formation before pump use and 50% of the responders considered the received formation insufficient. 20% of the supervisors showed no satisfaction and 15% low satisfaction with the used pumps. 65% of the participants considered the pumps safe, 10% poorly safe and 25% unsafe for the patient.
Conclusion(s): Infusion pump audits in our hospitals help us to identify possible deficiencies concerning the use, maintenance, staff formation and infusion pump safety issues. The following improving actions were highlighted: to create an accurate infusion pump inventory, to eliminate unsafe pumps, to control their maintenance and calibration, to define pump use protocols and to design mandatory pump formation for nursery staff. Such an audit may reduce the risk of medication errors and increase patient safety in the daily practice.

17AP3-1

Semiconscious patients at risk of ulnar neuropathy in the recovery room: An audit of postoperative arm positioning

Lown N., Newby D.
Wirral University Teaching Hospital NHS Foundation Trust, Department of Anaesthesiology, Upton, United Kingdom

Background and Goal of Study: Peripheral neuropathies, most commonly involving the ulnar nerve, are a recognised and potentially avoidable complication of general anaesthesia. They account for 15% of closed insurance claims for adverse anaesthetic outcomes[1]. Prospective research estimates 0.26% of all patients undergoing general anaesthesia develop ulnar neuropathy. Only 9% of cases have a clear intraoperative cause[1], therefore suggesting that ulnar nerve injury could occur postoperatively. We audited whether immediate postoperative care of the ulnar nerve met intraoperative standards.
Materials and Methods: We collected snapshot data in the theatre recovery area for adult patients who had received general anaesthesia, sedation, or postoperative opiates. Upper-limb orthopaedic patients were excluded from study data. We observed patients' arm positioning and Ramsey sedation scores at 10 and 20 minutes following arrival from theatre. Audit standards were derived from the American Society of Anesthesiologists' practice recommendations for the prevention of peripheral neuropathies. Standards included neutral forearm positioning, avoidance of elbow hyperflexion, and prevention of direct contact of the elbow with unpadded surfaces.
Results and Discussion: 46 patients met inclusion criteria; 76% were positioned on trolleys, 24% on beds. 9% had a non-neutral forearm position in the recovery room. 22% of patients showed elbow hyperflexion continued at both 10 and 20 minutes. 17 patients (37%) had direct elbow contact with a hard surface continued over both 10 and 20 minute observations, of which 3 (7% of total sample) were significantly sedated (Ramsey sedation score ≥ 4). Of the 17 patients with prolonged elbow compression, 94% were positioned on hospital trolleys.
Conclusion(s): Postoperative care of the ulnar nerve did not meet standards which would be expected intraoperatively. 7% of patients audited in the immediate postoperative period had two risk factors associated with an increased risk of ulnar nerve injury - abnormal arm positioning, and a depression of consciousness. This is consistent with previous studies that suggest ulnar nerve injury is not necessarily an intraoperative occurrence. We presented our audit findings to recovery room staff to raise awareness of ulnar nerve care.
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17AP3-2

Headache related with central venous catheter tip malposition

Fernandes R., Costa C., Rabico R., Aguiar I.
Hospital Pedro Hispano, Department of Anaesthesiology, Matosinhos, Portugal

Background and Goal of Study: Approximately 15% of patients undergoing central venous catheterization (CVC) experience some sort of complication. Infectious, mechanical and thrombotic complications have been described. Major procedural and post-procedural complications can arise from CVC tip malposition.The aim of this paper is to report a rare case of malposition of a CVC tip.
Materials and Methods: A case report of a 54-year-old male presented to our Acute Pain Team with severe headache on the 3rd post-operative day
Results and Discussion: The acute pain team of our Anaesthesiology Department was called to see a 54 years old male who developed headache on the 3rd day post laparotomy for duodenal perforation under combined general-epidural anaesthesia, suspected of having post-dural puncture headache. The procedure had been uneventful. The patient complained of severe right hemicraneal pain (VAS 10), without irradiation, described as the worst pain of his life. The pain started suddenly, at rest, while seated but didn't correlate with postural changes. It was not accompanied by nausea, vomiting or photophobia and the patient had no fever or any suspected coexisting infectious disease. His mental status was unchanged and his physical examination was unremarkable. A right internal jugular CVC had been placed pre-operatively and was being used for total parenteral nutrition (TPN). During the evaluation we noticed a close temporal correlation between pain and TPN infusion. An x-ray, ordered to document the CVC position, showed a malpositioned catheter, cephalically oriented in the internal jugular vein, with its tip near the jugular bulb. After removal and reinsertion of a new CVC the TPN infusion was re-started without complaints and the pain didn't recur.
Conclusion: We report a case of a rare malposition of a CVC tip in the jugular bulb that was diagnosed because the patient developed headache during a

TPN infusion. It is important that effort is made to minimize iatrogeny when performing a central venous cannulation. Adequate training, respect for the technique and landmarks, routine use of sonographic guidance and post-insertion conventional chest x-ray should be pursued.
Furthermore acute pain in the post-operative period is typically procedure related but there should always be a high index of suspicion of other causes not directly related with the procedure. The key to accurate diagnosis is a comprehensive history and detailed physical examination.

17AP3-3

Comparison of perioperative outcome for esophagectomy by thoracoscopy in the prone position with that for thoracotomy in the lateral decubitus position

Yatabe T., Fukunaga K., Tateiwa H., Tamura T., Yamashita K., Yokoyama M.
Kochi Medical School, Department of Anaesthesiology, Nankoku, Japan

Background and Goal of Study: Traditional esophagectomy is a highly invasive procedure. With the recent advances in laparoscopy, intrathoracic procedures in esophagectomy can be performed by thoracoscopy. During thoracoscopy, the prone position provides a good surgical view. We have reported that in esophagectomy, oxygenation is better in the prone position than in the lateral decubitus position [1]. Hence, we compared the influence of prone positioning with that of lateral decubitus positioning on patient outcomes in esophagectomy.
Materials and Methods: We enrolled 16 patients who underwent esophagectomy with thoracoscopy in the prone position between July 2009 and November 2010 (group P) and 16 patients who underwent thoracotomy in the lateral decubitus position between November 2007 and June 2009 (group L). One-lung ventilation (OLV) was established using a bronchial blocker in group P and using a double lumen tube in group L. Anesthesia duration and OLV, blood loss, ICU and hospital stay length, pulmonary complication frequency and time until walking ability was regained were recorded. $P < 0.05$ was considered statistically significant.
Results and Discussion: Anesthesia was maintained with propofol or sevoflurane and epidural anesthesia. Intraoperative anesthetic agents, anesthesia duration, and hospital stay length were not significantly different between the 2 groups. OLV time was longer in group P than in group L [240 (SD, 41) vs. 153 (48) min, $P < 0.0001$]. Total blood loss and pulmonary complication frequency were significantly lower in group P than in group L [204 (134) vs. 460 (307) ml, $P = 0.002$, and 0 vs. 31%, $P = 0.04$, respectively]. ICU stay duration and time until walking ability was regained were significantly shorter in group P than in group L [878 (118) vs. 1471 (830) min, $P = 0.004$, and 1.1 (0.3) vs. 2.6 (1.3) POD, $P < 0.0001$, respectively]. A minimally invasive procedure involving a small incision and incomplete lung collapse was associated with good outcome.
Conclusion: Patient outcome is better in esophagectomy with thoracoscopy in the prone position than with thoracotomy in the lateral decubitus position.
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17AP3-4

Anesthesia-related complications during donor lobectomy for living-donor liver transplantation: Incidence and risk factors

Araz C., Pirat A., Unlukaplan A., Adnan T., Karakayali H., Arslan G.
Baskent University, Faculty of Medicine, Department of Anaesthesiology, Ankara, Turkey

Background and Goal of Study: Several studies have focused on the surgical complications in donors of living-donor liver transplantation (LDLT), however, there are scant data regarding the anesthesia-related complications that may occur in these patients. The aim of this study was to evaluate the frequency, type, and predictors of anesthesia-related complications during donor hepatectomy for LDLT.
Materials and Methods: We reviewed the data of 182 consecutive LDLT patients who underwent lobectomy between May 2002 and September 2008. The data included demographic features, intraoperative and postoperative transfusions, amount of administered intraoperative crystalloid and colloids, intraoperative hemodynamics, preoperative and postoperative laboratory values, intraoperative and postoperative urine output, and length of hospital stay. anesthesia-related complications such as hypotension (more than 20% decrease from the baseline), hypertension (more than 20% increase from the baseline), arrhythmia, hypoxemia (oxygen saturation < 90%), hypothermia (esophageal temperature < 35.5°C), and need for transfusions were collected using anesthesia and patient charts.
Results and Discussion: Out of 182 consecutive LDLT patients 91 (50%) had at least 1 anesthesia-related complication including hypothermia (39%), hypotension (26%), need for transfusions (17%), and hypertension (7%). Patients who had a complication were older ($P = .001$), had a larger graft weight ($P = .023$), more frequently underwent right hepatectomy ($P = .019$), and more-frequently were classified as American Society of Anesthesiologists class II ($P = .027$) than those who did not have these complications. Logistic regression analysis revealed that only age (odds ratio, 1.064; $P = .001$) was a risk factor for anesthesia-related complications. Patients with these complications more frequently required intensive care unit admission and were hospitalized longer postoperatively. A before-after analysis showed that the use of in-line fluid warmers and acute normovolemic hemodilution significantly decreased the frequency of these complications.
Conclusion(s): Intraoperative complications were common in our LDLT donors, and older age was associated with an increased risk of these complications. Postoperative recovery was delayed in patients with an intraoperative complication.

17AP3-5

A coaxial breathing system may be faulty: Report of a case of severe hypercapnia after anesthesia induction

Makris A., Tsirigotis A., Gatos N., Rozakis D., Skarpa N., Mela A.
Asclepieion Hospital, Department of Anaesthesiology, Athens, Greece

Background and Goal of Study: Coaxial breathing systems gained acceptance in general anesthesia due to some advantages over the double limb circuit. However the inner tube of the circuit may become faulty leading to harmful events. We present a case of an unrecognized defect of the inner tube that led to severe hypercapnia.
Materials and Methods: A 66 year-old, ASA II male was scheduled for a lumbar spondylodesis under general anesthesia. After anesthetic induction, trachea was intubated and connected to a Datex-Ohmeda 7900 ventilator via a coaxial breathing circuit (Dar Breathing system triplex). Then, patient was turned into the prone position. Minutes later, carbon dioxide (CO_2) was noted on inspiratory baseline and end-tidal CO_2 ($PetCO_2$) increased to 60mmHg. Breathing sounds and patient's temperature were normal. Soda lime was cool and white but was replaced, as well as the capnography sensor. Inspiratory and expiratory valves were normal. We increased fresh gas flows and minute ventilation. $PetCO_2$ decreased transiently. Blood gases showed severe hypercapnia and respiratory acidosis. Breathing circuit was replaced. The capnography wave rapidly started changing to normal. In a few minutes $PetCO_2$ was below 40mmHg, with no rebreathing. The operation ended uneventfully and recovery from anaesthesia was without incidents. Examination of the discarded circuit did not reveal any defects at first place. After opening the outer tube, a 2 cm cut of the inner tube was revealed proximal to the patient end.
Results and Discussion: Triplex is a coaxial breathing circuit where inspiratory and CO_2 sampling lines are enclosed in the expiratory line. Gases passing through the inner tube are warmed by gases of the outer one. It is less bulky and easier to handle. There are several reports of inner tube malfunction due to compression, kinking or disconnection from its proper position. These problems could be identified by inspection or low pressure system tests. The cut in our case was small and these tests did not detect it. During patient positioning, bending of the circuit probably opened the lacerated part and expired gases entered the inner tube increasing dead space ventilation, leading to hypercapnia.
Conclusion: Since $PetCO_2$ monitoring is mandatory, anaesthesiologists are faced with contemplating CO_2 issues continuously. When a coaxial breathing system is used, a defect of the inner tube must be considered when investigating the cause of intraoperative hypercapnia.

17AP3-6

Anaphylaxis to ethylene oxide - a rare and overlooked phenomenon?

Bache S., Petersen J.T., Garvey L.H.
Copenhagen University Hospital, Glostrup, Department of Anaesthesiology, Glostrup, Denmark

Spina bifida patients have been reported to be at increased risk of anaphylaxis during anaesthesia. Latex is often incriminated as spina bifida patients are known to have an increased incidence of latex allergy. Ethylene oxide has recently been suggested to be an alternative cause. Ethylene oxide is a highly reactive gas widely used to sterilise heat-sensitive medical devices. Traces of ethylene oxide can be found in e.g. endotracheal tubes, syringes, intravenous catheters, infusion lines, urinary catheters and ventriculoperitoneal shunts. Spina bifida patients seem to be at increased risk of sensitisation against

ethylene oxide due to repeated exposure. Possible exposure mechanisms include early implantation of ventriculoperitoneal shunts, repeated urinary catheterisation and repeated surgical procedures.
We present the case of a spina bifida patient with a known latex allergy, who experienced an anaphylactic reaction during anaesthesia for evacuation of a subdural hygroma. Initially it was thought that an accidental latex exposure had caused the reaction. However, subsequent allergy testing revealed a neglible increase in IgE towards latex, but a markedly elevated IgE towards ethylene oxide. All other known drugs and substances, he had been exposed, to tested negative, and it was concluded that ethylene oxide was the cause of the anaphylactic reaction.
A few months later the patient needed his ventriculoperitoneal shunt replaced. Extensive measures were taken to minimise exposure to ethylene oxide during surgery and anaesthesia. It was achieved by using gamma sterilised alternatives to ethylene oxide sterilised devices and by opening infusion sets and rinsing with sterile saline before use. Most importantly a gamma sterilised ventriculoperitoneal shunt was procured. Subsequently surgery and anaesthesia was uneventful.
In conclusion patients with spina bifida have an increased risk of anaphylaxis during anaesthesia. Allergy to ethylene oxide is a rare, but important, cause in these patients. We recommend that postoperative allergy investigation is carried out in specialist centers, and that testing for ethylene oxide is always included in this high-risk population.

17AP3-7

A retrospective analysis of anesthesia malpractice claims in Turkey 2000 to 2009

Alkan G., Özköse Z.
Gazi University School of Medicine, Department of Anaesthesiology, Ankara, Turkey

Background and Goal of Study: In this retrospective study, we aimed to evaluate malpractices due to anesthesia, especially those resulting in injury and/or death. The purpose of this research is to manifest a profile of anesthesia malpractice, and introduce the legal procedure in Turkey for malpractice claims.
Materials and Methods: We researched 1818 forensic reports were examined and concluded by Turkish Supreme Health Council between January 2000 and January 2009. 112 cases (6,1%) were directly related with anesthesia.
Results and Discussion: In 83 instances, the council found the surgeon guilty in anesthesia - related malpractice cases and determined the surgeons' responsibility as 49,3 %. The anesthesiologist was at fault 52,9 % among 68 cases that the anesthesiologist performed anesthesia, . However not a single anesthesia technician was ever found guilty of malpractice alone, 40 % fault by the anesthesia technician in the anesthesia practice was discovered.
The most common causes of malpractice inadequate follow - up, inattention and carelessness (36,6 %). Ventilation problems (25,9 %) and inadequate preoperative evaluation -physical examination (20,9 %) take second and third place respectively. The most frequent reason for filing suits related to anesthesia malpractice include death (83,9 %) and hypoxic cerebral injury (6,3 %). In the cases that resulted in death, the patient died in 24 cases (25,5 %) after 24 hours of anesthesia implementation, and in 23 cases (24,5%) death occurred while receiving anesthesia.
Conclusion(s): In conclusion, the undesireable results of anesthesia primarily occurred under circumstances where: there was no anesthesiologist present; or the anesthesia was performed by a doctor who is a specialist in another practice area; or the anesthesia was performed by an anesthesia technician not under the supervision of the aforementioned doctors. In Turkey, the current legal framework should be reviewed to ensure that anesthesia should only be administered under the supervision of an anesthesiologist, thus making receiving anesthesia much safer for patients.

17AP3-8

Inspired oxygen fraction lower than 30% for patients after bleomycin exposition is not associated with perioperative pulmonary complications

Wuethrich P.Y., Burkhard F.C.
University Hospital Bern, Department of Anaesthesiology and Pain Medicine, Berne, Switzerland

Background: The incidence of pulmonary toxicity ranges from 0 to 40% in patients receiving bleomycin. Hyperoxic exposure during general anesthesia after bleomycin for treatment of germ cell tumors is purported to potentiate bleomycin-induced pulmonary toxicity, however objective evidence is lacking. The aim of this study was to retrospectively assess perioperative pulmonary complications after retroperitoneal lymphadenectomy (RPLND) in patients with bleomycin treatment < 6 months before surgery.
Materials and Methods: A consecutive series of 47 patients who underwent RPLND after bleomycin treatment for testicular cancer between 1991 and 2007 were reviewed. Patients with preoperative radiotherapy were excluded. Only patients receiving a RPLND within 6 months after completion of chemotherapy were included (n=22). Anesthesia was performed with a FiO2 of 100% for 3 minutes for induction of anesthesia and then with a FiO2 just under 30% during surgery (median surgical time 240 minutes (120-800)). After extubation, 2-3l of oxygen were administered for the next 2 days. We assessed all potential risk factors for bleomycin induced pulmonary toxicity (creatinin clearance < 35ml/min, cumulative bleomycin dose >300'000IU, age >40 years, stage IV disease). Clinical signs for pulmonary damage were documented (dyspnea, tachypnea, non-productive cough, postoperative oxygen saturation problems).
Results and Discussion: Median age at time of surgery was 26 years (19-49). Median bleomycin dose during chemotherapy was 270'000IU (270'000-540'000). American Joint Committee on Cancer stage groups were as followed: IIa: 4 patients, IIb: 8, IIc: 4, IIIa: 5, IIIc: 1.The majority of patients had mixed tumours 12 (60%), non-seminomatous tumours 5 (25%) and seminomas 3 (15%). No patients had pulmonary disease documented preoperatively. History of smoking was present in 9 patients. Creatinin clearance was normal in all patients. No pathognomic signs (dyspnea, tachypnea, and non-productive cough) for pulmonary damage could be detected up to 7 days postoperatively.
Conclusion: Administration of 100% oxygen for 3 to 5 minutes during induction of anesthesia and maintaining a FiO2< 30% during surgery appeared to be safe in this young patient population. We are aware of the limitations of the study especially the lack of pulmonary function assessment, however no clinically relevant pulmonary complications were observed. Prospective, controlled studies are warranted to assess this question.

