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Euroanaesthesia 2010
The European Anaesthesiology Congress

Abstracts Programme
Helsinki, Finland, June 12-15, 2010

Wolters Kluwer Health | Lippincott Williams & Wilkins

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Abstracts and Programme

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EUROANAESTHESIA 2010

The European Anaesthesiology Congress

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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 Hall 2 & 3 (level 0). Each abstract presentation session is displayed in a different poster board row. Rows are numbered, to easily locate a given session. The first board of each row contains an information board that lists the session reference, date, time and chairperson(s).

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

Note that the Best Abstract Prize Competition (BAPC), with session reference ESAPC1, takes place in Ballroom 2, as do the 'Best Abstracts - Runner-up Session 1' and the 'Best Abstracts - Runner-up Session 2'. The posters of these 'best' abstracts, however, will also be on display in Hall 2 & 3 (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 (There may be omissions in the numbering due to withdrawn abstracts.)

To locate abstract 6AP1-2 or other abstracts for session 6AP1 in this Final Programme, look for the session reference (6AP1) in the schedule listed below, then browse to the appropriate day and time in the chronological abstract presentation sessions listing on the next pages. The number of the poster board row is indicated for each session. To find the poster board for abstract 6AP1-2, go to the poster board row indicated for session 6AP1 (on the day of presentation), then look for the poster board with number two indicated at the top. (Note that some boards may be empty due to withdrawals.)

BAPCPC1-1

Direct effect of sevoflurane on breast cancer cell function in vitro

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Background and Goal of Study: In a recent retrospective clinical study, we found an association between anaesthetic technique during breast cancer surgery and recurrence or metastases [1]. While anaesthetic technique is reported to affect perioperative immune function, there is little known about direct effects of anaesthetic agents on cancer cells [2,3]. Therefore, we investigated the effect of sevoflurane on breast cancer cell functions that contribute to its metastatic potential (proliferation, migration and invasion) using two different breast cancer cell lines.

Materials and Methods: MCF7 is an ER+ breast cancer cell line while MDA-MB-231 is ER- and clinically more aggressive. Cells were incubated with or without sevoflurane in concentrations of 1, 2, 3, and 4 mM for 6 hrs, corresponding to clinically relevant concentrations and exposure times. Cell proliferation was determined using CellTiter 96 Aqueous One Solution Cell Proliferation Assay (Promega Inc.). Cell migration was determined by scratch method. Cell invasion was determined by BD Biocoat Matrigen Invasion Assay (BD Biosciences). Results were compared using independent sample t test for differences between groups.

Results and Discussion: Sevoflurane decreased proliferation by 37-100% in MCF7 cells and increased it by 5-26% in MDA-MB-231 ($P<0.05$). It increased migration by 58% in MCF7 ($P=0.04$) and by 63% in MDA-MB-231 ($P=0.03$). Invasion was also increased by sevoflurane; 29-47% in MCF7 ($P=0.02$) and 9-24% in MDA-MB-231, ($P=0.04$). Results on effect of sevoflurane on proliferation of MCF7 cells are consistent with previous studies, but in MDA-MB-231 cell line sevoflurane actually stimulated proliferation. This stimulating effect was then evident in both cell lines' migration and invasion. Although these functions are based on different mechanisms, they all contribute to metastatic potential of cancer cells and we can conclude that sevoflurane stimulates it. Differences between effect on proliferation of both cell lines could be explained by difference in differentiation between cell lines and by different mechanisms employed, all of which still needs to be investigated.

Conclusion(s): Our data is consistent with the hypothesis that anaesthesia for cancer surgery may facilitate conditions conducive to propagation or resistance of metastases, probably also by directly affecting cancer cells' function.

References:

1 Exadaktylos AK, et al. Anesthesiology 2006; 105: 660-4.
2 O'Leary GO, et al. Int J Devl Neuroscience 2000; 18: 39-45. #3. Kvolik S, et al. Life Sciences 2005; 77: 2369-83.

BAPCPC1-2

Nitrous oxide (N2O) persistently alleviates pain hypersensitivity in neuropathic rats: A dose-dependent effect

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Background and Goal of Study: Numerous studies indicate that changes in central synaptic excitability play a critical role in the development and maintenance of pain hypersensitivity in neuropathic pain (1). NMDARs are involved in this activity-dependent central sensitization following nerve injury. Antagonists of NMDAR have therefore been proposed as therapeutic agents for reducing neuropathic pain states (2). Unfortunately, NMDAR antagonists are generally poorly tolerated because they induce undesirable side effects at therapeutic doses. The present study evaluated whether nitrous oxide (N2O), a gas with potent NMDAR antagonist properties (3) and antihyperalgesic properties (4), may alleviate neuropathic pain.

Materials and Methods: A peripheral mononeuropathy was produced using the chronic constriction injury model. One week after, rats were exposed to a single 50%, 25% or 12.5% N2O during 1 h 15 min. Repetition of gas exposure for three consecutive days were also assessed. For comparison, the effect of the two NMDAR antagonists, ketamine (3×10 mg/kg) and MK-801 (3×0.15 mg/kg) were evaluated. Mechanical nociceptive threshold was estimated using the paw-pressure vocalization test. Experiments were conducted in an authorized laboratory (N° B-33-063-6) under the supervision of an authorized researcher (N° 3305267).

Results and Discussion: In addition to its acute anti-nociceptive effect, a single 50% N2O exposure provoked a delayed and sustained reduction (37-46%) of pain hypersensitivity for at least one month. In the same time, pain hypersensitivity of the contralateral uninjured hind paw was totally abolished. Following a single 25% N2O, a moderate effect was only observed on the uninjured hind paw. Following three exposures to 25% N2O, a partial reduction of pain hypersensitivity was provoked for 9 days on the injured hind paw and for 11 days on the uninjured hind paw. No effect was shown after one or three exposures to 12.5% N2O. For comparison, the beneficial effects of the NMDAR antagonists were limited to 2 days.

Conclusion(s): Independently of its acute analgesic effect via opioid systems, N2O persistently and dose-dependently reduces pain hypersensitivity in neuropathic rats. Altogether, these data suggest that N2O exposure could be an efficient and safe strategy for alleviating neuropathic pain in a persistent manner.

References:

1 Woolf CJ et al., Science 2000; 288: 1765-9.
2 Chizh BA, et al., Curr.Pharm.Des 2005; 11: 2977-94.
3 Jevtovic-Todorovic V et al., Nat.Med. 1998; 4: 460-3.
4 Richebe P et al., Anesthesiology 2005; 103: 845-54.

BAPCPC1-3

Does central venous oxygen saturation ($ScvO_2$)-directed fluid therapy affect outcome after colorectal surgery? A randomized controlled trial

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Background and Goal of Study: The optimal amount of intravenous fluid for surgical patients is still under debate. Studies using a restricted or goal-directed fluid approach have shown better postoperative outcome. Central venous oxygen saturation ($ScvO_2$) is an indirect measure of cardiac output and may be useful to guide the fluid administration. The aim of this study was to investigate if $ScvO_2$-directed fluid therapy affected the complication rate after bowel surgery.

Materials and Methods: We conducted a randomized controlled trial including 241 patients scheduled for elective bowel surgery. Patients were randomized to $ScvO_2$-directed fluid therapy (n=121) or control (n=120). The $ScvO_2$-group received Ringer-acetate® (B.Braun) 100ml/h and additional boluses of hydroxylethyl starch 130/0.42 (Venofundin®, B. Braun) 3ml/kg whenever $ScvO_2<75\%$. The bolus was repeated until $ScvO_2 \geq 75\%$ as long as the response to the bolus was ≥1% point increase in $ScvO_2$. Postoperatively the $ScvO_2$-group received glucose 50mg/ml 80ml/h. The control group received fluid based on blood pressure, urine output and estimated fluid losses. Both groups received their respective fluid treatment until 8:00am next day. The primary outcome was complications within 30 days postoperative, registered by a surgeon unaware of the allocation.

Results and Discussion: The $ScvO_2$-group received less fluid (mean 3869ml, range 1845-8450ml) than the control group (mean 6491ml, range 2500-12000ml), $p<0.005$. There was no difference in the number of patients with postoperative complications between the two groups (51 versus 51) although postoperative paralytic ileus was more common in the control group (5 versus 17 patients, $p=0.007$). Postoperative wound infection was the most common complication in both groups (20 versus 16 patients, $p=0.487$).

Conclusion(s): ScvO2-directed fluid therapy resulted in administration of less fluid, but did not affect the rate of postoperative complications. If goal-directed fluid therapy is a key-issue in reducing complications after bowel surgery, ScvO2 cannot be recommended as the parameter of choice to guide the fluid administration.

BAPCPC1-4

Unraveling the interactions between postoperative infection, surgery, and inflammation in post-operative cognitive dysfunction

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Background and Goal of Study: Recovery from surgery may be complicated by postoperative cognitive dysfunction (POCD) [1]. Postoperative complications, for example infection, have been associated with higher incidence of POCD although the mechanisms governing the interaction in the pathogenesis of POCD are not known [2]. Neuroinflammation has been correlated with cognitive decline [3,4]. In this study we sought to understand the effect of postoperative lipopolysaccharide (LPS) on inflammation and POCD-associated behavior after orthopedic surgery.

Materials and Methods: Adult C56BL/6J male mice were randomly assigned into groups that were: 1) untreated (naïve) animals; 2) tibial fracture under GA

and analgesia; 3) 24 h following tibial surgery, i.p. injection of LPS (1 mg/kg) 4) LPS injection only. Separate cohorts of mice per group were assessed for inflammatory markers (plasma cytokines and microglial activation), or hippocampal-dependent memory using trace fear conditioning (TFC).

Results and Discussion: TFC assessment at three days after surgery and LPS revealed a significant reduction in freezing behavior compared to both naïve littermates and animals undergoing surgery only, without complication ($p<0.05$ vs surgery). Up-regulation of systemic cytokines is usually self-limited to the initial 24 h; however, postsurgical administration of LPS up-regulated plasma levels of IL-1β for 72 h following intervention ($p<0.001$ vs control). In the hippocampus we reported higher degree of reactive microgliosis (CD11b) in animals treated with LPS compared to surgery or naïve; microgliosis was reported up to post-operative day 7 in the postsurgical LPS group ($p<0.05$).

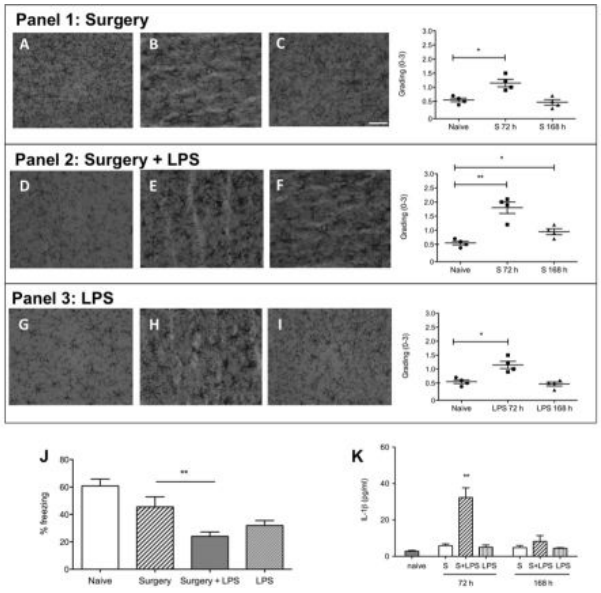

Figure 1. Effects of postsurgical LPS on neuroinflammation and behavior. Hippocampi were harvested at days 3 and 7 after surgery and stained with anti-CD11b. Pictures show CA1 (scale bar 50 µm, 20X), photomicrographs were blindly scored and microglia activation was graded on a scale 0 (lowest) – 3 (highest). *PANEL 1: SURGERY*.

Reactive microglia were found at postoperative day (POD) 3, returning to normal by day 7 (B-C) compared to naïve (A). *PANEL 2: SURGERY + LPS*. Moderate and mild microgliosis was observed at days 3 and 7, respectively (E-F), compared to control (D). *PANEL 3: LPS*. Reactive microglia were found at day 3 after LPS injection (H) with no significant changes at day 7 (I), compared to untreated animals (G). Immunohistochemical grading (0-3) illustrates panels 1, 2, and 3. At POD 3 there was a significant difference between surgery and surgery + LPS groups ($p<0.05$). At POD 7 mild microgliosis was reported in surgery + LPS administration only (*$p<0.05$ vs control) ($n = 4$). Non parametric data are presented with Kruskal-Wallis followed by Dunn's test. Contextual fear response, as measured by freezing behavior, is also impaired in animals receiving surgery followed by LPS exposure compared to naïve and surgery groups (G) (**$p<0.05$ vs surgery). Data are expressed as mean ± SEM ($n = 10$) and compared by one-way analysis of variance and Student-Newman-Keuls method and student t-test for comparison between surgery and surgery with LPS. Mice were injected with LPS (1mg/kg) 24 h following surgery. Levels of plasma IL-1β were measured by ELISA. At 72 h following surgery. LPS treated animals had a sustained elevation in IL-1β (H; **$p<0.01$ vs control). No IL-1β was detected after surgery or LPS only at 72 h. Data are expressed as mean ± SEm ($n = 4$) and compared by one-way analysis of variance and Student-Newman-Keuls method with Bonferroni corrections.

Conclusion(s): Cytokines are pivotal mediators in triggering and sustaining cognitive dysfunctions after aseptic inflammation following tibial fracture. Supervention of infection following aseptic trauma exaggerates inflammation and thereby exacerbates POCD. The individual contributions and their convergence on the inflammatory pathways will help define potential targets for intervention.

References:

1 Moller J.T. et al. Lancet 1998;351:857-61.
2 Gao L. et al. Chest 2005; 128:3664-70.
3 Wan Y. et al. Anesthesiology 2007;106:436-43.
4 Rosczyk H.A. et al. Exp Gerontol 2008;43:840-46.