Perioperative Care of the Elderly

18AP1-1

Efficacy and safety of sugammadex for reversal of rocuronium-Induced neuromuscular blockade in elderly patients

Ariño J.J., Velasco J.M., Martín M., Gabaldón M., Calvet A., López-Timoneda F.
Hospital Clinico San Carlos, Department of Anaesthesiology, Madrid, Spain

Background and Goal of Study: The clinical duration of neuromuscular blocking agents such as rocuronium is prolonged in elderly patients. Effective reversal of rocuronium-induced neuromuscular blockade (NMB) may be particularly important in this population. The aim of this study was to assess the efficacy and safety of sugammadex for the reversal of rocuronium-induced NMB in elderly patients.
Materials and Methods: Following local institutional review board approval, 25 consecutive patients aged more than 70 years, ASA Class II-III, and scheduled to have surgery under general anesthesia with the use of rocuronium were enrolled. 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}. Rocuronium 0.6 mg.kg^{-1} was administered as a single IV intubating dose, with maintenance doses of 0.15 mg.kg^{-1} or continuous infusion as required. Anesthesia was maintained with sevoflurane and fentanyl based on clinical need. At re-appearance of the second twitch (T2) after the last dose of rocuronium, a single IV bolus dose of sugammadex 2 mg.kg^{-1} was administered. NMB was monitored by acceleromyography TOF-Watch® SX at the adductor pollicis muscle, commencing after the induction of anesthesia and continuing at least until recovery of the train-of-four (TOF) ratio to 0.9. The primary efficacy variable was the time from the start of administration of sugammadex to recovery of the TOF ratio to 0.9. Safety was assessed by adverse events (AEs), heart

rate, systolic (SBP) and diastolic blood pressure (DBP) , and clinical evidence of residual or recurrent NMB. Data are expressed as mean (SD). Statistical analysis was performed using SPSS 15.0 for windows.
Results and Discussion: Thirteen patients received bolus and 12 continuous infusion as maintenance. Time from administration of sugammadex to recovery of the TOF ratio to 0.9 was 193.4 (63) s. Administration of continuous infusion prolonged recovery time compared with bolus doses 217.5 (73) s vs.169.2 (40) s (p=0.05). The total dose of rocuronium and duration of surgery were higher in the continuous infusion group (p=0.05). Safety: SBP and DBP were higher and heart rate was lower at 2, 5 and 10 min. from baseline; there was no clinical evidence of residual NMB and no AEs were reported.
Conclusion(s): Sugammadex was effective and well tolerated for the reversal of rocuronium-induced NMB in elderly patients.

18AP1-2

Influence of the somatic pathology on the course of traumatic disease in old patients with multiple trauma

Volkova Y.
Kharkiv State Medical University, Department of Anaesthesiology and Intensive Care, Kharkiv, Ukraine

Background and Goal of Study: In old patients' organism there are morphologic and functional changes that can lead to decreasing of oxygen transport system functioning and tissue hypoxia.
The aim of the study was to estimate the role of the old patients' somatic pathology (SP) in the course of traumatic disease.
Materials and Methods: 110 patients treated for multiple trauma (ÀÐÀÑÍÅ II 31,8±4,2) were prospectively studied. Only old patients without traumatic brain injury (GCS more than 13) were selected. Intensive care was equal in all groups. Patients were divided into three groups.
Patients without SP were in first group (32 patients). Second group consisted of 38 patients with no more than 5-year anamnesis of SP. 40 patients with more than 5-year anamnesis of SP formed the 3rd group. We analised parameters of central hemodynamics, morphometry parameters of erythrocytes, level of cytokines (TNF-α, IL-1, IL-6, IL-8), oxygen transport parameters (DO_2, $V\hat{I}_2$ and $ER\hat{I}_2$. We studied oxygen metabolism in peripheral tissues using polarography method on the 1st, 3rd, 5th days.
Results and Discussion: During the examination of patients we did not reveal the differences in the parameters of central hemodynamics and morphometric parameters of erythrocytes between the patients of I, II and III groups. In patients of the 3rd group the level of TNF-α, IL-1, IL-6, IL-8 was higher (ð< 0,05) than in patients of group I on the 1st, 3rd days of treatment comparing with the 1st group and on the 5th day comparing with the 2nd group. We also revealed the linear dependence between $V\hat{I}_2$ and DO_2 in patients of the 3rd group on the 3rd day of treatment that is the evidence of decreasing in them of DO2 level to the critical level. On the 5th day of treatment in patients of the 3rd group the parameters of oxygen transport were lower than normal parameters. In patients of the 1st and 2nd groups we did not reveal differences in oxygen transport parameters. The same dynamics were revealed while examination of oxygen metabolism in tissues.
Conclusion(s): Thus, we can conclude that the course of traumatic disease in old patients with multiple trauma depends on the state of endothelium and decreasing of functional activity of erythron system, which are due to somatic pathology. This fact shows the requirements for endolium protection therapy.

18AP1-3

Are morbidity and mortality of elderly patients having cystectomies predictable?

Atallah FN., Letocart P, Mazerolles M., Soulié M., Malavaud B., Fourcade O.
Rangueil Hospital - Toulouse University Hospitals, Department of Anaesthesiology and Intensive Care, Toulouse, France

Background and Goal of Study: Major surgeries realised in elderly have been increasing over last years. Radical cystectomy is a surgery burdened by a high postoperative mortality and morbidity. The aim of this study was to evaluate the incidence of mortality and morbidity in patients ≥75 years and determine predictive factors.
Materials and Methods: We studied all patients aged ≥75 years operated for radical cystectomies over 30 months in our hospital, with a follow up > 1 year. Comorbidities were graded according to ASA, ACE (Adult Comorbidity Evaluation) and Charlson[1] scores. Surgical complications were graded according to Clavien classification[2]: Grade 1-5 (requiring simple medical treatment - leading to death).
We analysed early (< 30 days) and late (up to 1 year) morbidity and mortality. Chi2, Spearman and Kaplan-Meier tests were used.

Results and Discussion:

Item	Patients	Percent	Item	Patients	Percent
Age ≥ 80 years	18	37%	ACE score ≥ 2	25	51%
ASA score ≥ 3	23	41%	Charlson score≥5	32	65%

[Population]

49 patients were studied with a median age of 79 years (range: 75-89). Frequent comorbidities were cardiac (Score of Lee≥2 represent 35%), COPD (30 %) and diabetes (8 %). Median duration of hospitalization was 16 days (3-58) and 6 days (3-20) for food resumption
There were four early deaths (8%); three due to aspiration pneumonia following ileus, and 15 late deaths (31%).
Early complications occurred in 24 patients (49%): 11 medical (ileus, pyelonephritis) and 13 surgical (occlusion, evisceration, parietal abcess). 12 patients had late complications (24%)
There was a significant correlation between ASA, ACE and Charlson scores. But no significant correlation was found between these scores and incidence of morbidity or mortality.
Early morbidity was not correlated with age, duration of surgery, smoking, renal function and fluid load; but was correlated with low BMI (p=0.01), blood transfusion (p=0.0004) and duration of ileus (p=0.009)
Death was only correlated with low BMI (p=0.03) and renal insufficiency (p=0.02)
Conclusion(s): In elderly patients, scores of comorbidity could not predict mortality and morbidity . Early mortality and morbidity were significantly associated with preoperative malnutrition, prolonged ileus, and blood transfusion. A multidisciplinary approach would allow to define the best therapeutic line for each patient. More studies are needed to determine predictive factors.
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18AP1-4

Postoperative pain management after major abdominal surgery in elderly patients

Cindea I., Balcan A., Gherghina V., Nicolae G., Samoila B., Costea D.
Emergency Clinical Hospital of Constanta, Department of Anaesthesiology and Intensive Care, Constanta, Romania

Background and Goal of Study: This prospective, randomized study compared the effectiveness on postoperative pain and safety of patient-controlled epidural analgesia with local anesthetic and opioid (PCEA) and patient-controlled analgesia with intravenous morphine (PCA), after major abdominal procedures in elderly, a vulnerable surgical population due to pre-existing pathological conditions.
Materials and Methods: Following approval of the local ethics committee and written informed consent, 78 ASA II-III elderly subjects (>75 years) with good mental status, scheduled for major abdominal surgery under general anesthesia, were recruited.
These patients were randomly allocated into two groups: group A (n=39) that received PCEA (0.1% ropivacaine and 5μg/ml fentanyl, basal infusion of 3-4ml/h, 2-3 ml bolus dose and lockout interval of 12min), respectively group B (n=39) whom PCA with intravenous morphine (1mg/ml morphine solution, 1-1,5 ml bolus dose, lockout interval of 10min) was given for postoperative pain management.
During a follow-up period including the first 3 postoperative days, pain intensity was assessed every 8h, at rest and after coughing, using visual analog scale. Sedation level, mental status, nausea/vomiting incidence, cardiorespiratory profile, gastrointestinal function were documented two times a day, along study period. All variables measured over time were evaluated using Friedman two-way nonparametric analysis of variance (p< 0.05).
Results and Discussion: Demographic data were similar in the two groups. Pain relief was statistically better at rest (p< 0.001) and after coughing (p< 0.004) in group A. The incidence of nausea/vomiting episodes, as well as sedation scores were significantly lower in group A than in group B (p< 0.001). Although no difference was registered concerning the occurrence of postoperative delirium, the lower incidence of transient, minor alterations in mental status suggested the advantage of group A, in this respect, too. Cardiopulmonary complications were similar in the two groups. Recovery of gastrointestinal function occurred significantly more quickly in group A than in group B (p< 0.004).
Conclusion(s): Although both self-controlled techniques, PCEA and PCA, provide adequate postoperative pain control in major abdominal surgery

aging people, better analgesic effectiveness without further side effects, an improved mental status and quicker bowel recovery could favor PCEA technique.

18AP1-5

How much propofol should be given to the elderly for induction of anaesthesia? A prospective study based on change of bispectral index (BIS) values

Hascilowicz T., Hamaguchi T., Nakata S., Yamamoto Y., Kiyama S., Uezono S.
Jikei University School of Medicine, Department of Anaesthesiology, Tokyo, Japan

Background and Goal of Study: Quantitative relationship between BIS values and propofol doses has not been extensively studied. The generally recommended dose for induction has a wide range (1 to 2.5 mg/kg), which may cause too deep sedation in the elderly. The goal of the study was to quantitatively assess the effect of propofol on BIS during induction and compare its features between younger and older patients.
Materials and Methods: After obtaining informed consent, 72 patients (38 men and 34 women, ASA PS 1 or 2) undergoing elective non-cardiac surgery were assigned to either below/equal to 60 or above 60 years of age group (younger and older group). They were randomly allocated to one of three subgroups (12 subjects in each subgroup) depending on the dose of propofol: 1.5, 2.0 or 2.5 mg/kg (younger group) or 1.0, 1.5 or 2.0 mg/kg group (older group). Bolus doses of propofol were administered following 40 mg of intravenous lignocaine. Fentanyl (2 mg/kg) and rocuronium (0.9 mg/kg) were given at 1.5 and 2 minutes after injection of propofol, respectively.
The difference between the baseline and minimum BIS value (∆BIS) during the first 5 minutes after propofol injection was compared between the two age groups.
Results and Discussion: The mean ages of younger and older patients were 41 and 69 years, respectively. The ∆BIS were normally distributed within the subgroups (Shapiro-Wilk test), and their means varied between the subgroups (one-way ANOVA; $P = 0.029$ and $P < 0.001$ in younger and older group, respectively).
A linear regression analysis demonstrated a good fit correlation between ∆BIS values and doses of propofol in both age groups (adjusted R^2 values of 0.97 and 0.93 for younger and older group, respectively).
Conclusion(s): A dose-dependent relationship between propofol dose and ∆BIS exists. Based on the change of BIS values during induction, 1.0 mg/kg of propofol is sufficient to provide adequate depth of anaesthesia in elderly patients.

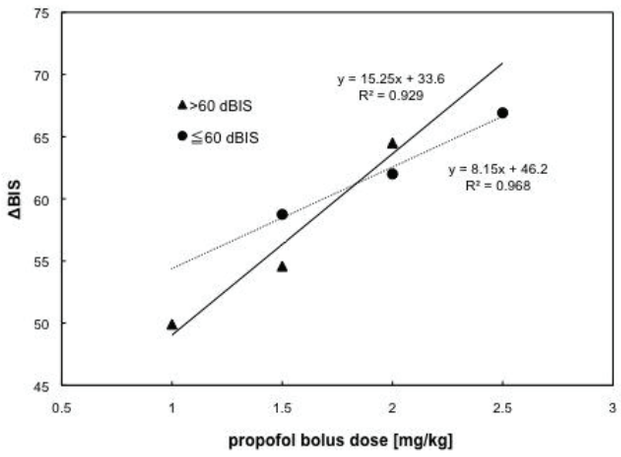

Figure 1. The dose-dependent relationship between bolus propofol and ΔBIS (the difference between baseline and minimal BIS value during induction).

[Bolus dose of propofol and change in BIS]

18AP1-6

Mortality and clinical outcome in urgent abdominal surgery over 80 years of age

Torolla A.E., Rojo Sanchís A., Chavero E., García Bernedo C.A., Samsó Sabé E., Beltrán de Heredia Marrodán S.
Hospital del Mar-Esperança (Parc de Salut Mar), Department of Anaesthesiology and Intensive Care, Barcelona, Spain

Background and Goal of Study: Due to physiological changes caused by aging and comorbidities an increase postoperative mortality and morbidity is observed in emergency abdominal surgery (EAS).Main objective was the evaluation of mortality rate in this population. Secondary objectives included evolution of activities of daily living (ADL) function and survival independent predictors after surgery.
Materials and Methods: Computer database and telephonical call were used to obtain information of patients operated from 2007 to 2009. Parameters collected: demographic data, type/path of surgery, postoperative complications, date of death, evaluation of ADL (Katz index (K): A to G, from independent to completely dependent) and living situation (home vs health-care assisted) at admission and 6 months after surgery. Multivariate analysis was calculated by Cox Regression
Results: Patients included 178, 40% male / 60% women. Mean age 85 years. ASA: I 0.6%, II 41,6%, III 44.4%, ASA IV 13.5%. Surgery type: cholecystectomies 43.8%, intestinal resections 37.6%, appendicectomies 10.1%, others 8.4%. Surgical access: laparoscopic 27.5%, open access 72.5%.
Mean follow-up (P25-P75): 2 years(1.3-2.8). 54 patients (30%) were death at the end of the study, being the survival at 1 month 92.7 %(0.96-0.89), at 6 months 87.6%(0.83-0.92), at 1 year 82%(0.88-0.76) and at 2 years 76%(0.82-0.70).Postoperative complications appeared in 118 patients (66%): cardiovascular 35.4%, respiratory 29%, neurological 33%, renal 24%, sepsis 25%, surgical reintervention 15%, others 25%.Interestingly, 94 patients (54%) were completely independent for ADL (K A) at admission, declining to 53 (30%) 6 months later. Moreover, dependent patients (K F-G) increased from 22 (12%) to 39 (22%).Among the 161 patients (90%) hospital admitted from home only 127 (71%) were not transferred to a health care assisted facility 6 months later. Multivariate analysis showed age, ASA status (III-IV), type of surgery (intestinal resections), respiratory complications, reintervention, K at admission (G grade) as independent factors for mortality.
Conclusions: Based on our results, although EAS in patients over 80 years does not imply high mortality, ADL is severely affected carring higher institutionalization and resources requirements. Previous functional status, severity of co-morbidities and possible postoperative complications (respiratory, reintervention) seemed to be independently related predictors of mortality.

18AP1-7

Importance of a comprehensive geriatric assessment in prediction of complications following major abdominal surgery in elderly patients

Gherghina V., Nicolae G., Cindea I., Balcan A., Popescu R., Costea D.
Emercency County Hospital, Department of Anaesthesiology and Intensive Care, Constanta, Romania

Background and Goal of Study: The comprehensive geriatric assessment (CGA) is a tool for acquisition of information for design of a treatment plan based on evaluation of the vulnerability of elderly patients from various perspectives. The prevalence of comorbidities and functional impairment among elderly patients may enhance the risk of operation-related complications, but the importance of these conditions in elderly patients undergoing major abdominal surgery remains unclear.
Materials and Methods: 162 patients >/= 60 years of age who underwent major abdominal surgery were registered prospectively and examined. A comprehensive geriatric assessment (CGA) that evaluated such diverse areas as functional status (ie, performance status and activities of daily living [ADLs] using the Barthel index), comorbidity, nutrition (ie, body mass index, arm-muscle circumference, albumin level, transferrin level, lymphocyte count, and cholinesterase level), and cognitive function (ie, mini-mental state examination [MMSE] and negative emotions for operation) was performed in the 2 weeks before patients underwent the operation.
Results and Discussion: Postoperative complications developed in 34 patients (21%). The patients with dependence for performing the ADLs, and dementia were more likely to develop postoperative complications ($p = 0.031$, and $p = 0.0065$, respectively). The patients who experienced longer operation times (ie, >/= 300 min; $p = 0.016$) were more likely to have complications. The incidence of digestive fistula in the patients with malnutrition increased seven-fold ($p = 0.045$) and that of postoperative infectious diseases in those

patients with obesity increased 24-fold (p = 0.0013), while all patients who developed delirium had low scores in the MMSE preoperatively (p = 0.0003). Using multiple logistic regression, the best model was obtained with a combination of MMSE (p = 0.031) and the Barthel index (p = 0.04). When the operation variables were added to this model, the operation time had the strongest effect (p = 0.016).
Conclusion(s): Dependence for the performance of ADLs and impaired cognitive conditions are important predictors of postoperative complications, especially when the operation time is long. CGA is necessary in addition to the conventional cardiopulmonary functional assessment in elderly patients.

18AP2-1

Postoperative cognitive dysfunction (POCD), markers of brain damage and systemic inflammation in elderly patients

Burkhart C.S., Rossi A., Dell-Kuster S., Strebel S.P, Monsch A.U., Steiner L.A.
University Hospital Basel, Department of Anaesthesiology and Intensive Care, Basel, Switzerland

Background and Goal of Study: The systemic inflammatory response after surgery and anaesthesia may cause an increased production of inflammatory mediators in the central nervous system and elevated markers of brain injury in peripheral blood. This has hypothetically been linked to the development of postoperative cognitive dysfunction (POCD) in elderly patients.
Materials and Methods: We investigated 43 patients aged >65 yrs undergoing elective major surgical procedures under standardized general anaesthesia with sevoflurane. Cognitive function was measured preoperatively and 7 days postoperatively using the Consortium to Establish a Registry for Alzheimer's Disease - Neuropsychological Assessment Battery. A postoperative decline > 1 z-score in at least two of the tested domains was defined as POCD. S-100β, Neuron-specific enolase (NSE), C-reactive protein (CRP) and leucocytes count were measured preoperatively, 2 days postoperatively, and 7 days postoperatively. S-100β, NSE, CRP, leucocytes count, operative characteristics and hospital length of stay in patients with POCD and without POCD were compared using the Mann-Whitney U test and are shown as median [range].
Results and Discussion: POCD developed in 22 patients (51%). Preoperative values for S-100β were lower in patients with POCD (0.044 [0.33-0.138] vs. 0.065 [0.032-0.177] mcg/L, p=0.006), which may be due to unevenly distributed baseline characteristics. Postoperative values for S-100β and pre- and postoperative values for NSE were statistically not different in patients with POCD and without POCD. However, patients with POCD had significantly higher CRP values and leucocytes counts on postoperative day 2 while preoperative values and values 7 days postoperative were similar between groups (Table 1). Patients with POCD had significantly longer duration of anaesthesia (318 [180-620] vs. 291 [126-560] min, p=0.049) while age, intraoperative blood loss and duration of hospital stay were similar between groups.

	POCD (n=22)	No POCD (n=21)	p value
CRP (mg/dl) 2 days postoperatively	232.5 [17.5-383.7]	98.5 [4.5-241.3]	0.009
Leucocytes (*10^9/l) 2 days postoperatively	10 [8-17]	8 [5-12]	0.012

[Table 1]

Conclusions: In this small group of patients systemic inflammatory markers 2 days postoperatively were asscoiate with POCD whereas postoperative markers of brain damage were not associated with POCD. This findings will need to be confirmed in a larger group of patients.
Acknowledgements: Supported by SNF Grant 32003B-121956

18AP2-2

Levobupivacaine 7.5 mg versus levobupivacaine 5 mg + sufentanyl 2.5 μg spinal anaesthesia in the elderly undergoing hip fracture repaire

Krobot R., Premuzic J., Sokol N., Kotaran J.
General Hospital Varazdin, Department of Anaesthesiology and Intensive Care, Varazdin, Croatia

Background and Goal of Study: Hypotension is commonly observed adverse effect of spinal anaesthesia, especially in the elderly. Intrathecal coadministration of opioids enhances sensory block without increasing sympathetic block (1). In this study we evaluated a clinical profile of spinal anaesthesia produced with either levobupivacaine 7.5 mg or levobupivacaine 5 mg + sufentanyl 2.5 μg in elderly patients undergoing hip fracture repaire.
Materials and Methods: 40 ASA II-III patients (75 - 92 ys) were assigned to 2 groups in this prospective, randomized, double-blind study. Group L patients (n = 20) intrathecally received levobupivacaine 7.5 mg and Group LS patients (n = 20) levobupivacaine 5 mg + sufentanyl 2.5 μg. Sensory (pin-prick test) and motor block (modified Bromage scale), hemodynamic data, time to first analgesic and side effects were recorded. T-test, Mann Whitney U-test and Fisher's exact test were used, P < 0.05 was considered statistically significant.
Results and Discussion: Demographic data, ASA status, operation time and start value of systolic arterial pressure (SAP) and heart rate (HR) were comparable between the groups. Surgical anaesthesia was achieved in all 40 patients. The upper level of sensory block was T_9 (T_{11} - T_7) in Group L and T_{10} (T_{11} - T_9) in Group LS, P = 0.21. Complete motor block had 12 (60%) Group L and 4 (20%) Group LS patients, P = 0.02. The mean duration of motor block was 98 ± 20 min in Group L and 74 ± 18 min in Group LS, P < 0.01. Maximum decrease of SAP from baseline was 35 ± 11% in Group L and 21 ± 9% in Group LS, P = 0.01 and of HR 14 ± 7% and 11 ± 6%, P = 0.22, respectively. Decrease of SAP < 80 mmHg had 8 (40%) Group L and 1 (5%) Group LS patient, P = 0.02 and decrease of HR < 50/min had 1 (5%) Group L patient. Time to first analgesic was 235 ± 53 min in Group L and 253 ± 58 min in Group LS, P = 0.74. Mild pruritus had 5 (25%) Group LS patients, P = 0.05. No postdural puncture headache, neurological complications, vomiting or respiratory depression were noted.
Conclusion(s): Levobupivacaine 5 mg + sufentanyl 2.5 μg spinal anaesthesia provided similar sensory block and postoperative analgesia, but faster motor recovery and more stable cardiovascular profile than levobupivacaine 7.5 mg spinal anaesthesia in elderly patients undergoing hip fracture repaire.
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18AP2-3

A preoperative carbohydrate drink does not reduce insulin resistance or complications after elective hip surgery

Hahn R.G., Ljunggren S.
Faculty of Health Sciences, Linköping University, Department of Anaesthesiology, Linköping, Sweden

Background and Goal of Study: A preoperative carbohydrate drink is often claimed to alleviate the insulin resistance developing in response to surgery, and even to reduce the incidence of nausea (1). We tested this hypothesis in elective hip replacement, which is a very common operation worldwide.
Materials and Methods: Sixty patients with a mean age of 69 years underwent elective hip surgery under spinal anesthesia. They were randomized to
(1) be fasting since midnight
(2) ingest 800 ml of tap water 2 hours before surgery
(3) ingest 400 ml + 200 ml of a nutritional carbohydrate drink (Preop, Nutricia) in the evening before + 2 hours before surgery. Insulin sensitivity was assessed on the day before, 2-3 hours after, and in the morning after the surgery.
The methods were the "Quicki", an algorithm based on the baseline levels of glucose and insulin, and a 12-sample intravenous glucose tolerance test (IVGTT) which had previously been validated in 20 volunteers against the hyperinsulinemic glucose clamp. Muscle catabolism was assessed by measuring the postoperative urinary excretion of 3-methylhistidine. Postoperative complications were registered by a research nurse who visited the patient 2 days after the surgery.
Results and Discussion: The Quicki showed no reduction of the insulin sensitivity 2-3 hours postoperativey and a decrease by 8% in the morning of the next day. The IVGTT showed no change in insulin sensitivity 2-3 hours after surgery, but a reduction by 40% in the next morning. These data, as well as the 3-methylhistidine excretion, did not differ between the 3 study groups.
The number of complications averaged 1.4, 1.6 and 1.6 per operation in the 3 groups. Nausea and vomiting occurred in 30% of the patients in all the groups.
The lack of insulin resistance 2-3 hours after surgery can be understood by that a reduction of the area under the curve of plasma insulin by 40% fully explained the concomitant prolongation of the half-life of glucose by 60%.
Conclusion: A carbohydrate drink taken before elective hip surgery did not affect insulin resistance, muscle catabolism or the incidence of postoperative complications.
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Acknowledgements: Financial support was received from the Stockholm County Council, Olle Engkvist Byggmästare Foundation, and Karolinska institutet.

18AP2-4

Are we efficient in the management of elderly hip fracture?

Velásquez S., Ruiz L., Bernia J.A., Fuentes A., Márquez E., García-Eroles X.
Hospital de Terrassa, Department of Anaesthesiology, Terrassa, Spain

Background and Goal of Study: The management of hip fractures is expensive and continues to generate significant expense during the postoperative period of one year. This demands considerable resources from the health system of a country (1). The incidence of hip fracture in the elderly in our midst is 517/100.000 cases / year (2); moreover, hip fracture in old age is commonly associated with the presence of multiple comorbidities, which makes the functional recovery of these patients difficult. Our work aims to analyze the impact of surgical treatment on healthcare costs and to evaluate whether we are dealing efficiently with hip fracture in the elderly.
Materials and Methods: We performed a retrospective study of the register of patients admitted, aged ≥ 64 years with the diagnosis of hip fracture in the Terrassa Hospital from 01/01/2009 to 01/01/2010. The total sample was 116 patients, 90 women (77.59%) and 26 men (22.41%).The variables analyzed were gender, age, ASA classification, operative duration, days of hospitalization, postoperative destination, surgical procedure, mortality during hospitalization and cumulative mortality during the year after surgery.
Results and Discussion: The average age of the cohort was 80, 65 years. The distribution of patients according to ASA was: ASA I: 0%, ASA II: 27.59%, ASA III: 63.79% and ASA IV: 8.62%. The mean operative time was 154, 96 minutes. The median length of stay was16,75 days. The mortality during hospitalization was 2.58% of patients, while mortality for the year after surgery was 18.10%. Total death: 20.69% of patients (20% women and 23.1% men). Hip fracture patients incur high hospitalization costs that tend to increase due to the growing incidence of this disease. We need to create strategies to reduce these costs. These strategies include identifying preoperative risk factors of morbidity / mortality by scales that include premorbid quality of life and quality of life expected of the patient.
Conclusion(s): Hip fractures in the elderly mean high health costs, increased by the presence of comorbidities. Given the current need for the optimization of resources, we need to create strategies to reduce costs in these patients.
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18AP2-5

The impact of pre-loading in prevention of spinal anestesia-related hypotension in elderly patients

Eruyar Günal S., Ceyhan A., Cuvas O., Korkulu F., Aslanargun P., Dikmen B.
Ankara Training and Research Hospital, Department of Anaesthesiology and Intensive Care, Ankara, Turkey

Background and Goal of Study: Various solutions can be used for spinal anestesia (SA)-related hypotension which can cause severe morbidity and mortality. We aimed to evaluate the effectiveness of preloading on hemodynamic parameters and to compare the vasopressor use in prevention of SA-related hypotension in elderly.
Materials and Methods: After approval of Ethical Committee of the hospital and informed consent of patients, 120 ASA I-III patients were randomly divided into 3 groups which consisting 40 of each. 1- 500 ml of %6 HES solution was given 20 minutes before SA. 2- 500 ml of %0,9 NaCl solution was given 20 minutes before SA. 3- No prehydration was given. For SA, 0,25 mg/kg %0,5 of bupivacain was applied. Systolic (SAP), diastolic (DAP) and mean arterial pressures (MAP) and heart rate (HR) was recorded at definite time intervals. A SAP value less than 90 mmHg or a 25% decrease in SAP value was considered as hypotension and 5 mg ephedrin was given in repeating doses. Total ephedrin consumption, the number of hypotensive attacks and other adverse effects were also recorded.
Results and Discussion: No significant differences were found in patients' demographic data. HR values of Group II were lower than that of Group III at 15th min, while the results of Group I and II were lower than that of Group III at 20th min, which all were statistically significant. HR declined with time in all three groups while no change was seen at 2nd, 4th, 6th minutes in Group I. SAP values of Groups II and III were significantly lower than that of Group I at 10th min. There was a significant difference for DAP values at baseline, 2nd and 10th minutes between three groups, while mean values of Groups II and III were significantly lower than that of Group I at baseline and 2nd min, and mean values of Group II were significantly lower than that of Group I at 10th min. SAP and DAP declined with time in all three groups. MAP values of Group II were significantly lower than that of Group I at 2nd, 6th, 8th, 10th and 15th minutes. MAP declined with time in all three groups while no change was seen at 4th minute in Group I. Preloading of IV fluids restricts the decrease in heart flow by facilitating venous return.
Conclusion(s): We conclude that colloidal preloading is effective in prevention of SA-related hypotension in elderly. Although it was not eliminated completely, the incidence of hypotension was decreased.

18AP2-6

Incidence and risk factors of acute postoperative delirium in elderly patients after elective and emergency surgery

Gherghina V., Nicolae G., Balcan A., Cindea I., Costea D., Popescu R.
Emercency County Hospital, Department of Anaesthesiology and Intensive Care, Constanta, Romania

Background and Goal of Study: Postoperative delirium (POD) is characterized by an acute change in cognitive function and can result in longer hospital stays, higher morbidity rates, and more frequent discharges to long-term care facilities.In this study, we investigated the incidence and risk factors of POD in 326 patients older than 65 years of age, who had undergone a elective or emergency surgery in the last two years.
Materials and Methods: Data related to preoperative factors (male gender, >70 years, previous dementia or delirium, alcohol abuse, serum levels of sodium, potassium and glucose, and co morbidities), perioperative factors (type of surgery and anesthesia, and duration of surgery) and postoperative data (length of stay in recovery room, severity of pain and use of opioid analgesics) were retrospectively collected and statistically analyzed.
Results and Discussion: A total of 326 patients (357 admissions) were enrolled in the study. The incidence of POD was 13.2 per cent (17.9 per cent for emergency operations). Independent variables associated with POD were: age above 75 years, co-morbidity, preoperative cognitive impairment, psychopathological symptoms and abnormal glycaemic control. Median length of hospital stay was 21 (range 1-75) days for patients with POD versus 8 (range 1-79) days for control patients ($P < 0.001$). The hospital mortality rate was 19 and 8.4 per cent respectively ($P = 0.021$).
Conclusion(s): The incidence of POD is high in elderly patients for both emergency and elective surgery, leading to an increase in hospital stay and perioperative mortality. To minimize POD, associated risk factors of co-morbidity, cognitive impairment, psychopathology and abnormal glycaemic control must be identified and treated.

Airway Management

19AP1-1

Routine use of fibreoptic nasendoscopy for assessment of vocal cord function and anatomy immediately prior to parathyroid and thyroid surgery

Varvinskiy A., Freeman N., Cunliffe D.
South Devon Healthcare NHS Foundation Trust, Department of Anaesthesiology, Torquay, United Kingdom

The incidence of pre-operative vocal cord paralysis in benign thyroid disease has been reported as 0.7% (2) rising to as much as 1.3% in re-operative parathyroid surgery (1). Up to 40% are asymptomatic (1,2). Routine pre-operative nasendoscopy to assess vocal cord function and anatomy aids surgical planning and highlights potential airway difficulties. Nasendoscopy is usually performed as an out-patient necessitating the use of expensive clinic facilities and potentially multiple hospital visits by the patient. Alternatively the patient is admitted early thus increasing bed occupancy. A trial of Anaesthetist led fibreoptic nasendoscopy immediately prior to surgery was carried out on 11 patients (3). Success has led to routine immediate pre-operative Anaesthetic room nasendoscopy in our unit.
Method: 5% lidocaine + 0.5% phenylephrine to nose. 10% lidocaine spray to tongue and oropharynx. Sedation: Remifentanil 0.05-0.175 μg/kg/min and Propofol 1μg/ml. Nasendoscopy with Olympus ENF-P4/GP and Olympus Op-

tim Medical Slide on Endosheath System (Medtronic). 4% lidocaine "spray as you go" technique. Visualisation of cords with functional assessment followed by assessment of tracheal anatomy.
Results: Of the 188 patients, one had an undiagnosed right vocal cord palsy. A second had unexpected tracheal deviation necessitating awake fibreoptic intubation. There were no complications, and no delay to the theatre lists.
Conclusions: Anaesthetist led nasendoscopy prior to Parathyroid and Thyroid Surgery is a quick simple & safe technique. If nasendoscopy identifies an unexpected difficult airway a fibreoptic endoscope can then be used for intubation. The use of a disposable sheath obviates scope sterilisation between patients. Sedation improves tolerance compared with outpatient nasendoscopy. Assessment immediately prior to surgery allows shorter pre-operative assessment and admission. Digital image recording aids follow up, and provides pictorial documentation if litigation becomes an issue.
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19AP1-2

Awake fiberoptic bronchoscopy for orotracheal insertion of a double lumen tube in five patients with an anticipated difficult airway

Yakobson K., Haitov Z., Gofman V., Bahar M., Chanimov M.
Assaf Harofeh Medical Center, Department of Anaesthesiology, Zerifin, Israel

Background and Goal of Study: Several studies have suggested that a 90° rotation of a single tube in patients with a difficult airway decreases the likelihood of difficulty in advancing the tube over a fiberscope.[1] Insertion of a double lumen tube (DLT) in the awake patient has been previously reported in two patients, but without tube rotation.[2] Other authors have not considered this technique as an optimal one for primary placement of a DLT because it is larger, more rigid and has a curved tip of 180º.[3] The purpose of this study was to assess the efficacy of awake fiberoptic intubation in patients with known difficult airways using a DLT and a modified 90º anticlockwise rotation maneuver of the tube.
Materials and Methods: We prospectively enrolled five patients scheduled for thoracotomy (four on the right and one on the left) for excision of a pulmonary tumor or metastasis. They were graded as Mallampati ^{3}IV and premedicated with ranitidine, morphine, promethazine and atropine sulfate. The airway was topically anesthetized with 10 ml of 2% lidocaine and 2 ml of 4% lidocaine was administered transtracheally. Fiberoptic intubation was performed with the patient awake using a 3.5 mm fiberoptic bronchoscope (PENTAX) passing through the bronchial lumen of the DLT and advancing under fiberoptic guidance orally to the vocal cords. After visualization of the larynx and vocal cords, the bronchoscope was passed into the trachea. To slide the DLT over the bronchoscope, pressure was applied on the neck over the larynx and the DLT was rotated 90° anticlockwise. After verification of proper tube position in the trachea, anesthesia was induced**.**
Results and Discussion: The DLTs were successfully located in all five awake patients with no side effects or complications.
Conclusions: In patients with anticipated difficult airways needing lung separation, we feel that our technique is safe when inserting the DLT through a wide mouthpiece and rotating the tube in an adequately anesthetized airway.
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19AP1-3

Improving intubation with the GlideScope: Two better than one?

Valencia Orgaz O., Gutierrez Agüera J.M., Gutierrez García I., García Gutierrez A., Pérez-Cerdá Silvestre F.
Hospital 12 Octubre, Department of Anaesthesiology, Madrid, Spain

Background and Goal of Study: The Glidescope Video Laryngoscope (Saturn Biomedical Systems, Burnaby, BC, Canada) is a laryngoscope with a high-resolution camera embedded within the blade and a light source mounted beside the camera for illumination. Its blade bends through 60 at the midline and is 18 mm wide. Many studies have concluded that the Glidescope improves visualization of vocal cords, although sometimes it may be difficult to direct the ET through vocal cords.
Our purpose was to evaluate between the different choices already published to improve intubation with the glidescope and a new one, which was the better when used by trainees in a manikin.
Materials and Methods: A total of 21 trainees (33% first year of residency; 24% second yearr, 24 third year, 19% fourth year) were recruited during a two months period to participate in the study. 62% have previously used the Glidescope and 43% the fiberscope. They were instructed in three different methods: 1:Standard malleable stylet with a 90 bend. 2: Modified distal bend Frova single-use intubation introducer.3: Standard Glidescope laryngoscopy plus fiberscope to introduce endotracheal tube (Olympus TP). They were randomly allocated to use the three methods in different starting order. Time to correct endotracheal intubation (passage of ET through vocal cords), number of attempts and subjective participants opinion of which was the best method, were collected.
Results and Discussion: Of the 21 parcipants 62% were females and 28% males. Mean age 28,57 years (SD 4,04; Max 38, Min 24).
The mean time for correct intubation was:
1.Standard malleable stylet: mean 27,81 seconds (SD 15,05; Max 61, Min 10);
2.Modified Frova introducer: mean 40,19 seconds (SD 15,95; Max 97, Min 23);
3.Glidescope+fiberscope : mean 46,95 seconds (SD 19,74; Max 95, Min 21).
When comparing the classic standard malleable stylet technique versus the others, there were significant statystical differences between standard stylet/modified Frova (P 0,001) and standard stylet/Glidescope+fiberscope (P < 0,001) but they were no found between Frova/Glidescope+fiberscope (P 0,066). Subjective opinion: 60% of participants chose the modified Frova as the best technique and 40% the Endoflex technique.Subjective opinion best method: 62% chose glide+fibersope technique.
Conclusion: In our study, although the stylet technique was the fastest and accurate technique, the use of fiberscope was chosen as the best subjective method by trainees.