BAPCPC1-5

A novel class of positive allosteric modulators of strychnine-sensitive glycine receptors

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Background and Goal of Study: Loss of inhibitory synaptic transmission within the dorsal horn of the spinal cord plays a key role in pain chronification. Inhibitory postsynaptic transmission in the spinal cord involves mainly glycine and, to a lesser extent, γ-aminobutyric acid (GABA)- thus, potentiation of either glycinergic or GABA-ergic neurotransmission should compensate for this loss. Due to their restricted expression in lower brain areas and the spinal cord, the strychnine-sensitive glycine receptor family has been suggested as an ideal target for substances to treat chronic pain. We have shown that the activity of a phenol derivative to co-activate glycine receptors is increased by insertion of a halogen into the para position to the hydroxyl group of a phenolic compound (1). Based on these results, we hypothesized that the potency of propofol- which had till then emerged as one of the most potent non-halogenated phenolic modulators of glycine receptors- could be substantially increased by halogenation.

Materials and Methods: We have studied the effects of three halogenated propofol analogues on chloride inward currents via human $\alpha_1\beta$ glycine receptors with the whole-cell patch-clamp technique. Receptors were heterologously expressed in human embryonic kidney cells (HEK 293).

Results and Discussion: The concentrations for half-maximum potentiating effects (EC_{50}-values ± SD) at $\alpha_1\beta$ glycine receptors for chloro-, iodo- and bromopropofol were 6.6 ± 3.8 nM, 6.2 ± 3.3 nM and 6.7 ± 1.8 nM, respectively. The EC_{50}-values were in a low nM concentration range and thus, show an up to 1000-fold increased potency to positively modulate glycine induced chloride currents in comparison to the effects of non-halogenated propofol.

Conclusion(s): These results show that the halogenation of the anesthetic propofol yields compounds with a highly increased potency for activation of chloride currents via $\alpha_1\beta$ glycine receptors. Our study suggests that the halogenated propofol analogues might be a group of substances with the ability to specifically target glycine receptors and thus, might show a desirable pattern of anti-nociceptive effects.

Reference:

1 Haeseler, G, Ahrens, J, Krampfl, K, et al. (2005). Structural features of phenol derivatives determining potency for activation of chloride currents via alpha (1) homomeric and alpha (1) beta heteromeric glycine receptors. *Br J Pharmacol* 145: 916-25.

BAPCPC1-6

Molecular effects of melatonin and ramelteon administration after hemorrhagic shock in rat liver

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Background and Goal of Study: Therapy with melatonin or melatonin receptor agonist ramelteon may improve liver function and hepatic perfusion after hemorrhagic shock in rat. Yet, the molecular mechanisms of hepatoprotection after treatment with melatonin or ramelteon have not been investigated yet. This study was designed to shed light on the molecular effects of melatonin or ramelteon administration after hemorrhagic shock in rat liver, utilizing whole genome microarray analysis.

Materials and Methods: After institutional review board approval, animals underwent hemorrhagic shock (mean arterial pressure 35±5 mm Hg) for 90 min and were rescuicitated with shed blood, followed by 120 min of reperfusion with Ringers (n=4 per group). After hemorrhage, animals were given vehicle, melatonin or ramelteon (each 1.0 mg/kg iv). Sham operated animals were treated likewise but did not undergo hemorrhage. At the end of the experiment, livers were perfused and harvested, total hepatic ribonucleic acid was extracted, and a rat whole genome microarray was used for pooled gene expression analysis. Microarray data was analyzed using the PANTHER classification system. Expression levels of six heat shock protein (HSP) transcripts were determined by quantitative polymerase chain reaction (QPCR).

Results and Discussion: QPCR showed a correlation of 74% (r^2=0.80) with microarray data. PANTHER analysis revealed a significant up- and downregulation of relevant biological pathways after induction of hemorrhage. The number of upregulated genes was especially increased for oxidative stress, inflammation, apoptosis, and interleukin signaling. This effect was greatly attenuated by melatonin and ramelteon treatment, with a non-significant trend towards a more intense effect of melatonin, compared to ramelteon. Differential gene expression of HSP β-1, β-8, 32, 47, 70-A1A and 90 showed that melatonin significantly attenuated the upregulation of HSP β-1 and 70-A1A after hemorrhage, while ramelteon displayed a significant reduction of the upregulation of HSP 32 after hemorrhagic shock (each $p<0.05$ vs. vehicle).

Conclusion(s): This study indicates that melatonin and ramelteon may modify molecular stress response after hemorrhagic shock in rat liver. Differential gene expression patterns for oxidative stress, apoptosis and inflammation after melatonin or ramelteon treatment may therefore play a relevant role for the hepatoprotective effects of both melatonin receptor agonists after hemorrhagic shock in rat.

Acknowledgements: This study was financially supported by a HOMFOR grant (A.M.).

Best Abstracts – Runner-up Session 1

BAPCAP1-1

Propofol pharmacokinetics in infants

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Background and Goal of Study: Infants and children differ markedly from adult patients. Since the introduction of propofol, it has gained popularity as an agent for both induction and maintenace of anaesthesia.There has been a lack of pharmacokinetic studies in children less than 3 years. The goal of the study was to determine the complete pharmacokinetic profile in infants (2-24 months).

Materials and Methods: After obtaining an informed consent from a parent or a legal guardian, 48 patients were randomly assigned into 4 groups 12 patients each. Group I: 2-6(months); Group II: 7-12 (months); Group III: 13-18 (months); Group IV: 19-24 (months); venous blood samples were collected for the analysis of propofol from a separate intravenous catheter in the contralateral arms at 1,5,10,20,60,65,70,90,120,and 180 minutes after the start of propofol infusion at a rate of 8-12 mg/kg/h. Propofol concentration were determined by high performance liquid chromatograpgy (HPLC). Propofol concentration data were analyzed with non linear mixed effects modelling (NONMEM) (version V, double precision).

Results and Discussion: The pharmacokinetic of propofol in infants followed two compartement model among the different groups are shown in Table 1.In the current study the estimate for systemic clearance for infants was 29.77±9.46 ml/kg/min. There was higher clearance value in smaller babies than the older ones. In the present study, volume of distribution (volume of centeral compartment and volume at steadt state) were also higher in in smaller infants than the older ones, this may explain why infants requirede a higher induction dose and probably and higher maintenance.

Parameter	group I	group II	Group III	group IV
Clearance cl (ml/min/kg)	44.11±0.95	28.85± 0.31	23.89± 0.14	22.98±0.14
central volume of distribution Vc (l/kg)	0.96±0.02	0.61±0.02	0.48±0.01	0.44±0.01
Volume of distribution at steady state Vss (l/kg)	2.56±0.05	1.73±0.01	1.47±0.01	1.43±0.01
Context sensitive half life HL (hr)	0.26±0.006	0.24±0.001	0.23±0.001	0.22±0.001

Conclusion(s): Smaller infants have a larger volume of distribution and a higher clearance of propofol. Therefore, the induction and maintenanace doses should be increased in this young age with using population based pharmacokinetic parameters for accurate propofol dosing stategy.

Mean Propofol Pharmacokinetic parameters in different groups

BAPCAP1-2

Transoesophageal echocardiography for assessing fluid responsiveness following cardiac arrest and resuscitation

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Background and Goal of Study: Fluid therapy after cardiac arrest is challenging as both hypovolemia and fluid overload may cause circulatory failure. Therefore, predicting fluid responsiveness is a major issue in the therapy of these high-risk patients. Variables derived by transoesophageal echocardiography (TEE) may provide helpful information, whether stroke volume will increase after fluid loading (1,2). The aim of the present study was to evaluate the performance of three derived TEE-variables to predict fluid responsiveness in the post-cardiac arrest period.

Materials and Methods: After IRB approval, in 20 anaesthetised pigs electrically induced cardiac arrest of 8 minutes was followed by cardio-pulmonary resuscitation. TEE derived stroke volume variation (SVV-TEE), variation of velocity time integral (ΔVTI) and variation of aortic blood velocity (ΔVpeak) were measured before and after a 5 ml/kg fluid bolus at baseline, one and four hours after return of spontaneous circulation (ROSC). Animals with an increase in stroke volume of at least 15% after fluid challenge were classified as responders, the others as non-responders. Performance of variables was analysed using receiver-operator characteristics (ROC).

Results and Discussion: 14 animals were successfully resuscitated and included into further analysis. Stroke volume was significantly decreased after ROSC (p<0.01). ROC curves are presented in figure 1. At baseline and four hours hours after ROSC all variables enabled indication of fluid responsiveness. During the first hour after ROSC, however, ΔVpeak may be superior to SVV-TEE and ΔVTI.

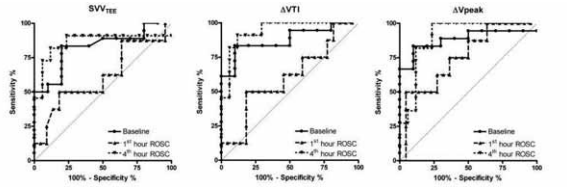

Figure 1. ROC-curves of variables in order to predict a 15% increase in stroke volume at different experimental time-points.

Conclusion(s): TEE may be a helpful tool for prediction of fluid responsiveness following resuscitation from cardiac arrest. However, during the first hour after ROSC only ΔΔVpeak enabled prediction of fluid responsiveness.

Reference:

1 Feissel M et al. Chest (2001) 119:867-73.
2 Slama M et al. Am J Physiol Heart Circ Physiol (2002) 283:H1729-33.

BAPCAP1-3

Routine vs guided by NIRS selective shunting in carotid endarterectomy. A prospective, randomized, comparative study

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Background and Goal of Study: Routine shunting in carotid endarterectomy under general anesthesia is not void of complications. We designed a study to compare routine vs selective shunting in carotid endarterectomy under general anesthesia using NIRS as a guide.

Materials and Methods: 253 patients were randomly allocated in three groups. In the first group we used INVOS infrared oximeter (INVOS 4100, Somanetics Inc., Troy MI) and applied a series of standardised interventions targeting mean arterial pressure, end tidal carbon dioxide, cardiac output, oxygen mixture. We used 20% rSO2 drop in the ipsilateral carotid artery after carotid cross clamping as a cutoff value for shunting. In the second group the patients received standard general anaesthesia with INVOS monitoring and if the change was greater than 20% shunting was suggested. The third group included patients who underwent routine carotid endarterectomy using routine shunting without INVOS monitoring. Neurologic events and the use of shunt among the three groups were recorded.

Results and Discussion: We found statistically significant differences in the placement of shunt among the three groups (p<0.001). Additionally, we did not find any statistically significant differences in neurologic outcome (p=0.97). Results are shown in tables 1 and 2.

	Shunt placement		
	Shunt not placed	Shunt placed	Fisher's exact tests, two-tailed p
Control	0 (0%)	90 (100%)	<0.001
INVOS with protocol	53 (71.6%)	21 (28.4%)	<0.001
INVOS without protocol	36 (40.4%)	53 (59.6%)	<0.001

	Neurologic Deficit		
	No neurologic deficit	Neurologic deficit	Fisher's exact tests, two-tailed p
Control	79 (87.8%)	11 (12.2%)	0,97
INVOS with protocol	65 (87.8%)	9 (12.2%)	
INVOS without protocol	77 (86.5%)	12 (13.5%)	

Fisher's exact test, two-tailed P = 0.97.

Conclusion(s): We demonstrated that selective shunting and routine shunting in carotid endarterectomy have no difference in neurologic outcome. NIRS with its known limitations has proved useful guide to carotid endarterectomy.

BAPCAP1-4

Which goal for fluid therapy during colorectal surgery is followed by the best outcome: Near maximal stroke volume or zero fluid balance? A clinical randomized double blinded multi centre trial

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Background and Goal of Study: To investigate whether goal directed fluid therapy to near maximal stroke volume (SV) guided by esophageal Doppler monitoring (ED) result in a better outcome than goal directed fluid therapy to normal bodyweight (BW) and zero fluid balance in patients undergoing colorectal surgery.

Materials and Methods: In a double blinded clinical multicentre trial 150 patients undergoing elective colorectal surgery, were randomized to receive fluid therapy following either the goal of near maximal SV guided by ED (ED-group) or the goal of zero balance and normal BW (R restrictive fluid therapy). Stratification for laparoscopic and open surgery was performed. The postoperative fluid therapy was equal in the two groups. Primary endpoint was postoperative complications defined and divided into subgroups by protocol. Analysis was performed by intention-to-treat. Follow-up was 30 days. The trial had a power of 85% to show a difference between the groups.

Results and Discussion: The number of patients undergoing either laparoscopic or open surgery as well as the patient characteristics was similar. No significant differences were found between the groups for overall-, major-, minor-, cardiopulmonary- or tissue healing complications (p-values: 0.79; 0.46; 0.84; 0.59; and 0.48 respectively). One patient died in each group (p=0.94). No significant difference was found for length of hospital stay (R: 6.71 (SD 8.5) vs. ED: 8.04 (SD 7.3); p=0.29).

Conclusion(s): Goal directed fluid therapy to near maximal SV guided by ED is neither beneficial nor harmful compared with goal directed fluid therapy to zero fluid balance and normal BW in patients undergoing elective colorectal surgery.

Acknowledgements: To the investigators not mentioned in the top: Morten Rasmussen, Bo Belhage, Bettina Hansen, Dorthe Ritz Møller, Louise Boldrup Jensen, Vagn Berg, Niels Thomassen and Louise Simonsen. To Deltex Medical for lending us CardiQ´s and tarning and To FreseniusCabi for providing Case Report Forms and Randomisation envelopes.

BAPCAP1-5

Bradykinin and adenosine receptors mediate desflurane induced postconditioning in human myocardium: Role of reactive oxygen species

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Background and Goal of Study: We have previously shown that brief exposure to desflurane after prolonged hypoxia induced postconditioning in human myocardium, *in vitro*[1]. The goals of this study were to determine:1) the role of reactive oxygen species (ROS) generation, and adenosine and bradykinin receptors stimulation in desflurane-induced postconditioning, 2) if adenosine and bradykinin given at the beginning of reoxygenation could mimic postconditioning, 3) if adenosine and bradykinin receptors activation induced postconditioning via ROS production.

Materials and Methods: After the approval of local medical ethics committee, right atrial appendages were obtained during cannulation for CPB from patients scheduled for routine coronary artery bypass surgery and aortic valve replacement. The force of contraction (34°°C, stimulation 1Hz) of right atrial trabeculae (n=6 in each group) was recorded during 30-min hypoxia followed by 60 min reoxygenation in control group. Desflurane 6%, was administered during the first 5-min of reoxygenation alone and in the presence of 150µM mercaptopropionylglycine, a ROS scavenger, 100µ M 8-(p-Sulfophenyl)theophylline, an adenosine receptor antagonist, 20nM HOE140, a selective B2 bradykinin receptor antagonist. In separate groups, adenosine 150µM and bradykinin 1µM were administered at the onset of reoxygenation alone and in the presence of mercaptopropionylglycine. The end point of the study was the recovery of force at 60 min of reoxygenation (FoC_{60}) was compared (mean+SD) between the groups by a variance analysis. The results are expressed in % of baseline.

Results and Discussion: Desflurane (FoC_{60}: 84+6% of baseline) enhanced the recovery of force after 60-min of reoxygenation as compared with control group (49+14%; *P*>0.0001). Mercaptopropionylglycine (54+3%), 8-(p-Sulfophenyl)theophylline (62+9%), HOE140 (58+6%) abolished beneficial effect of desflurane-induced postconditioning. Adenosine (80+9%) and bradykinin (83+4%) enhanced the FoC_{60} as compared with control group (*P*>0.0001). Mercaptopropionylglycine abolished the beneficial effects of adenosine (54+8%) and bradykinin (58+5%).

Conclusion(s): *In vitro*, stimulation of adenosine and bradykinin B2 receptors and ROS generation, in early reoxygenation, were involved in desflurane-induced postconditioning in human myocardium. Additionnally, the cardioprotective effect of adenosine and bradykinin administered at the onset of reoxygenation, was mediated, at least in part, through ROS production.

Reference:

1 Lemoine S, Beauchef G, Zhu L et al. Anesthesiology 2008; 109: 1036-44.

BAPCAP1-6

Effects of circadian rhythm on ventilator-induced lung injury

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Background and Goal of Study: It has been demonstrated that injury patterns can fluctuate according to the circadian rhythm. Currently it is unknown whether the extent of ventilator-induced lung injury (VILI) varies at different times of the day. We hypothesized that VILI is influenced by the circadian rhythm, showing a time-specific differential gene expression pattern.

Materials and Methods: 36 C57BL/6 mice were randomly assigned to be studied at 4 different time points (1am, 7am, 1pm, 7pm). At each time point, animals were randomized again to 3 different treatments: control (n=3), low pressure (LP) mechanical ventilation (MV) (n=3) and high pressure (HP) MV (n=3). MV animals were anesthetized and mechanically ventilated for 2 hours. Total RNA was extracted from lungs and RNA expression analysis was performed in pooled samples using a genome-wide array (Illumina Mouse WG6 v2.0 BeadChips). Quantile normalization was performed. Gene expression data were further filtered based on the fold changes across the different conditions using a threshold of >2. Highly enriched biological modules were determined using the ToppGene program (http://toppgene.cchmc.org). The false discovery rate (FDR) cutoff value was 0.05%. P value <0.05 was considered statistically significant.

Results and Discussion: The gene expression in response to MV varied across the analyzed time points (Figure 1), suggesting that MV triggers different transcriptional responses in the lung at different times of the day. Highly represented biological processes included the immune and inflammatory response, the response to external stimuli and wounding as well as cell proliferation. Moreover, these genes are part of pathways that have been shown to be regulated by MV, such as apoptosis signaling, toll-like receptor signaling, nuclear factor kappa B (NFkB).

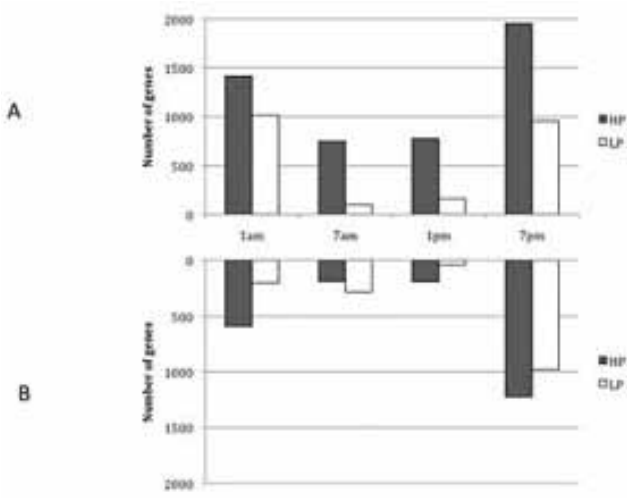

Figure 1. A) Number of genes upregulated as compared to control. B) Number of genes downregulated as compared to control. HP = high pressure, LP = low pressure, Genes were considered differentially expressed if having a fold change >2 as compared to control. Data are derived from pooled samples analysis.

Conclusion(s): Our data indicate that MV-induced expression of genes that can play a role in VILI shows a circadian fluctuation. These findings suggest that there may be a circadian variation in the susceptibility to VILI.

Acknowledgements: RNA expression analysis was performed at UHN Microarray centre, Toronto, ON, Canada. This study was partially supported by a CIHR grant.

Best Abstracts – Runner-up Session 2

BAPCAP2-1

Prognostic value of intraabdominal pressure in surgical intensive care unit

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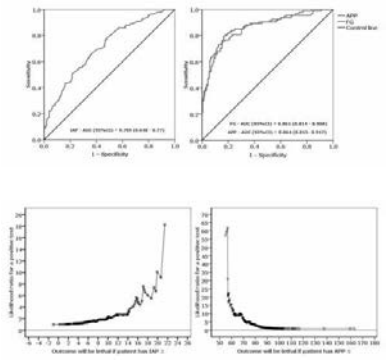
Background and Goal of Study: Effects of elevated intraabdominal pressure (IAP) on various organs are widely investigated. However, prognostic impact of IAP and derivative variables on Surgical Intensive Care Unit (SICU) mortality is not well known. This is to determine the prognostic value of IAP and derivative variables (Abdominal perfusion pressure APP=MAP-IAP, Filtration gradient FG=MAP-2××IAP) on SICU mortality.

Materials and Methods: Our prospective observational study includes 304 SICU patients admitted after major abdominal procedures. IAP was measured transvesically every 6h during whole SICU stay in accordance with World Society on Abdominal Compartment Syndrome. For each IAP measurement, APP and FG were calculated. Variables were summarized using trapezoidal integration of all values obtained during SICU stay. Analyzing receiver operating characteristic curves (ROC), we determined sensitivity, specificity and likelihood ratio of positive test result (LR) for possible cut-off values of IAP, APP and FG for prediction of all cause SICU mortality.

Results and Discussion: The area under the ROC for IAP, APP and FG were all significantly>>0.5, indicating better prediction of SICU mortality than guessing. Prognostic potential of APP was significantly higher than those of IAP and FG; (p<0.05 for all comparisons). Increase in IAP or decrease in APP corresponds to an increase in LR. LR approaches to indefinite at IAP≥21mmHg or APP≤50mmHg, indicating that probability of poor outcome approaches to one. The optimal cut-off values for IAP and APP for prediction of SICU outcome was defined as IAP=20mmHg with LR 8.417 (95% CI=11.538–5.295) and APP=60 mmHg with LR 14.446 (95% CI=18.398–10.494).



Conclusion(s): IAP and APP are useful prognostic tests with APP having the maximum prognostic potential for discrimination of survivors and non-survivors in SICU. Both IAP≥≥20 mmHg and APP≤≤50mmHg are harbingers of poor prognosis in SICU.

BAPCAP2-2

Desflurane-induced postconditioning against myocardial infarction is mediated by large-conductance calcium-activated potassium channels

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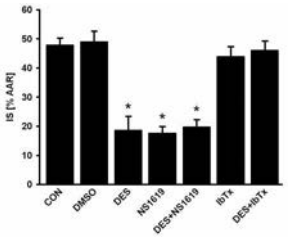
Background and Goal of Study: Anaesthetic-induced cardioprotection against myocardial infarction is mediated by mitochondrial ATP-dependent potassium channels.[1,2] Mitochondrial large-conductance calcium-activated potassium (BK_{Ca}) channels play a crucial role in anaesthetic-induced preconditioning.[3] We tested the hypothesis that desflurane-induced postconditioning is mediated by BK_{Ca}.

Materials and Methods: After institutional approval, pentobarbital-anaesthetized male BL6 mice received 45 min coronary artery occlusion (CAO) followed by 180 min reperfusion. Animals received no intervention or the solvent dimethyl sulfoxide (DMSO, 10µl/g). Desflurane (1.0 MAC, 7.5 Vol%) was administered for 18 min, starting 3 min prior to the end of CAO. The BK_{Ca} activator NS1619 (1µg/g) and the BK_{Ca} inhibitor iberiotoxin (0.05µµg/g) were given either alone or in combination with desflurane. Infarct size (IS) and area at risk (AAR) were determined with triphenyltetrazolium chloride and Evans blue, respectively. Data were analyzed with one-way and two-way ANOVA and posthoc Duncan test. Data are presented as mean±SEM.

Results and Discussion: Hemodynamic parameters at baseline and AAR were not different between groups. Infarct size (IS/AAR) was 48±2% (n=7 per group) in control animals. Desflurane (19±5%*), NS1619 (18±2%*) and the combination of desflurane and NS1619 (20±3%*) significantly (*p<0.05 vs. control) reduced myocardial IS. Iberiotoxin alone had no effect on IS (44±4%), but abolished desflurane-induced postconditioning (46±3%).

Conclusion(s): In mice, desflurane and NS1619 alone significantly reduced myocardial infarct size to a similar extent. The combination of desflurane and NS1619 did not further reduce myocardial IS, indicating a similar signal transduction pathway. Desflurane-induced postconditioning was abolished by blockade of BK_{Ca}. These results indicate that desflurane-induced postconditioning is mediated by BK_{Ca}.



References:

1 Kersten JR, Schmeling TJ, Pagel PS et al. Anesthesiology 1997; 87: 361-70.

2 Krolikowski JG, Bienengraeber M, Weihrauch D et al. Anesth Analg 2005; 101: 1590-6.

3 Redel A, Lange M, Jazbutyte V et al. Anesth Analg 2008; 106: 384-91. **Fig.1: Infarct size as percentage of AAR (IS/AAR).** *significantly (p<0.05) different vs. CON.

BAPCAP2-3

Comparison of postasphyxial resuscitation with 100% and 21% oxygen on function of brain cortex mitochondria in adult rats

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Background and Goal of Study: To compare the effects of resuscitation using 100% and 21% oxygen on the function of brain cortex mitochondria of cardiopulmonary resuscitation following asphyxial cardiac arrest in adult rats.

Materials and Methods: Thirty-six Sprague-Dawley rats were randomly divided into three groups: sham operation (control,n=12), 21% oxygen resuscitation (n=12), and 100% oxygen resuscitation (n=12). Rats in the latter two groups using mechanically ventilated, anesthetized adult rats as an animal model, suffered from cardiac arrest,which was induced with asphyxia by clamping the tracheal tubes. SOD,MDA,Na^+ K^+-ATPase activities and membrane fluidity of brain cortex mitochondria were measured for each individual group.

Results and Discussion: The rates of restoration of spontaneous circulation were 82% in both resuscitation groups. There was no difference in the SOD activity of brain cortex mitochondria among three groups.Na^+ K^+-ATPase activities of brain cortex mitochondria was similar between the 21% oxygen resuscitation group (2.1±0.2 umol Pi/mgprot/h) and the 100% oxygen resuscitation group (1.9±0.3 umol Pi/mgprot/h), and both were significantly lower than that in the control group (3.8±0.4 umol Pi/mgprot/h) (P<0.01). The membrane fluidity of brain cortex mitochondria in both tried groups were no difference,which lower than the control group.After resuscitation with 100% oxygen, MDA concentrations in brain cortex mitochondria (10.7±0.6 µmol·L^{-1}·g^{-1}·Pro) were significantly higher than those in the 21% oxygen resuscitation (6.9±0.7 µmol·L^{-1}·g^{-1}·Pro), both still higher than in the control (3.4±±0.3 µµmol·L^{-1}·g^{-1}··Pro).

Conclusion(s): Resuscitation with 100% oxygen or 21% oxygen have a similar effect on the parameters measured, suggesting that resuscitation of asphyxiated adult rats using room air(21% oxygen) might not be inferior to that using 100% oxygen. However, resuscitation with room air resulted in lower MDA concentrations, it is associated with decrease oxidative stress, which could contribute to less post-asphyxial mitochondria injury in the brain cortex, and might produce a better outcome than using 100% oxygen.

BAPCAP2-4

Modeling frequency and impact of alerts of the 'triple low' condition

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Background and Goal of Study: We previously demonstrated that simultaneous intraoperative presence of low BIS, low MAC and low MAP ('Triple Low') was an independent predictor of poor postoperative outcome. Longer duration of this condition was associated with higher mortality and worse outcome (LOS, 30-day readmission and complication rates). In preparation for implementing real-time alerts we sought to identify optimal trigger parameters (threshold values and durations) for predicting 30-day mortality.