19AP1-4

Awake intubation of patients with difficult airway in emergency: Comparative study between GlideScope videolaryngoscope and fibreoptic bronchoscope

Jakushenko N., Kopeika U., Nagobade D., Mihelsons M.
Riga First Hospital, Department of Anaesthesiology, Riga, Latvia

Background and Goal of Study: Airway management of emergency cases has the high risk of aspiration. Awake intubation(AI) by fibreoptic bronchoscope(FB) is gold standard in predicted difficult airway (DA) due to control of under direct vision, but blood and vomit can to obscure the view and reduce the success of intubation. GlideScope videolaryngoscope (GS) allows visualization of passing the endotracheal tube (ETT) through the vocal cords into the trachea very well in presence of secretions.
The goal of study was to evaluate the feasibility of these devices for AI of patients with DA in emergency.
Materials and Methods: Following ethics committee approval, 20 spontaneously breathing patients, with median age 35±17 years, ASA II-III-E, with physical features suggesting a DA undergoing urgent surgery were included in this prospective study.
Patients with mouth opening ≥ 25 mm were oral intubated by GS (GS group) - 11 patients, other 9 patients were intubated by FB (FB group). AI were performed under sedation (Ramsay 3-4) with ketamine:propofol(1:1), and topical anaesthesia using 10% lidocaine spray. Data collected: respiratory and haemodynamic parametrs, intubation time (IT), cough, laryngospasm, secretion, regurgitation, aspiration.
Tracheobronchoscopy for sanation was performed after AI in regurgitation and aspiration cases. The results were analyzed using Fisher's exact test.
Results and Discussion: AI were successful for all patients. Results are expressed in the table. Mean IT was statistically significantly longer in FB group versus GS group. Cough, laryngospasm rate were the same, but secretion, regurgitation, aspiration rate were lower in GS group. The respiratory parameters were better in GS group. The mean arterial pressure and heart rate were higher in FB group.
Conclusion: These results demonstrate that the AI by GS significantly allows to reduce respiratory and haemodynamic reactivity to intubation. GS is useful tool for AI in patients with DA in emergency.
Acknowledgements: This study was supported in part by European Social Foundation (ESF).

Parameters	Glide Scope (n=11)	Fibreoptic bronhoscope (n=9)	p value
Intubation time(IT), sec	22+/-8	63+/- 19	p<0.05
Bradipnea or SpO2<93%	2	5	p<0.1
Cough	3	4	p>0.05
Secretion	2	7	p<0.05
Laryngospasm	2	3	p>0.05
Regurgitation	1	3	p<0.05
Aspiration	0	2	p<0.05

[Results]

19AP1-5

Remifentanil target controlled infusion (TCI) vs ketamine or ketamine in combination with remifentanil TCI for conscious sedation in awake fiberoptic intubation: A randomized controlled trial

Belda I., Cubas M.G., Rivas E., Valero R., Martínez-Pallí G., Balust J.
Hospital Clínic de Barcelona, Department of Anaesthesiology and Intensive Care, Barcelona, Spain

Background: Awake fiberoptic intubation (AFOI) is used in patients with predicted difficult airway management. Although it is not easy, to achieve a comfortable conscious sedation is the key for a successful AFOI. The goal of this study was to compare different conscious sedation strategies aimed to improve comfort and safety in morbid obese patients underwent AFOI.
Materials and Methods: Seventy-five morbid obese patients underwent bariatric surgery were randomized in three different conscious sedation strategy groups to facilitate AFOI: Remifentanil (R) using target controlled infusion (TCI) system, Remifentanil TCI + Ketamine (RK), and Ketamine (K). All patients received 2mg of midazolam and atropine prior the start of the procedure. TCI effect site concentration for R (Alaris®, Minto Pharmacokinetic model) was used. The initial target set was 1.5ng.ml^{-1} and adjusted by consecutive 0.5ng.ml^{-1} increments until the desired level of sedation (Ramsay 3). A unique intravenous dose of K 0.3mg.Kg^{-1} was administered in K and RK patients. We recorded demographic data, hemodynamic and respiratory parameters, Ramsay sedation scale, the incidence of cough and the time spent during AFOI. Patient recall was recorded 24h after the procedure.
Results: Seventy patients were included in the study (R25; RK25; K20). No differences in demographic data were found between groups. Nor hemodynamic instability nor desaturation (< 90%) was present in any patient. RK patients required minor TCI target sets to achieve the same level of sedation than those who received only R (R, 2.4±0.4 *vs* RK, 2.1±0.8ng.ml^{-1};p< 0.05) but RK patients showed a higher incidence of intense cough than R group (44% *vs* 12%;p< 0.05). One RK patient showed over sedation (Ramsay 4) without desaturation. No significant differences were found when we assessed uncomfortable recall 24 h after the procedure between R and RK groups (4% *vs* 12%) and mean time invested in AFOI between R and RK groups (R,11.5±3.6 *vs* RK,10.53±3.7 min). K group had an unacceptable high incidence of intense cough (60%), agitation (15%), inadequate level of sedation (10%) and uncomfortable recall (60%), although time spent in AFOI was shorter. For these reasons the inclusion in the group k was stopped.
Conclusion: Conscious sedation with R TCI provides optimal conditions to perform comfortable and safe AFOI. The addition of K did not offer advantages to the use of R alone. K 0.3mg.Kg^{-1} alone is not an adequate sedation strategy for AFOI.

19AP1-6

Cricoid pressure revisited

Rocha A.C., Batista S., Nunes J.M.
Hospitais Universidade de Coimbra, Department of Anaesthesiology, Coimbra, Portugal

Background and Goal of Study: Cricoid pressure (CP) is considered by many anesthesiologists as mandatory in patients at high risk for gastric regurgitation and as part of any rapid sequence induction of anesthesia. However, there is a lack of evidence for its effectiveness and evidence for numerous deleterious effects.[1,2] This discrepancy between widespread use and limited evidence prompted us to assess application of CP among anesthesiologists and Knowledge about its potential problems.
Materials and Methods: fifty five questionnaires were mailed to all anesthesiologists who work in the *Hospitais da Universidade de Coimbra (HUC)*, Anesthesiology Department. The questionnaires were applied over a 6 months period. The authors investigated the use of CP among *HUC* anesthesiologists, the knowledge to its proper application (when to apply, who applies), the effectiveness and complications associated with the maneuver.
Results: 42 completed questionnaires were retrieved (76.4% of the physicians). Of the 42 respondents, 34 (81.0%) use CP: 28 (66.7%) in any patient at risk for gastric regurgitation and the remaining 6 only use the maneuver in emergency situations. Although 34 physicians believe that CP prevents gastric regurgitation, 7.1% witnessed cases of regurgitation and 81.0% describe difficult laryngoscopy (not mutually exclusive answers). Most of the anesthesiologists considered that only physicians and nurses are skilled in application of CP, but not anesthesia trainees.
Conclusions: Although anesthesiologists have described complications associated with CP, the maneuver is accepted by most. This data can orient the development of future studies to check if the responses to the questionnaire and actual clinical practices agree.

19AP1-8

Comparison of a propofol target-controlled infusion and inhalational sevoflurane for fibreoptic intubation under spontaneous breathing anesthesia in patients with difficult intubation

D'Arienzo S., Stumbo R., Coletta F., Sansone P., Pace M.C., Passavanti M.B., Aurilio C.
Second University of Naples, Dept of Anaestesthesiological, Surgical and Emergency Sciences, Naples, Italy

Background and Goal of Study: The most recommended technique for the management of patients with a difficult airway is fibreoptic intubation (FOI). The aim of the present study was to compare propofol and sevoflurane as hypnotics during fibreoptic intubation under spontaneous ventilation in patients who were difficult to intubate.
Methods: After regional ethical committee approval,during a four months period, twenty-four patients (age 28-40 yo), ASA I-III, scheduled for maxillo-facial surgery were included, in this prospective, randomized study. Patients were randomized to one of the two groups:PRO (n=11) receiving propofol TCI and SEV (n=13) receiving sevoflurane.The airway was topically anesthetized with lidocaine 5% before performance. After 3 min of pre-oxygenation,patients received either propofol with a plasmatic target concentration of 4 mcg/ml (PRO) or sevoflurane 4% with tidal volume ventilation (SEV). After 2 min, propofol was increased by 1 mcg/ml and sevoflurane was increased by 1% every 2 min until there was no reaction during mandible translation. This concentration was maintained for 4 min before starting nasotracheal fibrescopy for intubation. During both induction and fibrescopy, arterial blood pressure (BP), heart rate (HR), pulse oximetry (PO_2), $ETCO_2$ and bispectral index (BIS), and were monitored. Other parameters measured were rate of success, duration of the induction and of the FOI. The respiratory and hemodynamic complications were also evaluated.Statistical analysis was performed using student t test. All comparisons were two sides, and a P value less than 0.05 was considered significant.
Results: Induction and procedure duration were significantly shorter in SEV compared with PRO. Intubation was performed successfully in both groups. During induction, no difference in pulse oximetry,BIS values at the end of induction, or duration of induction were noticed. Only one episodes of desaturation under 90% occurred during fibreoptic intubation in PRO compared with none in SEV. The incidence of hypertension or tachycardia was significantly higher in SEV compared with PRO.
Conclusion(s): Propofol and sevoflurane provide a high success rate for the performance of FOI in patients who are difficult to intubate.
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19AP1-9

Efficacy of a new approach to videolarygscope-guided tracheal intubation

van Zundert T., Brimacombe J.R., Marcus M.
Maastricht University Medical Center, Department of Anaesthesiology, Maastricht, Netherlands

Background and Goal of Study: We determine the efficacy of videolaryngoscope-guided tracheal intubation using an alternative position for the blade in patients with normal airways.

Materials and Methods: Seventy paralysed anaesthetised patients (ASA 1-3, aged 18-80 yr) with normal airways were studied. The best view of the vocal cords was obtained by an experienced anaesthesiologist using a C-MAC™ videolaryngoscope with the blade placed in the vallecula and the epiglottis elevated indirectly (standard position), and by advancing it into the vallecula until the epiglottis was downfolded and elevated directly (alternative position). The following data were collected: the success rate for the alternative position, the laryngoscopic view in both positions, the number of attempts at tracheal intubation in the alternative position, and postoperative sore throat at 2 and 24 hours.
Results and Discussion: The alternative position was obtained in 77% (54/70) with the size 3 blade, 20% (14/70) with the size 4 blade and failed in 3% (2/70). The view of the cords was better in the alternative position (Cormack and Lehane 4/3/2/1: 68/0/0/0 vs 48/20/0/0; p=0.01). Intubation was successful at the first, second and third attempt in 78% (53/68), 87% (13/15) and 100% (2/2), respectively. The frequency of sore throat was 4% (3/70) and 0% (0/70) at 2 and 24 hours, respectively.
Conclusion(s): In patients with normal airways, the alternative blade position provides a better view of the vocal cords but does not facilitate a high first attempt intubation success rate.
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19AP1-10

The STOP BANG score do not predict post operative complications

Moussard M., Besch G., Pili-Floury S., Petit P., Samain E.
Teaching Universitary Hospital Jean Minjoz, Department of Anaesthesiology and Intensive Care, Besancon, France

Background and Goal of Study: Obstructive sleep apnea syndrome (OSA) is a common disease that is frequently undiagnosed in patients undergoing planned surgery .
Its detection could be of interest as OSA is associated with per and post operative complications. The STOP BANG score seems to be efficient in surgical patients to identify patient at risk of OSA***[1]***. This study aims to assess the ability of the STOP BANG score to predict respiratory respiratory and cardiac complications.
Materials and Methods: Monocentric and prospective observational study conducted from April to July 2010. All consecutive patients planned for general or vascular surgery were included. The STOP BANG score was calculated (1 point by item) by assessing the following points: Snoring, Tired , Observed with apnea, high blood Pressure, Body mass index >25 Kg/m2, Age > 50 years old, Neck circonference > 40 cm and male Gender. A STOP BANG ≥ 3 defined the group at risk for OSA (OSA_{risk}). Anesthesia and post operative cares were left to the discretion of the attending anesthesiologist, blind to the STOP BANG score.
The data collected were: difficult mask ventilation, difficult intubation, per operative hypoxemia (SpO2< 90%), postoperative hypoxemia in thePACU, and severe respiratory and cardiovascular complications during the first 2 postoperative days.
Data are given as mean±SD or percentage. The predictive value of a STOP BANG score≥ 3 to predict post operative complications was estimated. A p > 0,05 significant.
Results: 283 patients (age:6 ±16 yr; male sex: 48%) were studied. The ASA status and the Lee score were significantly higher in the OSA_{risk} group (n=158) than in the control group (n=125) (p=0.0081 and 0.0083 respectively), but the level of the surgical risk did not differ (p=0.49).
Difficult mask ventilation was significantly more frequent in the OSA_{risk} group (19% vs 8%, p=0.02). No statistical difference was found regarding the difficult intubation (p=0.99), peroperative hypoxemia (11% vs 6%, p=0.08) or the postoperative respiratory (23% vs 17%, p=0.17) or cardiovascular (6% vs 3%, p=0.32) complications between the 2 groups. Three deaths occurred in the OSA_{risk} group. a STOP BANG score above > 3 had a sensitivity of 69% and a specificity of 45% to predict postoperative complications (AUC [CI95%] =0.5645 [0.4169-0.7122]).
Conclusion: The STOP BANG score fails to predict postoperative respiratory and/or cardiovascular morbidity and mortality in general surgery.

19AP2-1

Pressure required to force water through pre-conditioned breathing filters - a laboratory study

Davies N.G., Vijayakumar M., Wilkes A.R.
Cardiff University, Anaesthetics, Intensive Care and Pain Medicine, Cardiff, United Kingdom

Background and Goal of Study: Breathing filters are commonly used in anaesthesia and intensive care to prevent cross-infection. However, contamination can occur in the machine side of the filter and of the breathing system (1). A recent study showed that water could be forced through unused electrostatic filters at very low pressures (less than 15 cmH_2O) and through unused hydrophobic filters at higher pressures (2). In the intensive care setting, filters may be used for an extensive period of time. Our study aimed to see if pre-conditioning filters influences the pressure at which water may be forced through the filter.
Materials and Methods: We assessed three samples each of six different pleated hydrophobic filters previously assessed for water transmission under pressure. Each filter was connected to a patient model which expired warmed, humidified air for 24hours. The filter was then removed from the model and attached to one port of a water filled system so that the patient side of the filter was open to ambient air and the water was in contact with the surface of the machine side of the filter. The other port of the system was connected to an infusion pump set at a rate of 400 ml min^{-1} to find the pressure at which water leaked through the filter, up to a maximum pressure of 125 cmH_2O.
Results and Discussion: Results were compared to recent results obtained in our department on unused filters using the same rig and method (2). Data are mean (SD) and number allowing transmission of water.

Filter	Pressure at leak (cm H20)	
	Unused	Preconditioned
Vygon/ HEPA 551.53	64 (31), 5/5	75 (21), 3/3
Pall/ Ultipor BB25	101 (14), 5/5	116 (16), 2/3
Teleflex/ Iso-gard HEPA Light	>125, 0/5	>125, 0/3
Pall/Ultipor BB100	84 (16), 4/5	30 (3), 3/3
Pall/Ultipor BB22-15	72 (17), 5/5	49 (9), 3/3
Teleflex/Iso-gard HEPA Small	117 (0), 1/5	>125, 0/3

[Table 1]

Conclusion(s): Pre-conditioning can have a significant effect on the pressure required to force water through filters. This may be particularly relevant clinically in the intensive care setting or in operations that last for many hours. Although some filters performed just as well after having been in use for 24 hours, others showed a marked reduction in performance which should be considered when choosing between different filters.
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19AP2-2

The influence of positive end-expiratory pressure on leakage around endtracheal tube cuff: An in vitro study

Komai M., Kamada T., Takayama W., Morita Y., Masuda J.
Kawasaki Municipal Hospital, Department of Anaesthesiology, Kawasaki, Japan

Background and Goal of Study: One of the causes of VAP (Ventilator associated pneumonia) is escape of fluid above an endotracheal tube (ETT) cuff into the lower airways. Even though a lot of consideration has made on condition of ETT cuff to prevent aspiration, a few reports have been made about the relationship between the leakage and modes of mechanical ventilation, positive end-expiratory pressure (PEEP) in particular. Therefore, we compared the rate of leakage in spontaneous ventilation model between ZEEP and 5 cmH2O of PEEP.
Methods: An ETT with 8 mm internal diameter (Parker tube, Kobayashi medical) was placed in the model trachea (MT), consisted of a PVC tube with an internal diameter of 22 mm. The cuff sealing pressure was set at 25cmH2O. The MT was laid at 45 degree to the horizontal and was connected to two chamber lung model, Vent Aid TTL; IMI. To simulate spontaneous breathing, the first driving chamber was connected to Aestiva/5 (GE healthcare) and was ventilated under IPPV (TV 500 ml, frequency 10 times/min, PEEP 0 cmH2O, flow 4L/min). The second chamber was connected to the distal end of the MT.