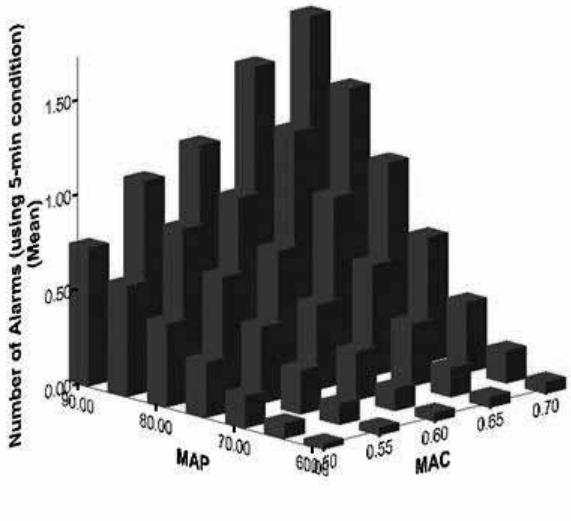
Materials and Methods: With IRB approval, BIS, MAP and end-tidal volatile anesthetic concentrations (in MAC equivalents) were extracted from our registry. Alert frequencies were modeled by generating an alert for every N contiguous minutes (N= 1-10) of combinations of 'Triple Low' threshold conditions (BIS: 40-50, MAP: 60-90, and MAC: 0.50-0.70). The Area under the Receiver Operating Curve (AUC) was calculated to assess performance with regard to predicting 30-day mortality.

Results and Discussion: In 23,999 available non-cardiac cases AUC decreased with the number of contiguous minutes required to generate an alert (Table 1). However, the number of alerts using 1-min threshold conditions was sufficiently high to likely be disregarded by clinicans. We expect implementing a longer threshold condition which produces a more acceptable alert frequency. Figure 2 shows the number of alerts produced by various MAC and MAP combinations lasting for 5 contiguous minutes (at a fixed BIS threshold of 45).

BIS=45, MAP=75, MAC=0.70

Triple Low Duration for Alert	1min	2min	3min	4min	5min	6min	7min
Incidence (% Patients)	50.5%	44.8%	40.1%	35.3%	31.5%	26.7%	23.3%
Frequency (Alerts per patient: mean (SD))	8.8 (19.1)	3.9 (8.8)	2.3 (5.5)	1.6 (3.8)	1.1 (2.9)	0.8 (2.3)	0.6 (1.8)
AUC (%)	61.1*	60.3*	59.6*	60.0*	59.9*	59.2*	58.5*

*p<0.001 relative to random chance (AUC=50%)



Conclusion(s): The cumulative number of 'Triple Low' minutes was a better predictor of 30-day mortality than numbers of alerts requiring 2 or more contiguous minutes of 'Triple Low' state, however, clinicians may disregard 1-min alerts as too frequent. Use of parameters which generate similarly high AUCs at lower alert frequencies may be more effective.

BAPCAP2-5

Sevoflurane postconditioning provides neuroprotection up to 7 days after ischemia/reperfusion via mitoK$_{ATP}$

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Background and Goal of Study: This study aimed to evaluate whether exposure to sevoflurane at the onset of reperfusion provides protection similar to sevoflurane preconditioning and whether the effect depends on mitochondrial potassium ATP-dependent channel (mitoK$_{ATP}$) in a rat model of focal cerebral ischemia.

Materials and Methods: Adult Wistar male rats were subjected to focal cerebral ischemia for 1 hour followed by 24 hours or 7 days of reperfusion (I/R). Preconditioning (S-PRE) consisted of 15 min exposure to sevoflurane at 1 minimum alveolar concentration (2.6%) 72 hours before ischemia. Postconditioning was performed by exposure to sevoflurane immediately at the onset of reperfusion (S-POST) or by a delayed exposure 5 min after the onset of reperfusion. Implication of mitoK$_{ATP}$ channel was assessed by intraperitoneal injection of the selective blocker 5-hydroxydecanoate (5HD) before each sevoflurane administration (S-PRE-HD and S-POST-HD) or by the mitoK$_{ATP}$ channel opener, diazoxide, given in place of sevoflurane. Cerebral infarct size, neurologic deficit score (NDS) and motor coordination were evaluated 24 hours and 7 days after reperfusion.

Results and Discussion: Cerebral infarct size was reduced by sevoflurane preconditioning (128.15 [82.33-222.88] mm3, n=8, p=0.019) and early postconditioning (120.13 [80.76-185.28] mm3, n= 11, p=0.001) compared to I/R (235.31 [183.36-257.8] mm3, n= 12). NDS in S-PRE and in S-POST at 24 hr after reperfusion were lower than those of I/R while the sole S-POST improved motor coordination. At 7 days, only infarct volume remained lower in S-PRE (107.01 [61.52-149.63]; n=8; p=0.035) and in S-POST (100.78 [60.53-137.96]; n=8; p=0.008) compared to I/R (145.70 [140.91-184.62], n=8). Neuroprotection mediated by sevoflurane was lost when it was given 5 min after the onset of reperfusion (248.96 [96.39-312.43] mm3; n= 6; p= 0.91) and was abolished by inhibition of mitoK$_{ATP}$ (S-PRE-HD: 194.09 [123.03-225.57] mm3, n=6; S-POST-HD: 260.90 [241.96-297.51] mm3, n=9). Diazoxide alone mimicked sevoflurane-induced pre (123.61 [70.19-165.92] mm3, p=0.01, n= 6) and postconditioning (84.52 [65.36-136.0] mm3, p<< 0.001, n= 9).

Conclusion(s): The pretreatment with sevoflurane or its early administration at reperfusion provides neuroprotection via mitoK$_{ATP}$ in a rat model of focal cerebral ischemia.

BAPCAP2-6

Local cortical EEG responses to verbal command after clinical loss of consciousness

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Background and Goal of Study: Temporospatial changes occurring in brain electrical activity during anesthesia induction have not been thoroughly investigated and even less is known about the EEG reactivity at the loss of consciousness (LOC). The objective of this study was to investigate the EEG reactivity before and immediately at LOC as defined by loss of motor response to verbal command.

Materials and Methods: Ten healthy men aged 19-28 years were enrolled. Propofol was administered i.v. using target control infusion aiming at escalating pseudo steady-state plasma concentrations of 1.0-1.5-1.75-2.0-etc. mg/ml at 10 min intervals until LOC was reached. LOC was defined as no response to the request "open your eyes". After LOC, the administration of the drug was discontinued. Consciousness was assessed at 5 min intervals until LOC was reached. EEG was recorded using 20-channel digital EEG. Time-varying spectral changes in EEG induced by verbal command were estimated with a Kalman smoother algorithm (2).

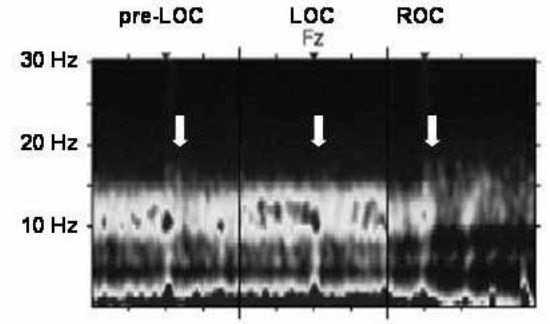

Figure 894a EEg mean power spectrogram including all 10 subjects as a function of time. Black markers indicate moment of verbal command (pre-LOC as the last meaningful response, moment of no response (LOC), and regaining of consciousness (ROC) as the first meaningful response to the request). White arrows indicate effects of verbal command on the EEG spectrum. X-axis presents time in minutes.

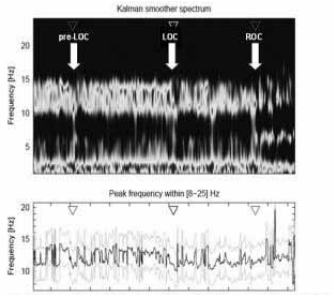

Figure 894b Representative subject under propofol anesthesia (drug concentration at LOC 1.75 µg/ml). Kaiman smoother time-varying specturm (top) for the EEG band 0.5-25 Hz. Peak frequency whthin the band 9-25 Hz as a function of time (bottom) and an adaptive band (5 Hz wide) around the peak frequency. White arrows indicate moment of verbal command (pre-LOC. LOC and ROC as in fig.1). The time is presented in minutes from the beginning of the experiment Kalman smoother algorithm tracks meaningful brain reactions in multiple signal

Results and Discussion: Frontal fast alpha and slow beta activity increased towards LOC. LOC testing (verbal command) caused an abrupt break in frontal alpha to beta activity (Fig.1.) Spectral estimates obtained from channel Fz are presented in Fig.2. Responses involving multiple frequency bands were observed at LOC.

Conclusion(s): Verbal command induced an interruption in frontal EEG activity while the subjects still responded, and similar EEG reactivity was detected even though the subjects showed no clinical response to the verbal command. A strong brain response to stimulus at LOC was found also on the group level.

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Acknowledgements: Funded by the Academy of Finland (NEURO-project No. 8111818) and Turku University Hospital (EVO-grant 13323).

Evidence-based Practice and Quality Improvement

1AP1-1

Body temperature in the post-anesthetic care unit and its effect on post-operative morbidity

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Background and Goal of Study: While the adverse consequences of accidental hypothermia during major surgery are well documented [1], in short cases, involving healthy patients, data are lacking [2].

Materials and Methods: For two months we identified all American society of anaesthesiologists (ASA) class I- II patients undergoing orthopaedic procedures scheduled to last 30 minutes or less in a regional centre. With consent we recorded their sex, age, anaesthetic duration, and any warming devices used. Tympanic temperature was recorded arriving in the recovery room (RR), with hypothermia defined as < 36 C. We contacted patients 72 hours later documenting postoperative nausea/vomiting (PONV), analgesic use, and recovery of functional status.

Results and Discussion: 100 patients were enrolled (median age 37 years, anaesthetic time 30 minutes). Warming blankets were used for 4 patients. Only 34 were normothermic (group A) arriving in the RR, with 66 hypothermic (group B). Age and operative duration (37.5 vs 36.5 years, and 30 vs 35 minutes) were similar. By 72 hours PONV had been experienced by 5.8 % of group A and 27% of group B. No analgesia was required after discharge by 44 % in group A and 6 % in group B. Full functional status had been resumed by 44 % of group A and 24 % of group B.

Conclusion(s): Even in healthy patients undergoing short orthopaedic procedures, inadvertent hypothermia arises commonly. In this series, those who became hypothermic had more PONV, required more analgesia and were less likely to resume full functional status within 72 hours. These findings warrant further research.

References:

1 Temperature monitoring and peri-operative thermoregulation. DI Sessler, Anesthesiology 2008. 109 (2): 318- 38.
2 The management of inadvertent peri-operative hypothermia in adults: the National Institute for Clinical Excellence Full Guideline, April 2008.

Acknowledgements: Our special thanks to our colleagues from the department of anaesthesia and anesthetic nursing of WRH and to Dr. Tom Ryan for his statistical genius.

1AP1-2

Preoperative warming reduces the incidence of hypothermia in total hip- and knee replacement surgery under spinal anesthesia

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Background and Goal of Study: Perioperative hypothermia (body temperature < 36°C) in commonly seen and may be related to wound infections, increased whole-body oxygen demand during recovery, myocardial events and coagulopathy. Prewarming of patients undergoing surgery may lower the incidence of perioperative hypothermia, but this has never been investigated in patients undergoing surgery using spinal anesthesia. We therefore hypothesized that prewarming of surgical patients undergoing elective total hip- and knee replacement surgery under spinal anaesthesia is associated with a lower incidence of perioperative hypothermia in comparison with non-warmed or intraoperatively warmed subjects.

Materials and Methods: Patients scheduled for elective total hip- or knee replacement surgery under spinal anaesthesia were included in the period May 2008-December 2008 in the Spaarne Hospital Hoofddorp, the Netherlands. The population was randomised into three study groups. CON: No warming (n = 25); IW: Intraoperative warming using Hotdog® warming system (n = 29; Augustine Biomedical, Minnesota, USA) and PW: Pre- and intraoperative warming using Hotdog® (n = 16), starting one hour preoperatively. Temperature was measured preoperatively, intraoperatively, after 30 minutes of surgery, and upon recovery ward arrival. Data are represented as mean ± SD and were analyzed by ANOVA and Chi-squared test.

Results and Discussion: The study population consisted of 23 males and 47 females, aged 67 ± 9 years. Type of surgery did not affect perioperative temperature drop, but there was a significant difference in blood loss (282 ± 123 ml vs. 140 ± 70 ml; P < 0.01) between total hip replacements (n = 33) and total knee replacements (n = 37). Preoperative temperature was similar in all study groups. After 30 minutes of surgery, core body temperature was different between study groups (36.1 ºC ± 0.6; 36.4 ºC ± 0.5; 36.6 ºC ± 0.5 for CON, IW and PW respectively; P = 0.05). Differences in temperature were even more profound at 30 minutes postoperatively on the recovery ward (35.7 ºC ± 0.5; 36.1 ºC ± 0.6; 36.5 ºC ± 0.6 for CON, IW and PW, respectively; P < 0.01). The perioperative incidence of hypothermia was significantly higher in CON (19 of 25 patients) versus IW (9 of 29 patients) and PW (4 of 16 patients), P = 0.001.

Conclusion(s): Our data suggest that preoperative warming reduces the incidence of perioperative hypothermia during total hip- or knee replacement surgery in patients under spinal anaesthesia.

1AP1-3

Are we anaesthetising cold patients? A perioperative hypothermia audit

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Background and Goal of Study: Peri-operative hypothermia is known to be detrimental to a patient's recovery following surgery[1]. Previous audits in our hospital demonstrated the prevalence of post operative hypothermia and that changes in practice could reduce this[2]. Recent NICE guidelines[3] on perioperative hypothermia recommend that patients undergoing elective surgery with a pre-operative core temperature < 36.0°C should be postponed until adequately warmed. This audit assessed the prevalence of pre-operative hypothermia and its impact on post-operative temperature.

Materials and Methods: Over a 1month period data from 418 elective general, orthopaedic, vascular, urological and plastic surgical procedures was recorded. Variables recorded were: age, ASA classification, anaesthetic technique, type and duration of operation, use and description of preventative measures, theatre temperature, use of laminar flow, use of intraoperative temperature monitoring, core temperature pre-operatively in Reception and post-operatively in Recovery, and use of recovery warming devices. Core temperature was recorded using an infrared tympanic membrane probe.
Results and Discussion: Core temperature in reception was <36.0°C in 28 of the patients (6.7%). Of these patients 14 (50%) had a core temperature of <36.0°C in Recovery. This compares to 76 (19%) patients that had a core temperature of <36.0°C in recovery and a temperature ≥ 36.0°C in reception.
Conclusion(s): A small number of elective surgical patients had a core temperature of <36.0°C pre-operatively. A preoperatively hypothermic patient had a 50% risk of being hypothermic post-operatively compared to 19% for those with a core temperature ≥ 36.0°C. This work demonstrates that further education and practice change concerning the prevention of perioperative hypothermia is required.
References:
1 Mild Perioperative Hypothermia, Sessler D, NEJM 1997; 336:1730-1737.
2 Closing the audit loop – prevention of perioperative hypothermia, audit and reaudit of perioperative hypothermia. Gallagher McLintoch and Booth. Eur J Anaes 2003; **20**:750-752.
3 NICE Guideline CG65: The Management of Inadvertent Peri-operative Hypothermia in Adults.

1AP1-4

The impact of pneumoperitoneum pressure on acute postoperative pain in laparoscopic cholecystectomy

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Background and Goal of Study: Laparoscopic approach becomes nowadays a routine in cholecystectomy. The goal of study is to quantify the influence of pneumoperitoneum pressure on the acute postoperative pain.
Materials and Methods: 85 ASA I-II consecutive patients undergoing elective laparoscopic cholecystectomy were randomly allocated to either low-pressure (8 mmHg) (group A, n=44) or standard-pressure pneumoperitoneum (14 mmHg) (group B, n=41). General anesthesia was used in all subjects with hemodynamic and respiratory monitoring during surgery. The management of acute postoperative pain consisted in intravenous administration of 50 mg dexketoprofen and 1 g paracetamol every 6h during the first day after surgery. Rescue analgesia was provided with i.v. boluses of morphine. The incidence and severity of acute postoperative pain (VAS) at 6, 12, 24h post-procedure, the number of pain-free hours and the total morphine consumption during first day after surgery were documented. The quality of surgical conditions estimated by the surgeon using a 4 points scale (1=inappropriate conditions; 2=acceptable conditions; 3=good conditions; 4=optimal conditions) was recorded, too. Data were compared using Student t test, considering $p<0.05$ as statistically significant.
Results and Discussion: Demographics as well as data regarding intraoperative cardiorespiratory status were similar for both groups. The procedure was successful in all patients in group B, whereas in one case of group A, classical laparotomy was necessary. The incidence of acute postoperative pain registered a slight difference between groups, with a numerical advantage for group A. Pain scores were significantly less in group A than in group B, across the reference period (1.1+/-0.09 vs 2.48+/-1.35, 0.8+/-0.01 vs 2.21+/-1.12, 0.7+/-0.04 vs 1.14+/-1.04, $p<0.05$). The number of pain-free hours appeared statistically increased in group A compared to group B (13.5+/-2.2 vs 9.2+/-1.6, $p<0.05$). Group A consumed significantly less morphine than group B (2.4+/-0.8 vs 5.6+/-1.1, $p<0.001$) during study period. We recorded similar data regarding surgical conditions. Thus, in 97.72% in group A, respectively in 100% of cases in group B, the surgeon considered the insufflation pressure as being appropriate for laparoscopic procedure.
Conclusion(s): Low-pressure pneumoperitoneum seems to be better than standard-pressure pneumoperitoneum since, for similar surgical conditions, it creates less postoperative discomfort, at least in terms of intensity of acute postoperative pain.

1AP1-5

Effects of IV lidocaine administered prior to extubation on early and late recovery after breast surgery

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Background and Goal of Study: Systemic lidocaine may suppress tracheal tube induced coughing and postoperative sore throat (1). Data about the influence of IV lidocaine given immediately before extubation are sparse. We investigated in prospective, randomized, double-blind study whether IV lidocaine administered prior to extubation has influence on emergence and recovery after general anesthesia in women undergone breast surgery.
Materials and Methods: After obtaining IRB approval and informed consents, 48 women, ASA PS I-II, scheduled for breast surgery were randomized to receive IV lidocaine bolus of 1.5 mg/kg (GL group, n=25) or saline placebo (GS group, n=23) at the end of anesthesia, when sevoflurane was discontinued. Anesthesia was standardized (sevoflurane 1 MAC in 50% N_2O and oxygen). Early recovery, PONV/pain scores, cough and sore throat during 24 hours were recorded by a blinded anesthesiologist. Diclofenac and meperidine were given for pain and metoclopramide for PONV. Data, mean (SD) or n (%), were analyzed using χ^2 and t test.
Results and Discussion: GL group was similar to GS group regarding age, BMI, ASA PS status, anesthesia time and PONV risk score. Recovery data are presented in Table 1. There was no difference in pain scores or the opioid consumption.

Table 1. Recovery data.

	GL (n=25)	GS (n=23)	P
Tracheal extubation (sec)	532±229	519±252	0.87
Open eyes (sec)	503±158	493±269	0.60
Follows orders (sec)	553±301	531±228	0.87
Orientation (sec)	689±506	692±259	0.29
[a]Extubation quality score	1.7±0.6	3.2±0.9	<0.001*
[b]Strain	1.2±1.7	4.7±4.1	<0.001*
Cough at 1 min	3/25 (12%)	10/23 (43%)	0.01*
Cough 24 h	7/25 (28%)	13/23 (56%)	0.08
Sore Throat at 2 h	1/25 (4%)	6/23 (26%)	0.044*
Sore Throat at 24 h	2/25 (8%)	11/23 (48%)	0.005*

[a] 1=no cough/strain, 2= very smooth 3= moderate coughing 4= high degree of coughing and 5= poor extubation, very uncomfortable, [b] Average number of strains prior to extubation, * P<0.05

Conclusion(s): Administration of IV lidocaine at the end of anesthesia attenuated strain and cough on extubation and sore throat during first 24 hours after general anesthesia after breast surgery without prolonging the emergence. Lidocaine did not influence postoperative pain and the incidence of PONV. IV lidocaine prior to extubation may be useful in surgeries when straining and coughing on emergence increase postoperative complications.
Reference:
1 J Neurosurg Anesthesiol 2006; 18:165-9.

1AP1-6

Avoiding hypothermia in laparoscopic cholecistectomy

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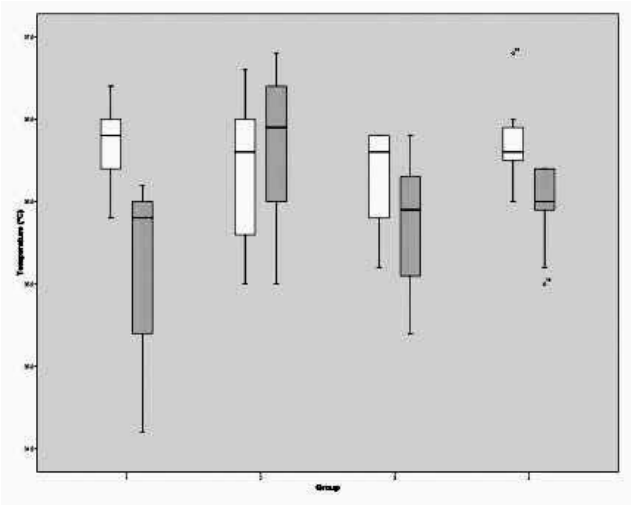
Background and Goal of Study: Perioperative hypothermia increases the incidence of infections, myocardial events and blood loss and patient discomfort. Avoiding hypothermia in short laparoscopic surgery (less than two hours) is not well studied. Our goal is to study the efectiveness of three ways to avoid hypothermia in short laparoscopic surgery.
Materials and Methods: After local ethics committe approval, written informed consent was obtained from 40 patients scheduled for laparoscopic surgery under the same type of general anaesthesia (propofol induction, sevoflurane in oxygen mainteinance and muscle relaxation) and the ambient temperature was adjusted to 21±1°C. The patients were randomly allocated to 4 groups according to sealed envelopes (A: a bed sheet, B: three cotton blankets, C: intravenous 38ºC fluid warming and D: upper body forced-air to 37.5ºC). Blinding was impossible. An esophageal probe was introduced after anaesthesia induction to measure basal and final core temperature (just before extubation) and the warming method was started. After checking normality of variables (Kolmogorov-Smirnoff test), Student's t test and ANOVA (with Bonferroni correction) were applied to continuous variables. Chi square was used to compare sex and ASA.

Characteristics and temperatures in different groups

Group	Age (yrs)	Weight (kg)	Height (m)	ASA (I/II/III)	Sex (F/M)	Basal T (ºC)	Final T (ºC)
A	62.3 (12.2)	70.7 (7.5)	1.59 (0.06)	1/9/0	7/3	36.3 (0.2)	35.6 (0.5)
B	61.8 (14.5)	79.4 (6.9)	1.59 (0.08)	3/6/1	6/4	36.2 (0.4)	36.3 (0.4)*
C	58.5 (15.0)	73.1 (10.9)	1.59 (0.07)	2/5/1	6/2	36.1 (0.3)	35.8 (0.3)
D	61.6 (13.6)	75.5 (13.3)	1.62 (0.07)	5/5/0	6/4	36.3 (0.2)	35.9 (0.2)

Data show number (proportion) and mean (SD). (*) p<0.05

Results and Discussion: Results are shown in table 1 and basal and final temperatures in figure 1. Basal characteristics of the patients were similar. We have found only differences in the upper body forced-air method but not with intravenous liquid warming or cotton blankets methods.



Conclusion(s): Only upper body forced-air method has proven to be effective in this clinical trial to avoid hypothermia.

1AP1-7

Anabolic benefits of epidural analgesia and amino acid infusion for diabetic patients undergoing colorectal surgery

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Background and Goal of Study: Surgical injury leads to an endocrine-metabolic stress response. These stereotypical features are amplified by type 2 diabetes mellitus (DM2) as represented by higher protein breakdown and an aggravated state of insulin resistance. Epidural blockade has been shown to improve substrate utilization after surgery resulting in a positive protein balance in patients given judicious nutrition support. Our aim was to test the anabolic effects of perioperative epidural analgesia and amino acid infusion in non-diabetics compared to patients with DM2 after colorectal surgery.
Materials and Methods: 12 non-diabetic (N) and 12 patients with DM2 (D) scheduled for colorectal tumor resection were randomized to receive epidural (EDA) or patient-controlled analgesia with morphine (PCA) for perioperative pain control. Protein kinetics were measured on the second postoperative day using L-[1-^{13}C]leucine infusion during a 2h fasted state and a 3h infusion of amino acids at a rate equivalent to 2.9 g*kg^{-1}*d^{-1}.
Results and Discussion: Amino acid infusion increased the rate of appearance (Ra) of leucine ($p<0.001$), and protein synthesis ($p<0.001$) in all patients. In diabetic patients, Ra of leucine and protein breakdown showed a tendency towards being lower in the group with EDA ($p=0.056$ and $p=0.07$). Leucine oxidation was suppressed to a higher extent in diabetic patients with EDA ($p=0.02$); this effect was even more pronounced when this group received amino acids ($p=0.001$). Diabetic patients achieved a higher positive protein balance than non-diabetic patients ($p=0.032$) and particularly benefited from the anti-catabolic effects of EDA compared to PCA ($p=0.012$) and from amino acid infusion ($p=0.014$).

Table 1

	NON-DIABETICS		DIABETICS	
Variable (μmol*kg^{-1}*h^{-1})	Fasted	Fed	Fasted	Fed
PCA	**6 patients**		**6 patients**	
Ra of Leucine	125 ± 15	143 ± 14	129 ± 11	165 ± 13
Protein Breakdown	125 ± 15	90 ± 14	129 ± 11	111 ± 13
Leucine Oxidation	19 ± 5	31 ± 7	16 ± 7	33 ± 4
Protein Synthesis	106 ± 14	113 ± 14	113 ± 9	132 ± 13
Protein Balance	-19 ± 5	23 ± 7	-16 ± 7	20 ± 4
EDA	**6 patients**		**6 patients**	
Ra of Leucine	124 ± 11	159 ± 17	123 ± 19	141 ± 25
Protein Breakdown	124 ± 11	106 ± 17	123 ± 19	88 ± 25
Leucine Oxidation	17 ± 4	38 ± 4	15 ± 5	24 ± 8
Protein Synthesis	106 ± 8	121 ± 17	108 ± 19	117 ± 21
Protein Balance	-18 ± 4	15 ± 4	-15 ± 5	30 ± 8

Study populations retrieved from: Donatelli et al. Anesthesiology 2005 Kopp Lugli et al. Anesthesiology 2008

Conclusion(s): Following colorectal surgery, a short-term peripheral infusion of amino acids stimulated protein synthesis, increased amino acid oxidation and reduced protein breakdown, therefore, rendering protein balance positive. This anabolic effect was particularly pronounced in diabetic patients who received perioperative epidural analgesia, suggesting that patients with DM2 would benefit more from amino acid-based nutrition support and epidural analgesia than their non-diabetic counterparts.