The ETT was connected to Evita4 (Drager medical) which was ventilated under two conditions: 1) ZEEP (PEEP 0cmH2O, PS 0cmH2O) and CPAP (PEEP 5cmH2O, PS 0cmH2O). The two chambers were mechanically linked together and the second chamber passively generated inspiratory flow in-sync with the ventilation via the first driving chamber.
After the cuff pressure and ventilator conditions were stabilized, 10ml of clear water was instilled into the space above the cuff. Subsequently, a single investigator measured the leakage in 10 minutes. These measurements were repeated 10 times in each ventilatory mode. Man Whitney U test was used for statistical analysis and a p-value of less than 0.05 was considered statistically significant.
Results and Discussion: A significantly greater leakage around the ETT cuff ($P < 0.05$) was observed during ZEEP. The median leakage volume during ZEEP and PEEP was 9.92 ml and 0 ml, respectively. During ZEEP, almost all the water passed through the cuff in 2 to 3 minutes. The greater amount of leakage around the ETT cuff might occur during spontaneous ventilation without PEEP. Therefore, particular attention should be paid on leakage of secretions before tracheal extubation.
Conclusion: The amount of leakage around the ETT cuff is significantly high with ZEEP than PEEP of 5 cmH2O.

19AP2-3

A novel method of preoxygenation using partial rebreathing in a co-axial Mapleson D circuit - a randomised, double blind, crossover trial

Glen J., Chalmers C.M., Price R.J.
Victoria Infirmary, Department of Anaesthesiology, Glasgow, United Kingdom

Background and Goal of Study: Preoxygenation is a standard technique in the practice of anaesthesia. However, there are problems with the techniques currently in use, which take time or require patient co-operation. We hypothesised that a period of rebreathing resulting in mild hypercarbia would improve the rate of subsequent preoxygenation, due to a physiological increase in respiratory rate and depth.
Materials and Methods: We carried out a double blind, randomised, crossover trial using 15 healthy male volunteers. Participants undertook two methods of preoxygenation, each of which involved breathing spontaneously through a co-axial Mapleson D (Bain) circuit for four minutes. In the standard (T) method oxygen flow rate was $15L.min^{-1}$ for the entire period. In the rebreathing (RB) method, flow rate was $1L.min^{-1}$ for the first 30 seconds and $15L.min^{-1}$ for the remaining time. The primary end-point was time to end-tidal oxygen concentration (EtO_2) 85%. Data were collected automatically and analysis performed remotely by a researcher blinded to the method being used.
Results and Discussion: Mean (SD) time taken to EtO_2 85% was 137.8s (50.7s) and 148.6s (39.4s) for T and RB methods respectively. The difference between the methods was not significant by paired t-test ($p=0.305$). Time to EtO_2 85% tended to be longer on the participant's first protocol. There was loss of mask seal on a total of five occasions. EtO_2 did not reach 85% on three occasions, on two of which mask seal was lost. EtO_2 90% was not reached on 14 occasions; on four of these mask seal was lost.
A period rebreathing CO_2 does not reduce the time taken to achieve preoxygenation. However, we have demonstrated problems with the standard method of preoxygenation. EtO_2 90%, the usual clinical end-point of preoxygenation, was not reached in almost 50% of cases. This was explained by loss of mask seal on only four occasions and occurred in spite of close attention by the researcher present. Mask seal was more commonly lost (four of five occasions) during the participant's first protocol. Along with the order effect demonstrated, this suggests that participants ‚learned' the technique of preoxygenation, which is not possible for most patients.
Conclusion(s): Preoxygenation time is not reduced by prior rebreathing. However, anaesthetists must be aware that the current standard method of preoxygenation is often inadequate, even when rigorously applied.
Acknowledgements: Tom Aitchison, statistician.

19AP2-4

Determination of the proper size of oropharyngeal airway: Correlation with external body measurements

Kim J.E., Park W.K.
Yonsei University College of Medicine, Department of Anaesthesiology and Pain Medicine, Seoul, Korea, Republic of

Background and Goal of Study: The aims of this study were to examine the relationships between the size of oropharyngeal airways(OPAs) and various external body measurements and to determine the proper size of OPAs for adults.
Materials and Methods: After obtaining approval from the IRB and informed consent, 50 subjects with ASA physical status I-II (22 male and 28 female) aged 20-75 years were enrolled. Before anesthesia, the distances from the tragus of the ear to the lateral border of the nares (TN distance) and to the lateral border of mouth (TM distance) were measured. During induction, we measured the curvilinear length of the Macintosh laryngoscope from the upper incisor to the tip of the epiglottis (IE distance). After induction, different sizes of OPAs (Guedel airway) (Nos.8, 9, 10, and 11) were inserted sequentially and we measured the distance from the upper incisor that touches the OPA to the tip of the epiglottis by passing the fiberoptic bronchoscope via channel of the OPA. When the length of OPAs was longer than that distance, we partly drew out the proximal part of the OPAs and repositioned the distal end around the tip of the epiglottis.
Results and Discussion: The distances among IE (10.9 ± 0.9cm), TN (11.0 ± 0.6cm), and TM (10.0 ± 0.6cm) were similar(NS). In Table 1, the length of OPAs No.8 and 9 appeared to be shorter while OPAs No. 10 and 11 were longer than the distance from the upper incisor to the tip of the epiglottis. The correlation between the TN or TM distance and height were significant in both the TN ($r=0.405$, $P< 0.001$) and TM ($r=0.534$; $P < 0.001$) groups. The formula of the regression lines (with 95% prediction intervals) for the TN and TM groups were $Y = 0.260X + 6.790$ and $Y = 0.361X + 5.032$, respectively (X axis, height).

	Distance from the distal end of OPA to the tip of the epiglottis	Straight length of the OPAs
No. 8 (mm)	2.2 ± 0.9	85
No. 9 (mm)	1.2 ± 0.76	95
No. 10 (mm)	-0.6 ± 1.4	105
No. 11 (mm)	-2.0 ± 0.9	115

[Table 1]

Considering the similarity between IE and TN or TM distances, based on the range of TN distance (98-122 mm, 2 SD), the proper size of OPAs would be predicted to be OPAs No. 10 and 11. However, these OPA sizes did not appear to be proper because they were longer than the distance from the upper incisor to the tip of the epiglottis.
Conclusion: TN or TM distance is not a likely predictor of proper OPA size. OPA of size No. 9 is likely to be suitable for use in adults.

19AP2-5

Improved self-reported skills in airway management techniques and adherence to guidelines after a training program for anaesthesiologists in Catalonia: QUAVA II

Lopez A.M., Masso E., Parra L., Valero R., Orrego C., QUAVA
Societat Catalana d'Anestesiologia, Reanimació i Terapeutica del Dolor. Hospital Clinic Barcelona, Department of Anaesthesiology, Barcelona, Spain

Background and Goal of Study: Based on an anonymous survey among anaesthesiologists in Catalonia, a collaborative project (QUAVA II) was designed to improve airway assessment (AA) and airway management (AM) focused on specific training requirements. The impact of one year intervention is evaluated
Materials and Methods: A prospective multicenter study was conducted in 38 hospitals. Anesthesiologists were asked to anonymously report their AA and AM guidelines adherence, to rate their experience and availability of AM techniques and specify their training needs. Experience was graded as: 1=expert; 2=frequent user; 3=occasional use without help; 4=only in mannequins; 5=never used;
An educational program was designed to fit the evidenced requirements. A group of experts trained a few educators in each hospital and assisted them to conduct local presentations and workshops. The survey was repeated after one year of implementation.
Results and Discussion: Sixteen hospitals have completed the data entry of 324 responding anesthesiologists (74%). Systematic preoperative AA increased from 83% to 88% and AM guidelines adherence from 89% to 97%. Changes in individual experience degree is shown in Table 1 (Data presented in % of anesthesiologists)
Conclusion(s): After the training program anesthesiologists upgraded the self-reported skills in AM techniques and increased the adherence to AA and AM guidelines. The impact of this improvement in difficult airway management in our patient populations is under evaluation.
Acknowledgements: To all anesthesiologists participating in QUAVA II study

	Pre	Post
Degree	1-2-3-4-5	1-2-3-4-5
Bougies	13-25-43-6-11	21-33-41-5-2
Extraglotic devices	47-39-11-1-1	48-43-9-1-0
Intubating LMA	19-26-42-7-4	24-33-37-6-1
Videolaryngoscopes	5-7-49-20-16	13-10-50-21-7
Fiberscope	12-25-40-11-8	16-29-40-11-4
Combitube	1-2-17-40-39	3-1-17-46-33
Cricotyroidotomy	2-0-14-38-43	1-2-10-57-29

[Table 1. Experience]

19AP2-6

Pre-oxygenation: Is it a waste of 'anaesthetic time' in elective patients?

Malik D., Ali P.
University Hospitals of Leicester NHS Trust, Department of Anaesthesiology and Intensive Care, Leicester, United Kingdom

Background: Pre-oxygenation prolongs apnoea time before hypoxia occurs following induction of anaesthesia.National guidelines exist for preoxygenation in RSI,however there are no national guidelines in elective patients,despite recommendation from several studies in favour of preoxygenation[1].
Audit Aims: To evaluate current preoxygenation practice in patients presenting for elective surgeries and questions the need to preoxygenate all elective patients?
Materials and Methods: Real time observational data were collected over two months period during the induction of anaesthesia,of 48 randomly selected adult patients presenting for elective surgery at our institute.All grades of anaesthetists were included in the audit by two independent auditors.The anaesthetists were blinded to as to which part of induction was being observed.
Results and Discussion: Seventy five percent of anaesthetists recorded baseline SaO_2 despite the 100% recommendation by AAGBI.Only 64.5% of patients were routinely preoxygenated. Junior trainees tended to Preoxygenate their patients more frequently than the selective Preoxygenation by seniors (64% vs 35%).Preoxygenation was improperly performed without a tight seal in the majority of cases and in supine position (77%). Most anaesthetists used SaO_2 as the end-point of Preoxygenation,with only 23%using EtO_2.Half of the patients who were not Preoxygenated,desaturated (mean of 80%) without any adverse outcomes.No discomfort was expressed by patients (16%) who held their own mask. Tidal volume (TV) breaths were preferred by anaesthetists compared to vital capacity (VC) breaths.
Conclusion(s): Baseline saturation should be recorded in all cases.It is good practice to pre-oxygenate all elective patients in view unanticipated difficult intubation.Preoxygenation should be performed correctly using 100% oxygen at 8 L/min with a tight fitting facemask.TV breaths for 3 min should suffice, if time is an issue such as in an emergency then 4 VC breaths[2] be used. All patients BMI >25 should be ramped up to 25°.It would be advisable for patients to hold their own mask to shorten induction time.
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19AP2-7

Evaluation of the practicability of a transcutaneous intratracheal retrograde intubation with microendoscopy in fresh cadavers

Reus E., Wolf G., Wrobel M., Becker K., Schick B., Volk T.
Saarland University Hospital, Department of Anaesthesiology and Intensive Care, Homburg/Saar, Germany

Background and Goal of Study: Securing the airway is often difficult in emergency situations. Tumor, trauma, bleeding and swelling of pharynx and larynx may make conventional intubation impossible. Retrograde intubation is described as an effective technique of securing the airway in these cases but it is often difficult to puncture the trachea midline and also to force the guide wire until it appears in the pharynx. With modern microendoscopy puncture of the trachea and forcing the guide wire can be done with visualizing and identifying the anatomical structures.
Materials and Methods: In the University of Saarland an interdisciplinary team of anaesthesiologists, ENT-surgeons, anatoms and pathologists evaluated the practicability of the transcutaneous, intratracheal, retrograde intubation with microendoscopy in 10 fresh cadavers. All steps of the procedure were documented by video and photo. Full sight on all structures was precedent condition for the whole procedure. All cadavers have been examined by conventional direct laryngoscopy before and graded as Cormack I, II, III or IV.
Results and Discussion: Retrograde intubation was accomplished successfully in every 10 cases. With direct laryngoscopy 7 cadavers had an airway situation Cormack I and II. 3 cadavers were airway grade Cormack III. In one airway the dorsal side of the trachea was injured by the introduction needle of the microendoscope.
Conclusion(s): Transcutaneous, intratracheal, retrograde intubation is an atraumatic, minimalinvasiv and secure technique to secure the airway. Further studies with living patients must be done to evaluate relevance and practicability of microendoscopy in retrograde intubation.

19AP2-8

Airway management in a patient requiring positive pressure ventilation post low tracheal tear

Kiernan F., Ahuja A.
Beaumont Hospital, Department of Anaesthesiology and Intensive Care, Dublin, Ireland

Introduction: Tracheal rupture is a very rare but potentially devastating complication of oesophagectomy.
Conservative nonoperative treatment is planned for tracheal rupture in patients breathing spontaneously or with a planned extubation within the first 24 h. However, the management of patients with severe respiratory failure requiring mechanical ventilation remains a difficult problem.
Case: A 74 year old woman was admitted to our Intensive Care Unit post oesophagectomy resulting in a tear of the posterior trachea. The tear involved the lower 4 cm of the trachea, and the carina, and was repaired immediately. She was extubated post-operatively, and initially managed conservatively with high flow oxygen. On the second post-operative day she developed respiratory failure, with hypoxia, hypercarbia and respiratory distress, requiring positive pressure ventilation.Initially she was intubated orally, with a 5.0 endotracheal tube inserted into the right mainstem bronchus via fibreoptic bronchoscope. A tracheotomy was then performed, and a size 5.0 endotracheal tube was inserted into the left mainstem bronchus, via the tracheotomy, with the cuff inflated below the level of the tracheal tear. Once the left side was secure the oral tube was removed. Subsequently, a right sided 5.0 endotracheal tube was passed, via the tracheotomy, into the right mainstem bronchus with the cuff inflated below the level of the tear.Two separate ventilators were used, with pressure regulated volume control.Her arterial blood gases and chest x-ray improved over the following 24 hours.
Conclusion: For patients who require positive pressure ventilation post tracheal rupture, the presence of an endotracheal tube with an inflated cuff, and positive airway pressure impairs healing. For patients with disruption of the lower one third of the trachea, selective bilateral mainstem bronchus intubations to allow positive pressure ventilation are ideal. This allows patients to be ventilated according to a protective ventilatory protocol while the tracheal rupture is allowed to heal.
References:
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19AP2-9

Airway management in an Italian cardiothoracic anaesthesia department: Incidence of difficult laryngoscopy and use of dedicated intubation devices

Merli G., Gregu S., Mazzanti V., Moliterni P., Salis S.
Centro Cardiologico Monzino, Department of Anaesthesiology and Intensive Care, Milano, Italy

Background and Goal of Study: According to previous studies, cardiac surgery patients could be affected by a higher incidence of difficult laryngoscopy than the general population due to older age and age-dependent alterations in anthropometric parameters. The aim of this study is an analysis about the laryngoscopic classes detected in a population of cardiac surgery patients. The incidence of difficult intubation and the use of dedicated devices to perform intubation are also related and studied
Materials and Methods: After Ethical Committe approval, a retrospective study was carried on a population of 6474 patients, who underwent cardiac surgery in a 6 year period (January 2005-December 2010). Patients data were collected from the PATS clinical database (Patient Analysis and Track-

ing System, Dendrite Clinical Systems Ltd, UK). Laryngoscopic classes were described according to the Cormack and Lehane classification modified by Yentis. The use of specific intubation devices and the subjective judgement of difficult intubation were cross-tabulated with laryngoscopic classes

Results and Discussion: Class III-IIIA-IV patients represented the 4.6% of the whole population. If estended to Class IIA, the incidence of difficult laryngoscopy increased to 10.1%.However Intubation was judged "difficult" in only 255 patients out of 6474 (3.9%). Among them, also 54 Class I-II patients were included.The Frova introducer was the most used device to perform intubation: 779 cases (12%). 42% of them were classified as low difficult laryngoscopies (Class I-II).Tube stylet use was 2.2%. Fiberoptic broncoschope was used in a very low number of cases, both alone (0.06%) and in association with an extraglottic device plus the Aintree Intubation Catheter (0.2%). The videolaryngoscopes were increasingly used (1.5%) in cases of difficult standard Macintosh laryngoscopy.

Conclusion(s): Our data show an incidence of difficulty lower than previous studies (4.6% vs 10%), indicating no differences with patients undergoing general surgery. This rate increases when Class IIA patients are included. However the judgement of difficult intubation declared by the attending anaesthesiologists remains lower (3.9%).

The Frova introducer is the most used intubating device in difficult cases. It's indicated when only a partial laryngeal view is possible. Nevertheless, it's also used to make the intubating manoeuvre easier and less traumatic even in absence of severe difficulty.

19AP3-1

A randomized study comparing three bronchial blockers, Arndt®, Coopdech® and EZ-blocker® and a double-lumen tube for lung isolation: A manikin study

van Gennep L., Mungroop H., Morei N., Scheeren T., Epema A.
University Medical Center Groningen, Department of Anaesthesiology, Groningen, Netherlands

Background and Goal of Study: Double-lumen tubes (DLT) and bronchial blockers (BB) are used for lung isolation and one lung ventilation during thoracic surgery. Recently [1] a new Y shaped bronchial blocker was developed, the EZ-Blocker, with two distal extensions to be placed in the two main stem bronchi. In a manikin model we compared lung isolation achieved with this new Y shaped blocker to the conventional Arndt BB and Coopdech BB, and a left sided DLT.

Materials and Methods: After instruction, 20 anesthesiologists intubated a manikin (Laerdal, Stavanger, Norway) with a single lumen tube (SLT) and a DLT as training. Next the sequence of the SLT (Mallinckrodt 8.0) versus DLT (Mallinckrodt 37Fr, leftsided) and BB (Arndt BB 9Fr, Cook Critical Care, Bloomington, USA; Coopdech BB, Smith Medical, Rosmalen, NL; EZ-blocker, AnaesthetIQ, Rotterdam, NL) were randomized. Intubation time and success rate (checked by fiber optic bronchoscopy, FOB) were recorded. After intubating with the SLT the different BB were introduced under guidance of a FOB into the left main stem bronchus. Time from introduction of the BB in the SLT until reaching appropriate position was recorded and position was checked. Data are expressed as mean ± SD, failure rate as percentage and compared using T-test and χ^2 test respectively, with $p < 0.05$ considered statistically different.

Results and Discussion: This study demonstrates that lung isolation with a DLT was achieved significantly faster compared to the different blockers. Isolation time between the blockers (table) did not differ significantly. However, the blockers had a higher success rate compared to the DLT (55%). The Arndt BB was the least successful BB (75%). Lung isolation with the EZ-blocker and Coopdech was successful in all cases.

Malpositioning of the Arndt BB consisted of introduction into the right main stem bronchus. Malpositioning of the DLT consisted of introduction into the right main stem bronchus or because the tip was placed too deep.

Conclusion(s): Because of the high success rates the EZ-Blocker and the Coopdech BB seem to be preferable to both the Arndt BB and the DLT.