1AP1-8

Enteral amino acids administration reduces hypothermia and maintains electrolytes balance during anesthesia

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Background and Goal of Study: Hypothermia increases bleeding during surgery, risk of ischemic heart disease and postoperative wound infection[1]. Intravenous amino acid infusion prevents hypothermia during surgery under general anesthesia[2]. However, amino acid solution is not prepared for the perioperative use and may not be appropriate for intravenous infusion during surgery because of inappropriate concentrations of electrolytes. We examined, therefore, the effect of continuous enteral administration of amino acids on reducing the degree of hypothermia and on serum electrolytes balance.
Materials and Methods: Twenty-four male Wistar rats were anesthetized with sevoflurane for induction and with propofol for maintenance. After anesthetic induction catheters were inserted into the juglar vein and into the duodenum. Blood samples were taken from 6 rats to examine electrolytes concentrations, and they were excluded from the experiment of body temperature measurement. Other 18 rats were divided into 3 groups, and 14mL/kg/hr of infusions of 10% amino acids, Amiparen® (Otsuka, Japan) and/or saline were given through both catheters for 2hours: A/S; enteral amino acids and intravenous saline, S/A; enteral saline and intravenous amino acids, S/S; both saline. The room temperature was kept at 24°C. Core body temperature was measured rectally at every 20 minutes for 2 hours. After the experiment, serum electrolytes were examined.
Results and Discussion: Body temperature decreased in all groups during anesthesia. The decrease in body temperature was significantly less in groups received amino acids, the A/S group and the S/A group, and than in the S/S group ($p<0.05$): A/S; -3.9±0.8°C, S/A; -3.3±0.7°C, S/S; -5.2±0.6°C. The serum Na^+ concentration before infusion was 140.3±1.1 mEq/L. The serum Na^+ concentration after infusion was 128.6±3.2 mEq/L in the S/A group, and it was significantly lower than in the A/S group: 136.4±2.6 mEq/L ($p=0.004$), although there was no significant difference in the decrease in body temperature between the A/S group and the S/A group. These results may suggest that amino acids were selectively absorpted from the intestine during anesthesia.
Conclusion(s): Continuous enteral administration of amino acids reduced the degree of hypothermia as well as intravenous amino acids, but did not cause hyponatremia for 2hours anesthesia. Enteral amino acids may be useful for prevention of hypothermia without disturbing electrolytes balance.
References:
1 Kurz A, et al. N Engl J Med 1996; 334: 1209-1215.
2 Sellden E, et al. Br J Anaesth 1996; 76: 227-234.

1AP1-9

Effect of two anesthetic techniques on the effects of cytokines production, gas exchange measurement, and postoperative pain in the spine surgery

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Background and Goal of Study: Anaesthesia may alter immune function with potential impact on the postoperative course, different anaesthetic methods may interfere with the stress response, especially cytokine activation during and after surgery. The aim of this study was to investigate the influence of two established anaesthetic techniques: total intravenous anaesthesia (TIVA) with target-controlled infusion (TCI) and inhalation anaesthesia (INH) on the perioperative changes of gas exchange, the balance of proinflammatory and anti-inflammatory cytokines, and the postoperative pain management.
Materials and Methods: Sixty patients with ASA I or II undergoing elective invasive disectomy were included in the study and were prospectively randomized into 2 groups to receive either total intravenous anaesthesia (n = 30) or inhalation anaesthesia (n = 30) according to standard random procedures. In the TCI group, anaesthesia was induced with propofol and fentanyl, and maintained with TCI with propofol guided by target AAI of 15-25 with the AEP monitor throughout the procedure. In the INH group, anaesthesia was maintained with desflurane guided by the AEP monitor. We measured whole body

oxygen consumption (VO_2), carbon dioxide production (VCO_2), energy expenditure (EE), and respiratory quotient (RQ) by the gas exchange method using the M-COVX during operative period. Plasma concentrations of proinflammatory cytokines (IL-6) and anti-inflammatory cytokines (IL-10) were measured before induction of anesthesia, skin incision, 1 hr after skin incision, 2 hrs after skin incision, at the end of surgery, and 2 hrs after surgery. After surgery, all patients received patient-controlled analgesia fentanyl for postoperative pain relief.
Results and Discussion: There were no significant changes in VO_2, VCO_2, RQ and EE between the different anaesthetic techniques during surgery. By the end of surgery, IL-6 concentration was significantly lower in TCI group than in INH group. The IL-10 concentrations at the end of surgery and two hours postoperatively in TCI group were higher than in INH group. Patients of TCI group had less pain compared with patients of INH group, whereas no significant change in the postoperative visual analog pain scores.
Conclusion(s): Anaesthetic technique may have an influence on pro- and anti-inflammatory cytokine levels. Total intravenous anaesthesia using propofol suppresses the inflammatory response caused by surgery to a greater extent than the inhalation technique using desflurane related to postoperative pain management.

1AP2-1

The effect of transdermal scopolamine in addition with intravenous dexamethasone for prevention of postoperative nausea and vomiting in patients with epidural PCA after major orthopedic surgery

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Background and Goal of Study: We sought to determine whether transdermal scopolamine (TDS) patch in combination with IV dexamethasone is more effective than IV dexamethasone alone and IV dexamethasone plus IV ramosetron for reducing PONV in patients receiving epidural PCA after major orthopedic surgery.
Materials and Methods: Patients undergoing elective, total knee or hip replacement surgery, anterior cruciate ligament reconstruction under spinal anesthesia having postoperative epidural PCA were participated. All patients were ASA I-III, aged 20-75. Patients were excluded, a drug-abuse history, infection at the lumbar spine, coagulation disorder, uncontrolled diabetics, glaucoma, history of dementia, and current steroid use. Patients were allocated into 3 treatment groups: Group D (n=40) received dexamethasone 8 mg intravenously; Group DR (n=40) received dexamethasone 8 mg and ramosetron 0.3 mg intravenously; Group DS (n=40) received dexamethasone 8 mg and TDS. In the day of their surgery, patients in group DS attached scopolamine patch behind one ear at 30 min before anesthesia. After the operation, each end of the observation period: 0-6h, 6-12h, 12-24h, anesthesiologists recorded the severity of the nausea, presence of vomiting, rescue antiemetics, and side effects (dry mouth, blurred vision, drowsiness) Statistical analyses were performed using SPSS 14.0. The One-way ANOVA test with Bonferroni correction was used to analyze the parametric data. Categorical data were analyzed by χ^2 test or Fisher's exact test. A p-value < 0.05 was considered significant.
Results and Discussion: The three groups were similar in terms of age, weight, height, and duration of surgery. The complete response (no nausea, no vomiting) rate over 24 hours was 47.5%, 50.0%, and 82.5% in group D, DR, and DS, respectively. The rate of patients who experienced nausea over 24 hours was 55.0%, 50.0%, and 17.5% and 50.0%, 25.0%, and 10.0% for vomiting. The overall rate of patient who required rescue antiemetics was 35.0%, 22.5%, and 5.0%. No patients in three groups complained blurred vision, and there was no significant difference in case of dry mouth, drowsiness between three groups. Other adverse effects, agitation, hallucination, amnesia were not observed.
Conclusion(s): In this study, the prophylactic use of transdermal scopolamine patch plus IV dexamethasone showed better efficacy for preventing PONV in patients undergoing major orthopedic surgery having epidural PCA than dexamethasone alone and dexamethasone plus ramosetron with minimal side effects.

1AP2-2

The effect of oral and IV ramosetron on the prevention of postoperative nausea and vomiting following laparoscopic cholecystectomy

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Background and Goal of Study: Patients undergoing general anesthesia for laparoscopic cholecystectomy have a high risk of postoperative nausea and vomiting (PONV). We investigated the effect of oral and IV ramosetron on PONV prophylaxis after laparoscopic cholecystectomy.
Materials and Methods: Seventy five patients scheduled for laparoscopic cholecystectomy were allocated randomly to one of three groups (n = 25 in each) to receive 0.3 mg IV ramosetron (group I), 0.1 mg oral ramosetron (group II), or 0.1 mg oral ramosetron plus 0.3 mg IV ramosetron (group III). Balanced anesthesia with desflurane and remifentanil was used in all patients. Postoperative nausea, retching, vomiting, pain and side effects were assessed at 2 h, 24 h and 48 h after surgery.
Results and Discussion: No statistical differences were observed among the three groups with regard to patient characteristics and information on surgery and anesthesia. The ratio of complete response (no PONV for 2 h) was higher in groups III than group I and II; 92% (n = 23, group III) *vs*. 72% (n = 18, group I) and 44% (n = 11, group II) during the first postoperative 2 h (p = 0.01). During the first 2 h after surgery, rescue antiemetics were used in significantly fewer patients in group III (n = 1, 4%) than group I (n = 7, 28%) group II (n = 14, 56%) (p = 0.00). Postoperative pain and the use of rescue analgesics were comparable among groups. There was no clinically serious adverse event due to study drugs.
Conclusion(s): Oral plus IV ramosetron was more effective than IV ramosetron and oral ramosetron for the prophylaxis of PONV after laparoscopic cholecystectomy (2 h). In addition, intravenous ramosetron 0.3 mg was more effective than 0.1 mg oral ramosetron for the prevention of PONV.

1AP2-3

Low dose of droperidol in confronting postoperative nausea and vomiting in laparoscopic cholecystectomy: A clinical trial

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Background and Goal of Study: Postoperative nausea and vomiting (PONV) occurs in 20 to 60% of surgical patients. Droperidol has been evaluated as an antiemetic after general anesthesia and has been reported to be effective. The purpose of this clinical trial is to determine the efficacy of low dose intravenous droperodol as used for the prophylaxis of PONV after general anaesthesia when performing laparoscopic cholecystectomy.
Materials and Methods: This is a prospective randomized double-blind placebo controlled study (Registration NCT00702442). A hundred patients subjected to laparoscopic cholecystectomy without bile spillage were randomized into two groups. In group A placebo was administrated, while in group B low dose droperidol (0.625 mg) was administrated. We then blindly evaluated PONV, adverse events and modification of electrocardiograph at 0, 2 and 24 hours postoperatively. Nausea was evaluated using a 10 grade VAS. No intervention or medication was additionally administrated to patients wish vomit.
Results and Discussion: Both groups were comparable concerning epidemiologic characteristics and intra-operative characteristics. Immediately postoperatively we had 24 % of vomiting (12 patients) for group A and 22% (11 patients) for group B (p=0.998). Two hours postoperatively vomiting was 8% and 10% for group A and B respectively (p= 0.801), while there was no vomiting for both groups at 24 hours. The nausea scores immediately postoperatively, were statistically different between grours A and B (p< 0.001) with means of 3.16 and 1.46 respectively. At 2 hours the means for groups A and B were 1.48 and 0.72 (p=0.012). No nausea was noted on 24 hours for both groups. No adverse event or electrocardiographic alterations were noted at any time in both groups.
Conclusion(s): Droperidol is an inexpensive antiemetic drug, which seems to have good results concerning PONV after intravenous general anaesthesia for laparoscopic cholecystectomy. Low doses of droperodol further support its use since no side-effects or electrocardiographic alterations. However, larger prospective trials are necessary in order to further validate these results.

1AP2-4

Effectiveness of antiemetic prophylaxis stratified by groups of risk in patients under general anaesthesia

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Background and Goal of Study: Postoperative nausea and vomiting (PONV) are common unpleasant side effects following general anaesthesia. Apfel defined a simplified risk chart with four primary factors (female, no smoker, previous PONV and postoperative opioids). The cost-effectiveness of prophylaxis

with antiemetics in low-risk patients (< 20% expected risk) remains controversial at present. Goal: Assessment of the effectiveness of antiemetic prophylaxis stratified by groups of risk based on Apfel' factors: high (3-4 factors), moderate (2 factors) and low (0-1 factor).

Materials and Methods: We used dataset of the observational prospective multicenter study PONVICAT (2007) where we had evaluated the praxis of antiemetic prophylaxis in Catalunya (Spain) in a sample of 1239 patients under general anaesthesia (ondansetron and dexamethasone in 90% of prophylaxis). To minimize confounding factors and biases of selection we developed a propensity score (PS) for the probability of receiving prophylaxis by logistic regression including the following variables: physical status (ASA), corporal mass index (CMI), type of anaesthesia and surgery, duration of anaesthesia, presence of SNG and Apfel' risk factors. Were matched pairs of patients (with and without prophylaxis) with score differences < 0.05 and the incidence of PONV was compared. Relative risk (RR), and number of patients need to treat (NNT) were calculated. Chi-square test and p < 0.05 were considered for statistical signification.

Results and Discussion: The results, stratified for risk groups, are showed in table 1. The NNT in low risk group was 10.3. The actual cost of antiemetics drugs allows us to consider this value quite moderate in terms of cost-efectiveness (under 6 euros per avoided vomiting). On the other hand, the NNT in the high risk group was 5.8, but the efectiveness and eficiency **could be considered very similar** providing that the mean of drugs per patient in this group was higher (two against one).

ANALYSIS POST MATCHING BASED ON PROPENSITY SCORE

RISK GROUP	N	PONV (without)	PONV (with)	p	RR (IC 95%)	NNT
High	240	45.8%	28.3%	0.008	0.63(0.45-0.89)	5.8
Moderate	240	32.5%	10%	0.0005	0.31(0.17-0.56)	4.4
Low	228	17.5%	7.9%	0.035	0.45 (0.21-0.95)	10.4

Without: without prophylaxis; With: with prophylaxis

Conclusion(s): The universal prophylaxis should be considered in guidelines for prevention of PONV.

1AP2-5

Effect of fluid infusion on postoperative nausea vomiting and pain in APFEL 3-4 scored females with two different anesthetic regimen

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Background and Goal of Study: Intravenous fluid administration has been shown to reduce PONV. Some patients have higher risk for PONV described by APFEL score.