References:

1. BJA 2010;104:119-120

	DLT	Arndt	EZ-Blocker	Coopdech	
Time (sec) mean ± SD	9,7 ± 2,4*	56,5 ± 17,5	59,9 ± 33,3	55,0 ± 29,8	*p<0.01
Success rate (%)	55 #	75 #	100	100	#p<0.05

[Lung isolation time and succes rate]

19AP3-2

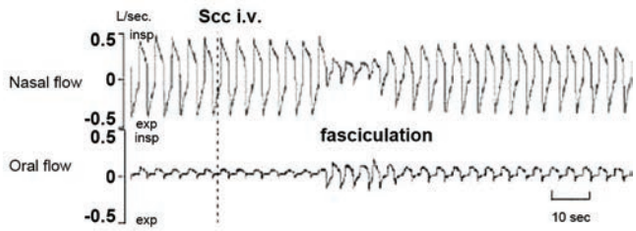
Succinylcholine administration does not impair mask ventilation in anaesthetized persons

Ikeda A., Isono S., Yogo H., Nishino T.
Graduate School of Medicine Chiba University, Department of Anaesthesiology, Chiba, Japan

Background and Goal of Study: In general, use of muscle relaxant prior to confirmation of mask ventilation is not advised because of possible difficult mask ventilation. We undertook this study to test the hypothesis that succinylcholine (SCC) administration impairs mask ventilation in anaesthetized patients. Furthermore, contribution of oro-nasal airway routes to ventilation during positive pressure ventilation was assessed by a custom-made partitioned facemask separating oral and nasal passages.

Materials and Methods: Anaesthesia was induced and maintained by continuous infusion of propofol (TCI 3-4 μg/ml) following fentanyl administration (100μg) in 18 non-obese adult patients. Oral and nasal flow was separately measured by two pneumotachographs attached to the facemask during pressure controlled ventilation before and after SCC injection (1mg/kg). Tidal volume (VT) was calculated by integration of five consecutive expiratory flows.

Results and Discussion:



[Oro-nasal flow changes responding to SCC injection]

Marked increase of oral flow and reduction of nasal flow were observed during fasciculation, and both returned to the pre-SCC levels and patterns.

VT (ml)	pre SCC	fasciculation	post SCC
Nasal route	277±246	200±156 δ	293±239
Oral route	125±140	222±164 δ	163±153
Nasal+Oral routes	402±211	418±192	457±185

[VT changes in response to SCC injection (n=18)]

Fasciculation produced significant nasal-VT decrease and oral-VT increase whereas these changes were totally reversed by 60 seconds after SCC injection. No significant change of total-VT was observed throughout the experiment. Both nasal and oral airway routes differently contributed to ventilation, suggesting advantage of full facemask during anaesthesia induction.

Conclusion: SCC does not reduce efficiency of mask ventilation, suggesting no adverse SCC effect on airway patency.

19AP3-4

Video laryngoscopes in emergency medicine - a comparison using a simulated entrapped car accident victim

Wetsch W.A., Carlitscheck M., Hinkelbein J.
University Hospital of Cologne, Department of Anaesthesiology and Intensive Care, Cologne, Germany

Background/aim: Video laryngoscopes (VL) have gathered clinical standard for difficult endotracheal intubation (ETI) in hospitals. Although ETI may be beneficial for survival in trauma patients, difficult intubation and thus failure in ETI is more frequent in the field.

However, unrecognized tube misplacement may be deleterious. The aim was to evaluate the usability of different VLs in a difficult preclinical emergency situation.

Material/methods: An intubation manikin (Ambu Airway Man, Ambu, Denmark) was placed at the driver seat of a MINI Cooper S (BMW, Munich, Germany) with the seatbelt fastened.

Access was only possible through the opened driver door. In a randomized order, participants intubated the manikin's trachea using (A) Glidescope Ranger, (B) Storz C-MAC, (C) McGrath Series5, (D) Ambu Pentax AirwayScope, (E) Airtraq and (F) Macintosh #3 as reference. Participants were 25 experienced

anaesthesiologists, 20 of them also board certified as emergency physician. Primary endpoint was time to successful tube placement, secondary endpoints were time to first ventilation, glottic view and tube position. Wilcoxon signed-rank and McNemar tests were used for statistical analysis; $p < 0.05$ was considered as significant.

Results: There was no unrecognized oesopaheal tube placement. With Airtraq and Macintosh, all participants were able to successfully intubate the manikin's trachea within 180s. Failure to intubate was more frequent with McGrath Series5, Glidescope Ranger and Storz C-MAC ($p < 0.05$). VLs offered a significantly better view to the vocal cords (Cormack&Lehane score) than with conventional Macintosh blade ($p < 0.05$). Time to ETI - as well as to first ventilation - was comparable between Macintosh, Airtraq and Pentax AWS, and significantly longer with McGrath Series5, Glidescope Ranger and Storz C-MAC ($p < 0.05$).

Discussion: Despite better glottic view was obatined with VLs, neither ETI nor first ventilation were performed faster than with reference method. VLs with tube-guide (Airtraq, Ambu Pentax AWS) facilitated ETI significantly faster and safer than VLs without tube-guide (McGrath Series5, Storz C-MAC, Glidescope Ranger). Good glottic view in emergency situations, especially in uncommon patient position and different handling, does not grant that the tube can also be placed safely.

Conclusion: VLs with integrated tube-guide may offer advantages in difficult emergency situations such as the intubation of an entrapped car accident victim.

19AP3-5

Improving communication of difficult tracheal intubation between primary and hospital care

Wilkes M., Gardner C.P., Beattie C., Mcnarry A.F.
NHS Lothian, Department of Anaesthesia and Critical Care, Edinburgh, United Kingdom

Background: Prior warning of potentially difficult intubation improves patient safety. Patients often have multiple sets of case notes and may attend different hospitals or travel abroad for healthcare. In the UK, the only constantly updated medical record is held by the General Practitioner (GP). Previously, we examined how anaesthetists communicated difficult tracheal intubation (DTI) cases to GPs [1,2].

In this survey, we investigated how GPs used this information. In particular, whether they were aware of a READ code (.SP2y3) for DTI that would ensure it appeared on the GP Emergency Care Summary that routinely accompanies referrals.

Methods: We created an online survey (www.zoomerang.com), distributed by cascade to all Scottish GPs (excluding two health boards with a moratorium on surveys).

Results: We received 211 replies in the 4 week return period (approx. 4% of Scottish GPs). All but 24 (12%) were GP Principals. Twenty (9%) had some prior anaesthetics experience. Seventy-eight (37%) of GPs had received correspondence in the past regarding DTI (typically from the anaesthetist) and half of these ($n = 39$) had then forwarded it on: 16% to the anaesthetist directly, 63% to the surgeon and 26% told the patient. Crucially, only 53% ($n = 20$) included it in the GP Emergency Care summary.

All but four (2%) of the GPs felt it important that a patient was made aware that they were a DTI and that the information was recorded in the primary care notes.

Suggestions on how to improve communication were made by 190 (90%) GPs. 98% stressed the importance of diagnostic coding in compiling patient records, but only 19 (9%) were aware of the .SP2y3 coding.

Some (14%) pointed out that labelling the code as HIGH PRIORITY would make DTI appear prominently in all summaries, for example, alongside drug allergies.

Conclusions: As anaesthetists, we must realise that family doctors are key to effective communication of the difficult airway. In the UK, GPs are aware of the importance of sharing this information but like their anaesthetic colleagues, often fail to do so.

Anaesthetists cannot rely on practices to be aware of the codes for every condition and we should aim to supply the READ code and Priority in our correspondence. We should also emphasise the need for GPs to relay DTI information back to us in future referrals.

Acknowledgements: Edinburgh Anaes Research & Education fund

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19AP3-6

Unplanned difficult airway access... real life practices!

Muller V., De Saint Maurice G., Dureuil B., Yavordios P-G., Steib A., Benhamou D.
HIA Percy, Department of Anaesthesiology and Intensive Care, Clamart, France

Objectives and Background: Improvement of patient's safety relies partly on adverse events reporting. In France since 2007, the assessment of near misses is realized in the national frame of physician's accreditation under the responsibility of the French Health Authority Agency (Haute Autorité de Santé). The French anaesthesia college (Collège français d'anesthésie réanimation) analyzes these near misses in order to seek causes, to assess their preventability and avoid their repetition.

Materials and Methods: The present study focuses on the first 250 question sheets referring to the unplanned difficult airway access.

Results: In 80% the cases were real unplanned difficult airway access and in the others cases, the airway preoperative assessment hadn't been taken into account. The laryngoscopy was difficult in 63% of cases and impossible in 46%. 34% of patients presented a $SpO2 < 90\%$.

During 32 events the anaesthetist was alone in the operating room. In 83 events he was with a nurse anaesthetist and in 118 cases he was with someone non-qualified in anaesthesia (surgeon, nurse…). The first two airway attempts were performed in 83% by an anaesthetist. In more than half of the cases it was a standard laryngoscopy.

After the failure of the first attempt, help was called up in 131 cases. This help was qualified in anaesthesia in 123 cases. The more common rescue technique was the stylet, successfully in 94/142 utilizations. The second was the LMA-Fastrach.

The preoperative assessment contained the Mallampati score in 92% of anaesthesia records. The combination of the three predictive signs recommended by the French guidelines (Mallampati score, mouth opening, thyromental distance) was missing in more than half of the anaesthesia records. A clear conclusion on airway access was present in 73% of anaesthesia records. Despite that, the opinion of 67 anaesthetists declaring the near misses was that the preoperative airway assessment was inappropriate.

58% of physician considered the cases as avoidable. The two main root causes advocated were a poor airway assessment in 28% of cases and a poor team communication in 26%.

In 135 cases preventing measures have been undertaken after the event (improvement of the anaesthesia record sheet, of the rescue material…).

Conclusion: According to this reporting system, the more common cause of unplanned difficult airway access is a poor airway assessment, in spite of the guidelines.

19AP3-7

Tracheomalacia and Tracheo-esophageal fistula: Complications of prolonged tracheal intubation - case report

Oliveira E., Vale C., Tourais I., Marques M.
University Hospital of Coimbra, Department of Anaesthesiology, Coimbra, Portugal

Introduction: Prolonged tracheal intubation(TI) is associated with important late complications. Ttracheomalacia(TCM) and tracheo-esophageal fistula(TEF) are two of them.In spite of being rare, they are associated with high morbidity and mortality. We present clinical case of patient, who developed TCM and TEF after prolonged TI.

Case Report: A 67-year-old, female, ASA II patient, admitted in the Burn Unit, with burns of 2nd and 3rd degree, by fire, in 29% of body surface (face, neck, anterior chest and upper limbs). At the admission: hemodynamically stable, intubated with cuffed 7,5 ETT and on controlled ventilation. On the 10th day of hospitalization,thorax escharectomy was performed, and she developed sinus bradycardia that evoluted into cardiac arrest. Maneuvers of basic and advanced life support were done, with reversion to sinus rhythm and palpable pulse. On the 18th day, the patient was with marked gastric distention and air leakage around the cuff. Chest radiography showed a high amount of air into the gastric cavity and tracheal dilatation at the site of cuff placement. To properly ventilate the patient, it was necessary to increase the volume of the cuff. Pressure cuff was measured and was 100 cmH2O. ETT was changed to a cuffed 8.5 ETT, but the proper sealing of the cuff was never achieved. Tracheostomy was performed, with the placement of a 8 tracheostomy tube, and the air leakage around the cuff persisted. Endoscopy was made, and tracheo-esophageal fistula was identified at 18 cm during the endoscopic procedure. As the patient condition didn't allowed surgery, an 8,0 wired ETT was placed in trachea with the cuff below the fistula under fiberoptic visualization. The patient died on the 45th day of hospitalization with multiorgan failure.

Discussion: Clinical suspicion of TCM and TEF should be high in the presence of a history of prolonged TI with high cuff pressures, air leakage around the cuff and peri-tracheal dilation at the site of cuff placement on the chest radiography. The cuff is the main factor for the occurrence of this mechanical injury and gastric tube may be related to the increased incidence of TEF. Reduced blood flow in the tracheal mucosa by hypotension or shock and reduced O2 concentration on the tracheal tissue by hypoxia or anemia are also predisposing factors. Fiberoptic endoscopy should be performed to confirm the diagnosis, and corrective surgery should be made.

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19AP3-8

Access to advanced airway equipment in the United Kingdom: Implications for training

Jeffrey A.S., Mcnarry A.F, Liew G., Daly O.
NHS Lothian, Department of Anaesthesiology, Edinburgh, United Kingdom

Background and Goal of Study: The Royal College of Anaesthetist's new 2010 curriculum includes a compulsory higher airway management module [1]. All trainees should be able to use fibreoptic intubation (FOI), high frequency jet ventilation (HFJV) and videolaryngoscopes (VL). Lack of device availability in Scotland has already been reported [2]. Given present financial constraints, we wondered if trainees in England, Wales & Northern Ireland could access these devices.

Methods: We contacted all hospitals in England, Wales & Northern Ireland with surgical services. We asked:

i) number of theatres and fibreoptic scopes per suite,
ii) how many videolaryngoscopes (VL) each site owned and if for training, routine or emergency use,
iii) if the theatres had HFJV,
iv) if difficult airway trolleys (DAT) were standardised across the site,
v) if low frequency jet ventilation (LFJV) was available,
vi) if there was separate LFJV for elective use,
vii) if there were head & neck, max-facial or ENT services on site.

Results and Discussion: We obtained data from 127 hospitals (53%). Access to FOI equipment was possible in 127 sites (100%), with the mean scope to theatre ratio being 0.4, range 0.09 to 1.0.

VL yes	VL owned	HFJV	DAT standardised	DAT with LFJV	Separate LFJV	Head & neck/ Max-Fax/ ENT
57%	53%	43%	87%	87%	35%	74%

[Results table]

Videolaryngoscope availability is shown below. 73 sites (57%) had VLs. The median number of VL per site was zero, with the range zero to four. Only 9 sites had more than one type and 20 sites more than one in quantity (Airtraqs excluded). 87% of VL sites used it for clinical training.

	McGrath	Airtraq	Glidescope	Pentax	Storz	Bonfils	Clarius Shikani
Sites with each VL	20	20	14	5	3	2	2

[Videolaryngoscope availability by type]

Despite 94 sites providing ENT services (74%), only 51 hospitals had HFJV (43%).

Conclusion: Our survey is limited by a lack of validation of the information provided. Fibreoptic scope availability varied widely with small hospitals and specialised units having a higher ratio, however these units have fewer trainees and our survey did not consider device utilisation. With less than 50% of sites possessing videolarygoscopy and high frequency jet ventilation, education with these devices will be difficult. Training in all advanced airway techniques will be hampered though lack of device availability regardless of trainer and trainee enthusiasm.

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19AP3-9

Tracheotomy tube rupture: A case report

Pampin Conde M.J., C.Taboada , A. Gonzalez, M. Lago, M. Rodriguez, C. Barreiro
Complejo Hospitalario de Pontevedra. H. Montecelo, Department of Anaesthesiology and Pain Medicine, Pontevedra, Spain

Background and Goal of Study: Tracheotomy tube rupture (TTR), the subsequent fragment migration and impaction in the left main bronchus, is an uncommon but potentially dangerous condition[1]. We report a case of tracheotomy outer tube fracture at the junction with the neck plate.

Materials and Methods: a 73 year old male, ASA II patient, tracheostomized 17 year previously and with a permanent tracheotomy silver tube. He went to the emergency room because suddenly became dyspneic and cyanosed after coughing. When the inner tube was removed was found the outer tube was fractured at the junction with its neck plate and was inhaled. Chest X-ray showed the fractured segment migrated resulting in a metallic foreign body in the left main bronchus. Respiratory failure was initially solved in the emergency room so the patient was taken to the operating room where was given local anesthesia with intravenous sedation (midazolam 2 mg and ketamine [2] 20 mg) and fiberoptic bronchoscopy was done trough the tracheal stoma. The silver foreign body was located and retrieved from the left main bronchus successfully.

Results and Discussion: Aspiration of a foreign body into the tracheobronchial tree is a potentially life-threatening event and requires quick treatment. Repeated boiling of the tube, chemical erosion by alkaline tracheobronchial secretions and the solutions used for cleaning and disinfecting it, are causes of corrosion of the tube. Prolonged use, ageing metal and manufacturing defects has been proposed as risk factors of a fractured tracheostomy tube. The first episode of tracheotomy tube fracture resulting in a bronchial foreign body was reported by Bassoe and Boe in 1960 since then the reviewed literature is in order to diagnose possible causes of tracheotomy tube fracture.

Conclusion(s): In the case reported, tracheotomy tube fractured could probably be due to prolonged wear and ageing metal as he reported not having changed the tube for more than two years. Frequent inspection and cleaning of the tracheotomy tube and its scheduled replacement may avoid that relatively rare but serious complication.

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19AP3-10

Bougie induced airway trauma and 'hold-up' sign

Anderson E.A., Hodzovic I., Wilkes A.
University Hospital of Wales, Department of Anaesthesiology, Cardiff, United Kingdom

Background and Goal of Study: Tracheal tube introducers are valuable in the management of unexpected difficult airway[1]. Tracheal ‚clicks' and ‚hold-up' signs are used to confirm tracheal placement of an introducer[1]. Serious airway trauma has been reported when distal ‚hold-up' sign was used to confirm tracheal placement[2]. There is currently no information on the forces exerted at the tip of an introducer associated with the ‚hold-up' sign. This study aims to determine the forces exerted in the airway when ‚hold-up' sign is used to confirm tracheal placement.

Materials and Methods: Ten samples of the Frova, BreatheSafe and Eschmann introducers were studied. The terminal end of the right main bronchus of the Laerdal Intubation Trainer was aligned with the disc of a force transducer. To simulate the increasing distances when ‚hold-up' sign can be elicited, airway extensions were added to the end of the bronchus. The force exerted at the tip was recorded three times for each distance: 25, 30, 35, 40 and 45 cm.

Results and Discussion: Our findings are presented in the table. Values are mean (SD) in Newtons.

'Hold up' at:	Eschmann	Breathesafe	Frova	p-value
25cm	1.3 (0.5)	3.0 (1.0)	6.3 (1.2)	<0.001
30cm	0.6 (0.1)	1.9 (0.5)	4.7 (0.7)	<0.001
35cm	0.7 (0.2)	1.9 (0.3)	4.7 (0.6)	<0.001
40cm	1.0 (0.3)	2.0 (0.2)	4.8 (0.6)	<0.001
45cm	1.4 (0.2)	2.1 (0.4)	5.7 (0.9)	<0.001

[Forces exerted during hold up sign]

Conclusion(s): The Frova introducer exerted significantly greater force during the ‚hold-up' than the BreatheSafe or Eschmann introducers. Surprisingly, forces exerted by the introducers increased (after the initial drop) as the distance from the incisors to tip increased to more then 35 cm. This may be due to a greater proportion of the force being transmitted to the introducer tip when an introducer is confined by an airway. A force of 2N corresponds to a peak pressure of 100kPa exerted over the surface area of an introducer tip. Consequently, a serious airway trauma is likely when ‚hold-up' sign is used to confirm tracheal placement of a single-use introducer.

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19AP4-2

Boost of the pulsation rate from 600/min to 1200/min during supraglottic, superimposed high frequency jet ventilation (SHFJV) optimises the operating conditions during vocal cord surgery and does not influence pulmonary pressures

Scherübl M., Mausser G., Arrer A., Schwarz G.
Medical University Graz, Department of Anaesthesiology and Intensive Care, Graz, Austria

Background and Goal of Study: Supraglottic, superimposed high frequency jet ventilation (SHFJV) via modified Kleinsasser laryngoscope is a common ventilation technique in endolaryngeal surgery. This technique ensures sufficient ventilation and oxygenation, and offers the surgeon an unimpaired operating field.

However supraglottic SHFJV often causes undesirable vibrations in the operating field which are annoying for the surgeon and can compromise the accuracy of vocal cord-surgery. Therefore in the past the high frequency part of the ventilation setting was increased from 600/min up to 1200/min. The aim of the study was to assess, if doubling of the pulsation rate in the high frequency part may lead to inadvertent high pulmonary pressures.

Materials and Methods: An artificial Adult Test Lung, Compliance 0.1 L/cmH2O (Metron 5601i, Michigan Instruments Inc, US), connected with an Adult Trachea model, was ventilated with a TwinStream Jet Ventilator (C. Reiner, Vienna, A) via a Jet Laryngoscope (SN LAR 104301, C. Reiner, Vienna, A).

The ventilator setting for supraglottic SHFJV was 12/min respectively 600/min and 1200/min, I:E was 1:1 and 1:2. The driving pressure ranged from 0.8 to 1.2 bar in the low frequency part and from 0.6 to 1.0 bar in the high frequency part. Recording of the data at steady state were repeated five times for all settings. For recording and calculation of the data we used the PneuView® Software (Michigan Instruments Inc, US) on a personal computer. Wilcoxon signed rank test was applied and measurement data were presented as mean ± SD.

Results and Discussion: In the ventilation settings no significant difference in pulmonary pressures could be registered. With augmentation of the driving pressure the pulmonary pressure generally increased, but no clinically inadequate pressure levels occured in any experiment.

Conclusion: Supraglottic SHFJV is a minimal invasive ventilation technique and offers the surgeon an unimpaired operating field. The augmentation of the high frequency part up to 1200/min doesn't cause inadvertent high pulmonary pressures, but it causes a reduction of the vocal cord vibrations and enables better surgery conditions. Therefore this technique may be useful to enhance the patient outcome in endolaryngeal surgery.

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19AP4-4

The performance of the i-gel® in comparison with the laryngeal mask airway classic

Ayedi M., Zouari J., Smaoui M., Jarraya A., Bouaziz I., Kolsi K.
Hopital Hedi Chaker, Department of Anaesthesiology and Intensive Care, Sfax, Tunisia

Background and Goal of Study: Many supralaryngeal airway devices are available. The I-gel® is a new supraglottic airway device with a non-inflatable cuff designed for use during anesthesia. It is composed of a soft gel-like cuff that adapts to the hypopharyngeal anatomy [1]. This study was designed to compare the I-gel® and laryngeal mask airway (LMA) classic.

Materials and Methods: Fifty two patients, 60-80 kg, ASA I-II physical status, undergoing a short-duration gynecologic surgery were included in this prospective, randomized study. In group1 (n=26) we used the I-gel®, in group2 (n=26) we used LMA classic inflated with a maximum of 20 mL of air. We evaluated the ease inserting, insertion time, number of attempts and leak proof of the I-gel® and LMA classic. Successful ventilation was defined as visible chest movement, square wave capnogram and stable arterial oxygen saturation. Ventilatory parameters during intervention were recorded. Complications during insertion and removal were noted. After that we reported the incidence of postoperative complaints by patients after 1 and 4 h postoperatively like sore throat, dysphagia, dysphonia, neck pain, numb tongue, gastric inflation and other complaints. Statistical study was performed using SPSS 18.0 for Windows, the analyses of data by chi-square and t-test , the results were considered as significant for $p < 0.05$.

Results and Discussion: The demographic characteristics and duration of the intervention were comparable between the two groups. There were no significant differences in number of attempts of insertion ($p = 0.561$), the quality of insertion ($p=0.244$) and leak proof ($p=0.074$) of the devices. Insertion time was shorter in G1 (20sec in G1 versus 28sec in G2; $p< 0;001$). There was a higher incidence of dysphagia at the first postoperative hour in G2 ($p< 0.05$). The other postoperative complaints were absent in both groups.

We noted that the Paw was higher in G1, 16mmHg versus 13mmHg in G2 ($p< 0.05$). In some cases, supraglottic airway device removal, was complicated by blood on the device (1case in each group), brief episode of laryngeal spasm (2 cases in G2), troublesome secretions (1case in G2), hiccough (1case in each group).

Conclusion(s): The I-gel® has a short insertion time rate and fewer complications than LMA classic; it seems to be an efficient and safe device.

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19AP4-5

Comparison of two supraglottic airway devices: I-gel and LMA-classic in pediatric anesthesi

Ayedi M., Zouche I., Smaoui L., Zouari J., Abidi S., Kolsi K.
Hopital Hedi Chaker, Department of Anaesthesiology and Intensive Care, Sfax, Tunisia

Background and Goal of Study: Supraglottic airway devices (SAD) are now widely used for surgery requiring general anesthesia. The I-gel is a new single-use SAD with a non-inflatable cuff. In this study we propose to compare the performance of the I-gel and the LMA-Classic used during pediatric anesthesia.

Materials and Methods: After obtaining local ethic committee approval and informed parents' consent, we conduced a prospective randomized clinical trial. children from 1 to 12 years old, undergoing elective surgery who required general but not necessarily tracheal intubation were recruited to the study. Patients with known lung disease and risk factors for difficult intubation or regurgitation were excluded.

The induction of anesthesia was made by sevoflurane 2 MAC, then an adapted size for child weight of the SAD was inserted by an experienced anesthetist (I-gel in group1 and LMA-Classic in group2). Correct insertion was assessed by proper chest expansion, the presence of a normal CO2 wave form on the capnograph, absence of audible leak, and symmetric chest auscultation. Patients were ventilated with volume-controlled mode, tidal volume was set at 8 ml/kg, respiratory rate was set to obtain an end-tidal CO2 between 30 and 35 mmHg. Data recorded were as follows: number of insertion attempts, duration of insertion, ease of insertion (E=easy; A=acceptable; D=difficult; F=Failure), laryngeal seal (E=Excellent; M=Medium; B=Bad), necessity of mandible subluxation or neck extension to be inserted, presence of gastric inflation and complications occurring during insertion and removal.

Results and Discussion: Forty patients were enrolled, demographic patients characteristics were similar between the two groups.

There was no significant difference in number of insertion attempts (1.15 for Group1 and 1.1 for Group2) and in the need of mandible subluxation (80% in each group). Need of neck extension was higher in group1 (70%) than in group2 (25%) ($P=0.004$). Duration of insertion was lower in group1 (6.6sec versus 10 sec in group2; $p=0.01$).

Insertion score was statistically similar in both group ($p = 0.16$) and score of laryngeal seal was better in group1 ($p=0.012$)

No complications occur in both groups neither in insertion nor in removal and no gastric inflation were noted in both group.

Conclusion(s): I-gel can be used safely and easily in pediatric anesthesia, it seems to provide a shorter insertion time and better laryngeal seal than LMA-Classic.

19AP4-7

Can we predict difficult intubation in obese patients?

Fotopoulou G., Vasileiou I., Dre K., Ntoka P, Lampadariou A., Tsinari K.
Laiko University Hospital, Department of Anaesthesiology, Athens, Greece

Background and Goal of Study: Difficult tracheal intubation and the consequent risk of hypoxemia significantly contribute to the morbidity and mortality associated with anaesthesia among obese patients. The aim of our study was to evaluate the incidence of difficult intubation and its predictors in obese patients.
Materials and Methods: We performed a prospective,controlled study between 20 obese [body mass index (BMI) ≥30 kg/m²] , adult patients undergoing laparoscopic sleeve gastrectomy or gastric bypass (group O) and 20 lean adult patients scheduled for elective surgery and intubated by the same anaesthesiologists (group L).
Patients with upper airway pathology or cervical spine fractures were excluded from the study. Variables assessed included age, ASA physical status,body mass index (BMI), modified Mallampati classification without phonation, thyromental and sterno-mental distance with the neck extended, temporo-mandibular joint mobility, neck extension, width of mouth opening, neck circumference and intubation difficulty scale (IDS) score. A Cormack grade III or IV was considered as difficult laryngoscopy. For the statistical analysis we used Fisher's exact test for quality variables and non-parametric tests for quantity variables. By multivariable regression analysis we looked for factors predicting difficult intubation in group O. Results are reported as percentages,odd ratio and 95% confidence interval. Differences were considered significant if $P < 0.05$.
Results and Discussion: The incidence of poor laryngoscopic view was similar between group O and L (10,4% vs 10.1%, P = 0.58), but difficult intubation (IDS>5) was more frequent in group O (20% vs 2%, P< 0,001). Although obese patients were younger (P < 0.001), they had significant comorbidities [obstructive sleep apnea (15,5% vs 2,2%, P < 0.001),diabetes (14.3% vs 3%, $P = 0.03$)]. Neck circumference, sterno-mental distance, thyro-mental distance and BMI are independently correlated to IDS>5 in group O{$P = 0.0003$ [odd ratio, 7.02 (5.44-8.59)] for neck circumference, $P = 0.0021$ [odd ratio, 3.00 (2.18-3.81)] for sterno-mental distance, P=0.0014 [odd ratio 3.70 (2.98-4.41)] for thyromental distance, and P=0.00012 [odd ratio 15.7 (13.81-17.58)] for BMI}.
Conclusion(s): Obesity is a risk factor for difficult intubation. Neck circumference, sterno-mental and thyro-mental distance can help anaesthesiologists predict a problematic airway management.

19AP4-9

No contact of epiglottis with mask aperture bars of extraglottic airway devices: Prevention of occluding the airway questioned

van Zundert T., Brimacombe J.R., Marcus M.
Maastricht University Medical Center, Department of Anaesthesiology, Maastricht, Netherlands

Background and Goal of Study: The original LMA-classic® was developed with two mask aperture bars in order to prevent a large epiglottis from falling into the aperture, blocking and occluding the airway. Newer extraglottic airway devices (EAD) either lack mask aperture bars, or have a varying number (2 up to 8) of mask aperture bars, or show a modified version (i.e. an epiglottic elevating bar). We tested the hypothesis that the anatomical position of single-use EAD is similar with or without aperture bars.
Materials and Methods: Sixty-eight consecutive patients were randomly allocated to receive anesthesia with one of four EAD: LMA-U® (The Laryngeal Mask Company, Mahe, Seychelles), Cobra-PLA® (Engineered Medical Systems, Indianapolis, Indiana USA), Portex® Silicone (Smith Medical Hythe, Kent, UK) or Ultimate® (Ultimate Medical Richmond Victoria, Australia) laryngeal mask. Each patient received two masks ad random, i.e. one mask in which the mask aperture bars were removed and one with the mask aperture bars left in situ. We evaluated via endoscopy, the anatomic position the EAD, including the position of the epiglottis, whether the epiglottis was in contact or not with the mask aperture bars and whether herniation through the aperture bars was seen.
Results and Discussion: Insertion of the EAD, and subsequent anesthesia and surgery, were uneventful in all patients. Endoscopic evaluation of the anatomic position of the EAD could not demonstrate any difference between the EAD with or without mask aperture bars, although herniation of arytenoids was seen in six patients of the Cobra group. In five patients the epiglottis made contact with a mask aperture bars, although this contact was very limited.
Conclusion(s): No anatomical utility of the mask aperture bars could be demonstrated in this study. Furthermore, our data suggest that the anatomical position of EAD may differ between EAD with a different number of mask aperture bars, as herniation of the laryngeal structures is seen more frequently when more than two mask aperture bars are present.
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19AP4-10

Evaluation of three different airway predictive indices in obstetric patients using the modified cormack-lehane scoring system (MCLSC)

Pentilas N., Stamatakis E., Valsamidis D., Glinavou A., Paraskevopoulos T., Zoggogianis I., Dimitriou V.
General Hospital of Athens ‚Alexandra', Department of Anaesthesiology, Athens, Greece

Background and Goal of Study: Airway management is the cornerstone in maternal mortality for many reasons. Obstetric anesthesiologists do not practice often enough airway skills due to the large number of regional anesthesia techniques performed specially in western societies. The purpose of this study is to evaluate the following clinical predictive indices: modified Mallampati test (MMT), the ratio of height to thyromental distance (RTHMD) and the Upper Lip Bite test(ULBT) using the 5-grade modified Cormack-Lehane scoring system as a marker for the presence or not of difficult laryngoscopy
Materials and Methods: We collected data from 35 parturients scheduled to receive general anesthesia for elective caesarian section. Preoperatively a single anesthesiologist with 4 years experience performed the MMT, ULBT and RTHMD. Rapid sequence induction was performed in all patients and laryngoscopic view was estimated by anesthesiologist (with at least 5 years experience) who used the modified Cormack-Lehane's classification. The anesthesiologist who performed the intubation was not aware of the preoperative results .We calculated sensitivity, specificity, accuracy, positive predictive value (PPV), negative predictive value (NPV), Likehood to odds ratio (LR+).
Results and Discussion: Difficult laryngoscopy (Grade 2b-3-4) occurred in 7 patients (20%), while difficult intubation occurred in 3 cases (8,5%). For the MMT test sensitivity, specificity accuracy, PPV, NPV and LR+ was 14.2%, 82.1%, 68%, 16%, 79% and 79% respectively. For the ULBT values were 42.8%, 96%, 88%, 75% ,84% and 10.2%. Finally for the RHTMD the results were 100%, 75%, 80%, 50%, 100%, 4% respectively.
Conclusion(s): Although our sample was small, results are in order with other studies. In our study we evaluated the bedside tests using the MCLSC which is considered to be the most reliable scoring system for laryngoscopy. ULBT seems to have satisfactory performance in the field of preoperative evaluation in obstetric airway.

19AP5-1

The use of the Airtraq laryngoscope to secure proper position of endotracheal tube during bedside percutaneous dilatational tracheostomy

Sustic A., Protic A.
Univ. Hospital Rĳeka, Department of Anaesthesiology and Intensive Care, Rĳeka, Croatia

Background and Goal of Study: Percutaneous dilatational tracheostomy (PDT) is widely used and accepted method for long-term ventilation of critically ill patients. However, serious complications related to PDT have been reported including several cases with intraoperative loss of airway with fatal consequences. Generally, this is sequel of the requested delicate position of the endotracheal tube (ETT) during PDT with partially deflated cuff located at the level of the vocal cords. Recently, the new disposable intubating device, Airtraq (Prodol Meditec S.A., Vizcaya, Spain) optical laryngoscope (AL), has been used successfully in difficult airway patients. The purpose of our nvestigation was to evaluate the usefulness of the AL with wireless monitoring for initial positioning and maintaining of optimal position of ETT during PDT.
Materials and Methods: 30 critically ill adult patients who required a PDT were enrolled in the prospective study. All PDT were performed by experienced operator and guide-wire dilating forceps technique was used. Endotracheal tube was positioned by AL in following manner: an appropriately sized and well lubricated AL was inserted into the oral cavity on the left side from the ETT and ETT was gently pushed into the guiding canal of the AL. Than AL is slowly drawn over ETT with its top positioned in vallecula.
Then the cuff on the ETT was deflated and the ETT was withdrawn until the cuff was visible partly between and partly below the vocal cords. In this position, cuff was reinflated under eye control. After securing correct ETT position,

AL is fixed with fixing tape and left "in situ" during PDT. Thus, the operator has possibility to control visually on the screen exact position of ETT during whole procedure.
Results and Discussion: The initial positioning of ETT has been done without any problems in all cases. Not in one PDT were the signs of hemodynamic or respiratory instability observed, nor oxygen desaturation of arterial blood, hypercarby or loss of passable airway. In all performed PDT the operator had perfect vision of exact position of ETT during the whole procedure.
Conclusion: AL with wireless monitoring is very suitable for airway management during PDT and this device offers important additional security for operator.

19AP5-2

Glidescope guided intubation: Comparison of Frova introducer, GlideRite Rigid, GlideRite Auto and Truphatek Truflex stylets in a simulated difficult intubation

Bell S.F., Davies N., Crossley A., Wilkes A.R., Hodzovic I.
Cardiff University, Department of Anaesthesia, Intensive Care and Pain Medicine, Cardiff, United Kingdom

Introduction: Video laryngoscopy is an established technique for assisting difficult intubation. The use of either a stylet or tracheal tube introducer is recommended. The Auto (one-handed tube delivery system) and the Truflex (manually adjustable tip) are two new stylet designs. We compared the Frova introducer, Rigid, Auto and Truflex stylets in Glidescope guided intubation.
Method: We invited 48 anaesthetists to take part in this randomised crossover study. Participants practiced one successful intubation with each device on a standard manikin and then intubated a second manikin set to simulate a grade 3 laryngeal view. The total intubation time was recorded from receiving the device to placing the tube in the trachea (with the device removed). The time from receiving the device to passing it through the vocal cords was recorded as the cord time. Intubation time >120s was defined as a failure. Number of attempts (removing the device from the mouth) and dental damage (presence of dental clicks) were noted. Ease of use (0mm=extremely difficult, 100mm=extremely easy) and overall device preference were recorded. We used repeated measures ANOVA and Friedman test to analyse continuous data and Cochran Q and Chi-Square tests to analyse categorical data.
Results: Pair-wise comparisons between the three stylets for intubation and cord time revealed no significant difference. The only failures occurred when using the Frova introducer (19/48 (40%)). One participant declared no device preference. *Values are mean (standard deviation), median [IQR] and number (proportion).* n=48.