Materials and Methods: This study is performed with 100 female patients who had APFEL score 3-4 after ethics committee aproval and informed concent was taken from patients. In group P1 15 ml/kg ringer lactate solution was infused 1 hour before operation. Induction was done with 2-3 mg/kg propofol, 1-2 µg/kg fentanyl and 0.6-0.8 mg/kg rocuronium and 5 ml/kg/hr ringer lactate was given intravenously during operation. In group P2 2 ml/kg ringer lactate solution was infused 1 hour before operation. Identical induction and fluid infusion was performed with previous group In group TP1 15 ml/kg ringer lactate solution was infused 1hour before operation. Induction was done with 5-7 mg/kg thiopental, 1-2 µg/kg fentanyl and 0.6-0.8 mg/kg rocuronium and 5 ml/kg/hr ringer lactate was given intravenously during operation. In group TP2 2 ml/kg ringer lactate solution was infused 1 hour before operation. Identical induction and fluid infusion was performed.Postoperatively nausea, vomiting and pain scores according to visual analog scale (VAS) and verbal descriptive scale (VDS) were recorded at 0.5, 1st, 4th,8th, 12th,24th hour. Antiemetic and analgesic drug use was recorded in postoperative 24 hour.

Results and Discussion: Results and Discussion: In group P1 and TP1 nausea VAS scores is statistically lower than group P2 and TP2 at 4th and 8th hours. P1 and TP1 groups were statistically significantly lower than P2 and TP2 in late (1-24 hour after operation) in respect of nausea VAS percentage of group population. And in all 24 hours after operation hidration groups (P1-TP1) were statistically lower nausea VAS scores than non –hidrating groups(P2-TP2). In 1st hour after operation when 4 groups were compared TP2 group had higher vomitting percentage significantly. Antiemetic drug usage was higher in TP2 group significantly. All groups had similar pain scores in all postoperative periods. These findings were similar with Yogendran and his friends results but our fluid regimen is lower than they had been used in their study.

Conclusion(s): Preoperative hidration may be effective at early period in postoperative nausea. More studies can be performed to estimate amount of preoperative fluid amount in order to prevent postoperative nausea and vomiting.

1AP2-6

What to do? Shall we add dexamethasone to ondansetron?

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Background and Goal of Study: Nausea and vomiting (N/V) is frequently seen after laparoscopic cholecystectomy operations. Antiemetics alone or in combinations are needed for this reason. Ondansetron is a widely used drug but is shown to antagonize tramadol's analgesic effect. On the other hand dexamethasone is shown to have analgesic effect in acute visceral pain. Addition of dexamethasone is a good combination for N/V prophylaxis but what about for analgesia? In our study we aimed to investigate the effects of dexamethasone and ondansetron- alone or in combinations – on postoperative tramadol consumption.

Materials and Methods: After local ethics committee approval and written informed consent 90 patients-ASA I-II and age 24-60 years – scheduled for laparoscopic cholecystectomy were randomly divided into 3 groups. Group O (n:30) received 4 mg ondansetron and 2 ml saline; Group D (n:30) received 8 mg dexamethasone and 2 ml saline; Group OD (n:30) received 4 mg ondansetron and 8 mg dexamethesone before induction.Following cholecystectomy 1.5 mg/kg tramadol loading dose was given by PCA with a bolus dose 30 mg and 10 minutes lockout time. In the recovery room patients who were accepted as awake were given the PCA buton control. Hemodynamic parameters, pain scores(NRS), tramadol consumption and side effects were measured at postoperative 5th,15th,30th,45th, 60th minutes and 4th, 8th, 12th, 24th hours. MedCalc Belgium programme was used for data analysis. Anova one way analysis of variance and Kruskal Wallis tests were used. p ≤0,05 was statistically significant.

Results and Discussion: Tramadol consumption in Group OD at the 30th minute was statistically lower than Group O (p:0.003); consumptions at other time intervals were also significantly lower in Group OD when compared to Group O and D(p:0.001). NRS at the 30 th minute in Group D was statistically lower than Group O. NRS values in Group OD were significantly lower than Group O and Group D (p:0.002)

Conclusion(s): We conclude that dexamethasone when used in combination with ondansetron may alter the antagonistic interaction between tramadol and ondansetron and therefore decrease tramadol consumption.

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1 Paech MJ: Ondansetron and dexamethasone dose combinations for prophylaxis against postoperative nausea and vomiting.Ambulatory Anesthesia 2007; 104(4):808-14.

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1AP2-7

Comparison of the effectiveness of preventive ondansetron monotherapy and ondansetron-dexamethasone combination in surgical patients at high risk for postoperative nausea and vomiting (PONV)

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Background and Goal of Study: We aimed to determine whether ondansetron was of comparable efficacy against the combined regimen ondanstron plus dexamethasone to prevent postoperative nausea and vomiting[1] in patients at high risk, according to the simplified Apfel's score.[2]

Materials and Methods: One hundred and fifty (150) patients, aged 23 to 79 years, ASA I-II, scheduled to undergo total thyroidectomy, modified radical mastectomy, total abdominal hysterectomy or open cholecystectomy under general anaesthesia were enrolled in this randomized, double-blind study. Exclusion criteria were any contra-indication to the drugs administered, use of emetics or antiemetics 24 h or less before surgery, pregnancy and lactation and the possibility for postoperative mechanical ventilation. The patients were randomized into 2 groups to receive ondansetron 8 mg (4 mg IV bolus before the induction of anaesthesia + 4 mg in 100 ml NaCl 0,9% IV within 20 min after intubation) in combination with dexamethasone 8 mg bolus before induction (group C) or ondansetron plus placebo (group P). NNausea, vomiting and administation of rescue antiemetic were assessed 2, 12 and 24 h postoperatively. Side effects were recorded, as well. Statistical analysis was performed with Fisher's exact test (p ≤ 0,05).

Results and Discussion: Demographic data were comparable in both groups. Twenty four (24) h postoperatively the incidence of nausea in patients with Apfel's scores 2,3 and 4 was 7,25% in group C against 29,03% in group P (p=0,000001), while the incidence of vomiting in those patients was 2,41% in group C against 10,48% in group P (p=0,014). Significantly lower incidence of nausea and vomiting during the first postoperative day was also registered in high-risk patients after mastectomy.

Average incidence of postoperative nausea and vomiting in patients with Apfel's scores 2, 3 and 4 who underwent mastectomy

	Nausea		Vomiting	
	no	yes	no	yes
Group P	16,28%	37,21%	39,53%	13,95%
Group C	44,19%	2,32%	46,51%	0%
p	0,000001*	0,02*		

*: p≤0,05

Conclusion(s): Patients at high risk for PONV, especially those who undergo mastectomy, will benefit most from the ondansetron-dexamethasone combination than ondansetron alone.

References:

1 HHabib A, Gan T. Can J Anesth 2004;51:326-341.
2 Apfel C et al. Anesthesiology 1999;91:693-700.

1AP3-1

Improving compliance with regular medication administration on the morning of surgery

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Background and Goal of Study: Many patients admitted for elective surgery are on regular medications for various co-morbidities. Omitting doses of these medications before surgery can cause a variety of problems including withdrawal symptoms, pain, anxiety and loss of symptom control. This audit looked at the number doses of regular medications that were incorrectly omitted on the morning of surgery. Following a simple intervention a re-audit was done to determine if there was an improvement in practice.

Materials and Methods: The original audit involved all adult non-day case elective admissions for surgery over 7 consecutive weekdays at a district general hospital. Information on regular medications and the reasons for omissions were collected from the patients' drug charts or by asking the patients themselves. The intervention was a simple form given to patients at the preoperative assessment clinic detailing each of their medications and advising them whether or not to continue administration. This form was completed by the nurses, checked by the doctors in the preoperative assessment clinic and then given to the patients to take home. The re-audit was done 8 weeks after implementing change and took place over a 3 week period.

Results and Discussion: The original audit collected data from 89 patients of which 58.43% were on at least one regular medication. **39.75%** of doses of non-contraindicated medications were missed. This included 30.00% of cardiovascular medications, 47.37% of anti acid medications and 50.00% of inhaler doses. 50.62% of missed doses were because 'the patient was unsure whether to take'. In the re-audit data was collected from 58 patients of whom 56.90% were on at least one regular medication. **15.47%** of doses of non-contraindicated medications were missed. There was improvement or consistency in all of the drug categories compared to the original audit; the percentage of cardiovascular medication doses missed was 9.38%. 53.33% of incorrectly missed doses were missed because the 'patient was unsure whether to take'.

Conclusion(s): The addition of this simple form into the preoperative assessment clinic provided written information for patients to refer to for guidance regarding which medications to take and which to omit before admission. It resulted in a significant improvement ($\chi^2 = 24.00$ with 1df; $p<0.0001$) in the numbers of regular mediation doses taken on the morning of surgery and is an effective, simple intervention which could be utilised in most preoperative assessment settings.

1AP3-2

Saving resources after the review of diagnosis protocols in case of allergic reaction during surgery in our hospital

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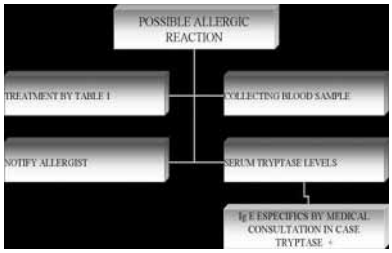
Background and Goal of Study: In one out of 15000 anesthetics acts produce an allergic reaction, and in such cases the mortality rate is 3.4%. Most allergic reactions occur for muscle relaxants in 60%, followed by 16.5% latex, 7.4% hypnotics, antibiotics, 4.7%, plasma substitutes 3.6% and opioids 1.9%. Local anesthetics represent only 0.7% and there is no case reported with inhaled anesthetics.It is therefore important for the anesthesiologist primarily diagnosing for clinic and identifying the trigger quickly to stop giving and start symptomatic treatment to achieve hemodynamic stability. It is very interesting to distinguish whether it was an allergic reaction "true" to either drug, latex, etc. Or whether it was due to a nonspecific histamine release much more common and banal, 1/1500 events. In our hospital the patient is derived to allergology with a report of what happened to specific IgE determination.

Materials and Methods: After suffering two cases of possible reactions in operating room. We review what has been done retrospectively and the literature, we found gaps in the diagnostic phase that generated an increase in avoidable costs, so we set contact the Allergy Service of our hospital, result of this collaboration is this article and following algorithm.

	IMMEDIATELY	1 HOUR	6-8 WEEKS
Serum Tryptase levels	X	X	
Plasma Histamine	X	X	
Methylhistamine in Urine		X	
SPECIFIC IgE		X	X
SKIN TEST			X



Results and Discussion: As a guideline the Community of Castilla la Mancha sets prices for specialized medical tests, diagnosis and treatment in the first consultation by 185.22 euros and 69.42 euros in successives. [8]. These patients have an average of three consultations of allergy to the final diagnosis. If we stick to our hospital surgical activity in 2005: 44.367 events, applying the percentages of the introduction there would be 3 "true" allergic reactions which require monitoring by the Department of Allergy and 30 cases of anaphylactoid reaction in which an initial determination of tryptase would have saved 9721.8 euros to the hospital.

Conclusion(s): • Close collaboration between the Department of Allergy, laboratory and anesthesia improves our profitability, to optimize resources and helps to make work cost-effective

1AP3-3

Day of surgery patient cancellation – A retrospective audit

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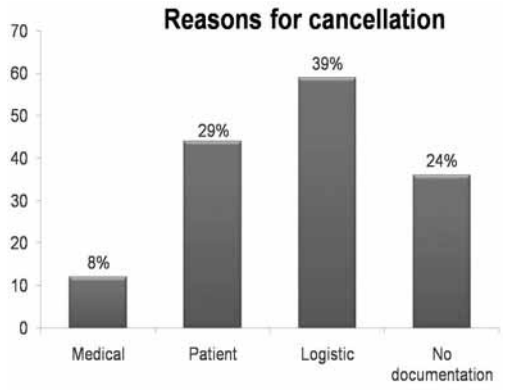
Background and Goal of Study: Day of surgery cancellations, are a major cause of inefficient use of theatre time and a waste of scarce resources. It is also stressful and costly to patients in terms of working days lost and disruption to daily life (1,2). Our aim was to audit the number of elective GA cases cancelled on the day of surgery and to ascertain the reasons and suggest strategies that could reduce this problem.

Materials and Methods: Retrospective case notes study over a 2 month period (March – April 2009) at University Hospital Llandough (UHL).

Results and Discussion: Out of 3794 patients listed for surgery, 390 patients were cancelled on the day of surgery (11.2%). This is above the recommended national average of 10%. Out of the cancelled patients, 188 were scheduled for a GA and it was these patients' notes that we reviewed. We classified the reasons for cancellation into 3 categories (1) Medically unfit, (2) Patient related [DNA, not starved, surgery not required] and (3) Logistical [lack of time, staff, equipment or bed].[figure1]69% of the cancellations were avoidable. Top 5 reasons for cancellation were DNA (25%), list overrun (24%), lack of staff (13%), medically unfit excluding respiratory tract infections (13%) and not starved (7%). None of the patients deemed medically unfit had been to a preoperative assessment clinic. In 24% of notes, there was no documentation of why the patients were cancelled.

Conclusion(s): •We recommend anaesthetist led pre-assessment clinics for all patients scheduled for GA.[br]•A timely pre-admission check/reminder either by telephone or text message 24-48h prior to surgery can help identify patients who are unable/ unfit to attend on the day of surgery and also allow alternative patients to be substituted on the list. Maintenance of an accurate database of those patients willing and able to attend at short notice for their surgery will avoid empty theatre slots.[br]•Clear and accurate documentation of the reasons for cancellation in the notes, is mandatory and will greatly help in forward planning and more efficient utilisation of theatre time.



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2 Ivarsson B et al. J Nurs Manag 2002; 10: 75-81.