	Frova	GlideRite Rigid	GlideRite Auto	Truflex	p value
Intubation time(s)	41 [21 - 79]	13 [9 - 17]	15 [13 - 23]	16 [12 - 20]	<0.001
Cord time (s)	40 [7 - 52]	6 [4 - 10]	6 [4 - 9]	7 [5 - 10]	<0.001
<1 attempt	33 (69%)	2 (4%)	0 (0%)	1 (2%)	<0.001
Dental damage	6 (13%)	0 (0%)	3 (6%)	0 (0%)	0.005
Ease of use (mm)	32 (30)	75 (17)	77 (17)	73 (16)	<0.001
Preferred device	5 (11%)	21 (45%)	13 (28%)	8 (17%)	0.006

[Glidescope intubation with stylets and introducer.]

Conclusion: This study found that the Frova introducer was an inferior adjunct for Glidescope guided intubation when compared to the three stylets. Differences in the design of the stylets did not appear to have a significant effect on our outcome measures (except device preference). Reports of airway trauma[1] when using the Glidescope with a rigid stylet highlight the need for meticulous care when using this technique.
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Acknowledgements: Truphatek Ltd and Verathon Medical provided equipment free of charge.

19AP5-3

Awake intubation with the Pentax Airway Scope - initial experience on 17 patients

Jarvi K., Hillermann C., Danha R., Mendonca C.
University Hospitals Coventry and Warwickshire NHS Trust, Department of Anaesthesiology, Coventry, United Kingdom

Background and Goal of Study: A fibreoptic scope (FOS) is commonly used for awake intubation. However, the Pentax Airway Scope (AWS), a rigid videolaryngoscope, can also be used in patients with adequate mouth-opening.[1,2] We report our experience on 17 patients who underwent awake AWS intubation in our institution.
Methods: All patients were consented. The indications for awake intubation were variable. They each received 200mcg iv glycopyrrolate, followed by sedation with 1-2mg midazolam and a remifentanil target controlled infusion at 1-4ng/ml. The airway was anaesthetised with 4% lidocaine - as a gargle and as a spray to the palate, oropharynx, base of tongue and posterior pharynx. The AWS, with size 7-8 endotracheal tube (ETT) mounted, was inserted. On visualisation of the vocal cords, further lidocaine 4% was sprayed to the larynx and trachea, through the ETT or the suction port of the AWS. The ETT was then advanced into the trachea. Patients were followed up the next day.
Results and Discussion: All 17 intubations were successful. Fifteen out of 17 patients had a grade one laryngeal view; the other two had a grade two and a grade four view. All intubations were rated as easy by the anaesthetist. One patient was lost to follow-up. Eight patients had partial recall of the event, eight had no recall. Fifteen patients rated the procedure well with scores of 8-10/10 (1= very unpleasant, 10=easily tolerable). Only one patient gave a rating of 2/10. No oral or dental damage was sustained.
Our results for the use of the AWS in awake intubation are promising. Compared to the FOS, it is quicker to set up (about one minute), has a single use blade, is battery-operated, has an attached screen and needs less training and practice to use. Grade one views are typically obtained, even in patients with grade three or four views at conventional laryngoscopy.[3]
Conclusion: The AWS is a useful alternative to the FOS for awake intubation. The main disadvantage is that about 25mm of mouth opening is required.
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19AP5-4

The reinforced laryngeal mask airway (RLMA) and airway protection during nasal surgery

Zhilla I.
University Hospital Center, Department of Anaesthesiology and Intensive Care, Tirana, Albania

Background: Since its first describe RLMA was introduced for use in head and neck surgery because from a lot of studies it provides a good seal around the laryngeal inlet protecting from the blood the airway during the surgical procedures[1, 2]. In this study we observed and provided that use of RLMA in sinus and nasal surgery is successful in protecting airways from surgical residues or aspiration.
Methods: The study was performed over a period of June 2008 to January 2010, after we obtained the ethical approval by the Ethical Commission and informed verbal consent from the patients selected. 150 patients ASA I-II adult patients aged 16-65years old, undergoing sinus and nasal surgery procedure were selected. During the surgery a RLMA, size 4-5 according to the weight of patients was used.The RLMA was examined after extubation on its inner aspect for contamination of blood and secretions and scored (0-3) by three observers according to soiling *(score of 0 = no blood; score of 1 = staining on the anterior aspect of cuff; score of 2 = staining on the inside of mask; score of 3 = blood in the tube.*

Results: Observing LMA,s after their removal we found: no blood or blood stained secretions seen on the laryngeal aspect of the LMA(score 0), 93 patients (62%); staining with blood or blood stained secretions on the anterior aspect of the cuff of the LMA(score1), 55 patients (36%); staining with blood or blood stained secretions inside the cup of the LMA 2 cases (2%).
Discussion: We found in our study a good protection on airways from an LMA, 62% score 0 and 36% score1, as like as comparing with other authors who founded more blood presence in trachea and glottis when was used an ETT. This might be because LMA covers supraglotic area and glottis so blood and fluids diverted laterally to the piriform sinus and post-cricioid regions.
Conclusion: At the end of this study we cofirm that the laryngeal mask provides good protection of the airways, so it can be used as well as endotracheal tube in nasal and sinus surgery.
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19AP5-5

Comparison of modified Mallampati classification, upper lip bite test and neck circumference in prediction of difficult intubation

Karci A., Karagöz S., Girgin P, Bozdoğan D.G.
Dokuz Eylül University, Department of Anaesthesiology, Izmir, Turkey

Background and Goal of Study: Sensitivity, specificity and accuracy of Modified Mallampati classification (MMC), Upper lip bite test (ULBT) and neck circumference have been compared with Cormack-Lehane classification.
Materials and Methods: In this prospective study, ASA 1-2, non-obese,185 Turkish patients who were scheduled for elective surgery were selected randomly and enrolled. Modified Mallampati classification, upper lip bite test and neck circumference of the patients were recorded before anaesthesia induction. Laryngoscopic views according to the Cormack and Lehane grading system were determined after induction of anesthesia and Grades 3 and 4 were defined as "difficult intubation". Sensitivity, specificity, positive and negative predictive values and accuracy of these tests were calculated.
Results and Discussion: The prevalence of difficult intubation was 8,1%. Specificity of the ULBT was 97,6%, whereas this variable for the MMC was 94%. The sensitivity and accuracy of MMC was 26,6% and 88,6%; whereas was 13% and 90,8% respectively for ULBT. Both of these tests have high specificity and negative predictive value, making them useful in identifying easy tracheal intubation and laryngoscopy. There was not a statistically significant correlation between neck circumference and Cormack-Lehane classification.
Conclusion(s): All these tests are poor predictors for difficult laryngoscopy when used as single preoperative bedside screening tests. Further studies are warranted to fully characterize the anatomic predictors of a difficult intubation.
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19AP5-6

Redictors of difficult airway in patients with morbid obesity

Barreiro Pardal C., Rodríguez Losada M., González Castro A., Sanduende Otero Y., Taboada Ben M.R., Raposeiras Roubín S.
Complejo Hospitalario de Pontevedra, Department of Anaesthesiology and Intensive Care, Pontevedra, Spain

Background and Goal of Study: Difficulty with tracheal intubation contributed significantly to morbidity associated with anesthesia. Many studies have been performed in an attempt to predict a difficult airway. Tracheas of obese patients may be more difficult to intubate. We conducted a study in morbidly obese surgical patients to identify different predictors of difficult airway in this population.
Materials and Methods: We performed a prospective study on all patients consecutively undergoing bariatric surgery at our institution from November 2006 to March 2010 (data from 98 patients). Data collected: age, gender, body mass index (BMI), history of obstructive sleep apnea (OSA), width of mouth opening, dentition, jaw protution, modified Mallampati, thyromental distance, cervical mobility, neck circumference, difficult ventilation and Cormack-Lehane grade. The SPSS program (version 15.0) was used for all statistical tests. Quantitative variables were expressed as mean ± SD and categorical variables as percentages. Comparison of continuous variables between groups (easy and difficult manual ventilation) was performed using the T-Student test for independent samples and between qualitative variables using Pearson 2 test.
Results and Discussion: The average age was 39.3 years. 83.7% were female. Median BMI was 45.8kg/m^2, thyromental distance 9.8cm, neck circumference 42.1 cm and width of mouth opening was 4cm. 13.3% presented history of OSA. 83.7% had normal upper teeth, 47.7% were Grade I at the upper lip bite test and 37.8% had a grade II. 37.8% were Mallampati II. 89.1% had good cervical mobility. Ventilation was easy in most cases (84.7%), not finding it impossible to ventilate any patient. 76.6% Cormack-Lehane I, no patient was impossible to intubate. Difficult manual ventilation was associated with a mean BMI=48.5kg/ m^2 (p=0.043).We found association between difficult manual ventilation and: male, OSA, higher degrees of Mallampati, reduced cervical mobility and higher degrees of Cormack-Lehane ($p < 0.05$).In the multivariate analysis, the presence of OSA and reduced cervical mobility were independent predictors associated with difficult ventilation.
Conclusion(s): Management of morbid obese patients' airway is more difficult than general population. Male gender, history of OSA, the test of the upper lip bite, Mallampati, neck mobility, Cormack scale and a BMI> 45 kg/ m2 may be considered as predictors of difficult airway.

19AP5-7

Intubation with Airtraq® and bronchial blocker compared with conventional intubation with double-lumen tube in thoracic surgery: Impact on the hemodynamic response

Ahamdanech Idrissi A., Payá Martínez E., Ribera C., Sánchez García E., Perez Carbonell A., Company Teuler R.
Hospital General Universitario de Alicante, Department of Anaesthesiology and Intensive Care, Alicante, Spain

Background and Goal of Study: Endobronchial intubation(EI) produces a higher response of tachycardia and hypertension due to the size of the tube and carina stimulation during placement. Thoracic surgery patients often have common risk factors with cardiovascular disease and therefore the risk of ischemic events during laryngoscopy and intubation is higher. The aim of our study is to compare two techniques of intubation, which allow one-lung ventilation, and the impact on hemodynamic response.
Materials and Methods: We present a prospective randomized study of 20 patients scheduled to undergo elective lung resection. GroupA: conventional laryngoscopy using double lumen tube. GroupB: Airtraq intubation(AI) using simple tube and Arndt bronchial blocker.Monitoring: Invasive arterial pressure monitoring, ECG II and V5, pulseoximetry. All patients were intubated with BIS< 50 and TOF0. We registered MAP, HR and ST changes in the periods T1 basal, T2 postinduction, T3 laryngoscopy, T4 intubation, T5 2' postintubation.
Results and Discussion: Both groups were comparable in age, weight, sex, baseline MBP and HR. Statistical analysis showed that changes in MBP at the times T3 and T4 in groupA, were significantly higher($P< 0.05$). HR was significantly lower only in groupB at T3. There were no significant changes in the ST register in any group.The selective intubation with double lumen tube is the gold standard in thoracic surgery that requires one-lung ventilation. The use of devices like the Airtraq and endobronchial blocker are indicated in patients with difficult airway.Patients with ischemic heart disease in thoracic surgery are considered as high risk patients for ischemic events during laryngoscopy and EI.The best hemodynamic profile that AI presents and the possibility of avoiding the use of double lumen tube, adds a new indication for this procedure as it helps reducing the adrenergic response to EI in patients with cardiovascular risk.
Conclusions: We conclude that a significant pressor response to EI with a double lumen endobronchial tube does occur and that may be diminished by AI using a single tube and endobronchial blocker.It could be indicated in patients with heart disease.
References:
Hemodynamic responses to laryngoscopy and intubation:etiological or symptomatic prevention. M.Capuzzo.Minerv Anestesiol2010;76(3):173.Comparison of the effects of intravenous alfentanil and esmolol on the cardiovascular response to double-lumen EI.A.Maguire.Anesth2007;96:319

19AP5-8

Evaluation of the success rate of the intubation with the videolaryngoscope McGrath® in combination with the direction giving Truflex™ stylet versus a hockeystick formed stylet in a simulated airway

Reus E., Liening K., Wrobel M., Grundmann U.
Saarland University Hospital, Department of Anaesthesiology and Intensive Care, Homburg/ Saar, Germany

Background and Goal of Study: Orotracheal intubation is the goldstandard for securing the airway. The unexpected difficult airway is always a challenge for experts as well as for trainees. Videolaryngoscopy with specially curved blades becomes more and more common for these cases. A problem is often that laryngoscopy is easy with the curved blades, but intubation is difficult because of the flection of the blade. The user has often a good view on the glottis but can not introduce the tube. To solve the problem the stylet of the endotracheal tube is often formed like the flection of the blade or as a hockey stick. The aim of our study was to compare the success rate of a hockey stick formed stylet versus the first flexible-tip re-usable stylet, the Truflex™.
Materials and Methods: After ethic vote approval 20 anesthesiologists in the first or second year of practise without any experience in videolaryngoscopy maintained a 5 minute lasting instruction and performed a standardized intubation with an airway simulator SimManMark II of Laerdal with the videolaryngoscope McGrath in combination with the Truflex™ or a hockey stick formed

stylet. In a randomized sequence 8 different kinds of airway were managed. All steps of the intubation were documented and compared. Data are mean ± SD.

Results and Discussion: Intubation with the Truflex™ was 14.8 seconds faster in the simple airway (Cormack I) as intubation with the hockey stick formed stylet (26.4s ± 5.5s vs 41.2s ± 18.3s, p< 0.05). In the difficult airway (immobilized cervical spine) the intubation with the Truflex™ was 12.9 seconds faster compared with the hockey stick formed stylet (22.9s ± 4.0s vs. 35.8s ± 13.9s) and with the head in plane position even 14.1 seconds faster (24.3s ± 4.8s vs 38.4s ± 21.5s). The success rate of intubation was 100% with the Truflex™ and 83% with the hockey stick formed stylet.

Conclusion(s): For the untrained anaesthesiologist the combination of McGrath videolaryngoscopy and Truflex™ is an alternative to secure also the difficult airway.

19AP5-9

Satisfaction and complications comparing flexible reinforced laryngeal mask airways (FRLMA) with ETT in surgery of the face in adults

Goma A., Pons I., Moret M.L., Guitart J.
Hospita Plato, Department of Anaesthesiology, Barcelona, Spain

Background and Goal of Study: Laryngeal mask airway (LMA) is an important adjunct to airway management since its introduction in 1998. Specific LMA for otolaringological and dental anesthesia (FRLMA) were described in 1990 *(1)* but sometimes surgeons and anesthesiologist doubt about its usefulness and benefits.

The main purpose of this study is compare the patient's, surgeon's and anesthesiologist's satisfaction comparing the use of the FRLMA versus tracheal intubation (ETT) in facial surgery. A secondary objective is compare the incidence of respiratory and hemodynamic complications between both procedures.

Materials and Methods: Surgical and anesthetic records of 44 patients undergoing ORL and maxillofacial surgery. All patients underwent general anesthesia induced with propofol, atracurium and fentanyl and maintained with propofol and remifentanyl. Patients were assigned into two groups: FRLMA or ETT.

The surgeon, patient, and anesthesiologist at the end of the surgery were asked about their satisfaction with the anesthetic procedure (1:poor-4:great). Hemodynamic instability was considered above 140-85 for more than 5 consecutive minutes. Respiratory complications were only considered broncospasm, laringospasm, and difficulty in intubation.

Statistical analysis was made with Gstat 2.0. comparing qualitative results with chi2.

Results: There were found statistically significant differences in patient's and anesthesiologist's satisfaction, superior in the LMA group. There were not statistically significant differences in surgeon's satisfaction.

Hemodynamic instability was superior in the ETT group with diferences statistically significant. There were more respiratory complications in the ETT group but diferences were not statistical significant.

Discussion: Theoretical doubts make sometimes prefer ETT to FRLMA in ORL and oral surgery.

This study shows that, when compared, patients and anesthesiologists prefer FRMLA to ETT, and surgeons have no preference for any. The study also shows that FRMLA offers a better hemodynamic response.

As compared to other studies *(2)* we conclude that further studies are needed before confirming that FRMLA cause less serious respiratory complications than ETT.

Conclusion: FRLMA is a great alternative to ETT for ORL and oral surgery.

References:

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19AP5-10

Comparative study of three videolaryngoscopes for nasotracheal intubation with restricted mouth opening: A manikin study

Sanchez R., Añez Simon C., Ivars Parraga C., Santos Marques L., Serrano Gonzalvo V., Camps Vidal M., Anestarraco (IISPV)
Hospital Joan XXIII Tarragona, Department of Anaesthesiology, Tarragona, Spain

Background and Goal of Study: Limited mouth open is an important factor when dealing with a difficult airway. The videolaryngoscopy lets us intubate without the need of the three axis alignment and in case of nasotracheal intubation(NTI), can help us pointing the endotracheal tube (ET) towards the trachea.

We have realized a comparative study with 3 videolaryngoscopes (c-Mac, Truview and McGrath) in a manikin model whose mouth opening has been limited.

Materials and Methods: We modified a manikin (Ambu® Airway Management Trainer)so we could limitate the mouth open.Seven anesthesist proceeded to NTI 10 times with each VDL at the inter-incisor distance (IID) following: 3'5,3,2'5,2 and 1'5 cm. We did use a preformed nasal tube. The endpoints collected were: time to view vocal cords, best glottic view by using Cormack & Lehane clasification, time to achieve NTI successfully, requirement of cervical hyperextension or other maneuvers and technique difficulty assessed by a 4 items Likert scale. The chi-square and Mann-Whitney tests were used to analyze data.p< 0'05 was considered stadistically significant.

Results and Discussion: McGrath is the best to obtain a Cormack Lehane I glottic vision in all IID. It also has been the VDL that needed more hyperextension maneuvers.C-Mac and McGrath were the only devices with which we could intubate at an IID of 1'5 cm. When the IID is 3'5 cm, McGrath is clearly faster than C-Mac and Truview to visualize vocal cords. As we restrict mouth opening, truview requires more time to view them.When NTI time is analyzed, Truview device revealed to be the one that needed more time for mouth opening between 2'5-2 cm.When comparing them, Truview VDL has revealed as the easiest to use when NTI is performed with an IID of 3'5 cm. However, C-Mac gets better results when IID is 2'5cm.

Blade size is a limiting factor when it is used in patients with restricted mouth opening. The blade angle should improve glottic view. Nasal route enables intubation when the interincisor gap is limited and also permits more ET maneuvres rather than oral route. In many cases the ET headed between vocal cords on its own.

Conclusion(s): Videolaryngoscopy could be a good option when performing NTI with a restricted mouth opening. Based on our results, McGrath seems to be the best option because of its ease of use, its speed and also the glottic view that allows.Nevertheless, these findings are limited by the interpretation of a manikin model.

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