1AP3-4

A pre-operative assessment clinic reduces length of stay and cancellations in an Irish university teaching hospital

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Background and Goal of Study: Preoperative anaesthetic assessment is a vital part of the workup of a patient for elective surgery. The role of the preoperative assessment clinic (PAC) is expanding in Ireland since the Association of Anaesthetists of Great Britain and Ireland published its views on the role of the anaesthetist in pre-operative assessment in 2001. (1) Our goals at set up of our PAC in January 2009 were to reduce cancellations by having patients assessed by an anaesthetist prior to admission, to identify new health issues and to facilitate the prompt treatment of any new or uncontrolled medical problems. To reduce costs, we also aimed to reduce bed occupancy and length of hospital stay.
Materials and Methods: We undertook a retrospective audit of all patients invited to attend the PAC. We also looked at a subset of patients scheduled for major vascular surgery, ie abdominal aortic aneurysm repair, carotid endarterectomy and infra-inguinal bypass, with respect to pre-operative length of stay (LOS) as these patients usually require extensive workup prior to surgery. Patients admitted for similar procedures during 2007 were used as controls for comparison. In our institution the PAC is led by a nurse specialist with consultation from a consultant anaesthetist or specialist registrar.
Results and Discussion: 406 patients were assessed over a 12 – month period from the following specialties: 92 vascular, 43 gynaecology, 26 orthopaedic, 58 breast / endocrine surgery, 49 ENT, 105 general surgery, 13 plastic surgery, 20 other. 25 patients (6.15%) were newly diagnosed with a significant cardiac problem requiring further investigation. 9 patients (2.21%) were cancelled by the anaesthetist / surgical team after risk – benefit analysis post anaesthetic assessment. Mean pre – operative length of stay (LOS) in the vascular subset group (n = 38) was 1.94 days compared to 5.45 days in the control group (n = 64, p = 0.0002, student t test). 37 surgery cancellations took place at the theatre area in the period January – December 2009. None of these patients had been to the PAC. 20 of 37 were cancelled for anaesthetic reasons which may have been preventable had these patients been assessed at the PAC.
Conclusion(s): We have found that a preoperative anaesthetic clinic increases efficiency, reduces pre-operative length of stay in a vascular subset of patients and reduces day of surgery cancellations.

References:
1 Pre-operative assessment: the role of the anaesthetist. 2001 AAGBI.

1AP3-5

Validation of the STOP-Bang questionnaire as screening tools for obstructive sleep apnea in patients scheduled for bariatric surgery

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Background and Goal of Study: Obstructive sleep apnea (OSA) is common in morbidly obese patients and a practical screening tool for surgical patients is required. This study was conducted to validate the STOP-Bang questionnaire in patients scheduled for bariatric surgery.
Materials and Methods: During a 18 month period, consecutive preoperative morbidly obese patients without previously diagnosis OSA were recruted. The STOP-Bang included 8 yes/no questions : 1-Do you snore loudly? 2-Do you often feel tired, fatigued, or sleepy during daytime? 3-Has anyone observed you stop breathing during your sleep? 4-Do you have or are you being treated for high blood pressure? 5-BMI more than 35 kg/m2? 6-Age over 50 yrs old? 7-Neck circumference greater than 40 cm? 8-Gender male? A high risk of having OSA was considered if at least 3 items were answered yes. The score from the STOP-Bang questionnaire was evaluated versus the apnea-hypopnea index (AHI) from monitored polysomnography preoperatively performed in all the patients.
Results and Discussion: Patients characteristics (n=184) were age 35±12 yrs, body mass index 45±7 kg/m2 and ASA score 2 [1-3]. 142 (77%) patients were classified as being at high risk of OSA. The AHI was 12 [4-27] (median [IC 25-75]) The sensitivity (Se), specificity (Sp), positive (PPV) and negative (NPV) predictive value of the STOP-Bang questionnaire with different AHI cutoffs or the need for CPAP therapy are showed in table : n=184 Se; Sp; PPV; NPV; AHI>15 (n=80) 96%; 38%; 54%; 93%; AHI>30 (n=40) 100%; 29%; 28%; 100%; CPAP (n=74) 99%; 37%; 51%; 98%;
Conclusion(s): The STOP-Bang questionnaire is a valuable and easy-to-use screening tool for OSA in obese patients scheduled for bariatric surgery. In our population, it allowed to rule out OSA diagnosis (AHI>30) with a VPN of 100%.

Reference:
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1AP3-6

Comparison of outcome data after liver transplant: Familial amyloid polyneuropathy (Portuguese type) recipients versus classical indications for liver transplant

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Background and Goal of Study: Familial Amyloid Polyneuropathy (FAP), an inherited fatal neurological disease caused by a mutant transthyretin, produced mainly in the liver. In those patients, Liver Transplant (LT) is, for now, the only treatment that can hold the progression of the disease. In our center, 36.5% of liver transplants are performed in FAP patients. The hypothesis is that LT for FAP (because it is not a liver disease) takes less surgical time to perform, consumes less blood products and has better survival rates than the classical indications for LT.
Materials and Methods: We studied prospectively all the patients submitted to Liver Transplantation in our center during the last three years.Retransplanted patients were excluded from the analysis. We compared demographics data (age, sex, body mass index), surgical time, blood products consumption, bleeding, amount of adrenergic drugs used and survival rates (90 days, 1 year). Mann-Whitney and X2 tests were used for statistical analysis of numeric or categorical variables, respectively. The level of significance used was P <0.05.
Results and Discussion: We studied 191 patients and divided them in two groups: the FAP recipients (n=65) and the classical indications for liver transplant (CILT) (n=126). In our study, regardless of the association between LT in FAP patients and fewer intra-operative complications (hemorrhage, administration of adrenergic drugs) we didn't find a better outcome in survival rates (90 days and 1 year) as in others centers 1. FAP survival rates may be related to nutritional status of these patients1, a criteria that we usually don't use in our Unit, which might explain the results found.

Data comparison between the 2 groups

	FAP (n=65)	CILT(n=126)	P value
Age (years)	38 (33.5-44.5)	52.5 (46-58)	P<]0.001
Body Mass Index (kg/m2)	21.6 (19.6-24.5)	25.1 (22.7-27.8)	P<0.001
Surgical time (min)	253 (221-299)	240 (220-285.2)	P=0.15
NA (mg)	1.1 (0.75-2.2)	1.6 (.85-3.6)	P<0.03
Blood Products (ml)	0 (0-500)	960 (0-1947.5)	P<0.001
Bleeding (ml)	1300 (1000-2100)	3425 (1975-5125)	P<0.001
Survival 1 year(%)	75.5	73.3	P=0.575

Results are median (interquartil range), or %

Conclusion(s): Our transplant center needs to increase the selection criteria of FAP patients in order to improve the final outcome.

Reference:
1 Ole B Suhr, Bo-Goran Ericzon, et al., Stybjorn Friman. Liver Transpl. 2002;8:787-794.

1AP3-7

Charlson index and surgical risk scale. Application on the 479 surgical patients who died in a tertiary university hospital over a period of three years

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Background and Goal of Study: A number of methods has been proposed for standardizing patient data to permit direct comparison of patient outcome: APACHE II (1985), POSSUM (1991), SAPS II (1993)…. Charlson index and surgical risk scale (SRS) have the advantage of the ease in collecting data (analytical variables are not needed) and all variables can be collected in the preoperative period. We analyze the results than Charlson index and SRS had in all surgical patients who died in our center for a three years period.
Materials and Methods: We performed a cross-sectional study over surgical death patients, for a three years (2004-06) period. 479 death patients in total over 53220 procedures made (36 intra operative deaths). To all surgical death patients a SRS category and a Charlson index grade were allocated. Based on other studies, we placed the dividing point between low and high mortality probability in "0" for Charlson index, and "8" for SRS. A descriptive analysis evaluating pre, intra and postoperative data was made. We performed a comparative study between dead patients with low and high mortality probability using the chi square of Pearson.
Results and Discussion: [table1]Charlson index was a better predictor in reference to preoperative data, while surgical risk scale predicted better intraoperative and postoperative complications.
Conclusion(s): Only 37 of 479 surgical patients who died in our hospital, were marked with low probability of mortality by both risk scales. No patients marked as low risk of mortality by SRS died into the operating room. Only 2 patients marked as low risk of mortality by Charlson index died into the operating room.

1AP3-8

Rhabdomyolysis after colorectal surgery in obese patients: Influence of muscle mass index (MMI)

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Background and Goal of Study: Postoperative rhabdomyolysis (RML) may be secondary to surgical positioning. It has been described after prolonged surgery, especially in obese patients. Patient muscle mass has been recently associated with postoperative RML after laparoscopic surgery. We evaluated the relationship between muscle mass index (MMI) and specific proteins of muscular degradation in obese patients undergoing laparoscopic colorectal surgery in modified lithotomy position.
Materials and Methods: Prospective longitudinal study in obese patients (BMI≥27%) undergoing elective laparoscopic colorectal surgery. We excluded patients with impaired renal function and those who, despite being scheduled for laparoscopic surgery, underwent open surgery. IMM was preoperatively measured by bioelectrical impedance analysis(Bodystat® 50 kHz, 800 mA) and arm muscle circumference. We monitored intraoperative variables (temperature,surgical time, hemodynamics). CPK, urea, creatinine and myoglobin blood and urinary levels were monitored at 24, 48 and 72 hours postoperatively. Mann-Whitney test was used for statistical analysis. Results are expressed in median (range).
Results and Discussion: We included 17 patients (12 male/5 female) with a mean age of 66±3 years and a mean BMI of 32.8±3.8 kg/m2. Mean duration of surgery was of 229±15 minutes. When we divided patients according to MMI, no differences were found between patients with MMI ≤ 20% (group 1, n=7) and MMI >20% (group 2, n=10), although an increase in serum CPK was observed in the second and third day after surgery in the group with MMI>20%.Serum and urinary creatinine (Cr) were higher in group 2 than 1 at 24 and 48 postoperatively hours, p=ns.Urinary myoglobin was higher in group 2 than 1, p=ns.

mg/dl	Group 1	Group 2
Serum Cr 24h	0,72 (0,08)	0,96 (0,98)
Serum Cr 48h	0,87 (0,31)	0,98 (0,91)
Urinary Cr 24h	58,4 (55,2)	117,7 (77,2)
Urinary Cr 48h	60,3 (60)	91,6 (58,3)

mcr/L	Group 1	Group 2
Myoglobin 24h	1900 (600)	2200 (1500)
Myoglobin 72h	2000 (675)	2100 (1263)

Conclusion(s): Identifying preoperative risk factors and giving particular attention in positioning these patients during surgery could be useful in avoiding postoperative muscle injury. Although a higher sample size may be needed to demonstrate a linear relation between MMI and RML, patient muscle mass could be a prognostic indicator of muscle injury in obese patients undergoing laparoscopic colorectal surgery.

1AP3-9

The incidence and severity of increased serum creatinine amongst patients undergoing gastric bypass surgery

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Background and Goal of Study: Morbidly obese patients frequently have risk-factors predisposing to renal dysfunction, including diabetes, hypertension and the medications used to treat these conditions. In addition, abdominal pressures may be elevated and renal perfusion compromised in the peri-operative period, and the risk of low grade rhabdomyolysis is present. We wished to identify the precise incidence of renal dysfunction in our bariatric surgical population and any associations that predict its development.
Materials and Methods: All patients were seen pre-operatively in a multidisciplinary outpatient clinic and had baseline electrolytes and full blood counts performed, repeated on the day after surgery. Patients received a standard liberal intra-operative fluid regimen of 2-4 litres of Hartmanns Solution. By linking the surgical database to the hospital pathology system (Telepath), we were able to extract sample data for each patient prior to and on the first day after surgery. We collected demographic data and compare patient groups, defining a rise of >25µmol/L as clinically significant if it resulted in a creatinine outside the normal range (our limit 120µmol/L).
Results and Discussion: Between May 06 and Nov 09, 784 Morbidly obese patients (273 with BMI >60 kg/m^2) underwent primary Roux-en-Y Gastric Bypass (RYGB) at our Bariatric Surgical Unit. Complete Creatinine data was available for every patient. 580 pts were female (76%) with an average age of 44 years (37 patients over 60 years). The median BMI was 55 kg/m^2 (range 35-103) and the median weight was 157 kg (range 90-295 kg). Baseline creatinine was normal in 764 patients (98%) and increased in 20. Following surgery the creatinine was elevated in 28 patients. A significant increase (abnormal value with rise >25µmol/L) occurred in 8 patients with normal pre-operative renal function (1.2% incidence) and in 8 patients with pre-existing renal dysfunction (40%) The remaining 12 patients with abnormal creatinine prior to surgery had a median reduction in serum creatinine of 15µmol/L. Amongst patients developing renal dysfunction, the median BMI was not different from the overall at 54 kg/m^2, but median age was markedly elevated at 57 yrs.

Abstract 1AP3-7 – Relationship between mortality risk and perioperative data

Perioperative Data	High Risk (Charlson>0 + SRS≥8)	Intermediate Risk (Charlson=0 + SRS≥8)	Intermediate Risk (Charlson>0 + SRS<8)	Low Risk (Charlson=0 + SRS<8
Number of patients	241	128	73	37
<3 associate dis.	19%	44% (p<0.05)	25%	38% (p<0.05)
Number of assoc.dis	4±2	2.9±1.8 (p<0.05)	3.9±1.9	3.3±1.8 (p<0.05)
Urgent Surgery	81%	95%	18% (p=0.001)	43% (p<0.05)
Surgery Time(hours)	2.7±2.1	2.6±1.8	2.1±1.5 (p<0.05)	2.6±1.7
Intraoperative Compl.	19%	14%	4% (p=0.002)	11%
Intraoperative Deaths	34	2	0	0
Need of critical care	51%	55%	40%	68% (p<0.05)
Re-operation	32%	26%	22%	57% (p=0.003)
Multi-organic Failure	15%	26% (p=0.017)	15%	14%
Cause of death	Cardiac Death	Cardiac Death	Cardiac Death	Sepsis Death

Conclusion(s): A surprisingly low proportion of bariatric surgical patients have renal impairment pre-operatively. The strongest predictor of post-operative renal dysfunction is the presence of pre-existing renal impairment. Increased age is strongly associated with post-operative renal dysfunction, but BMI is not.

1AP3-10

Should the data collection form guide CPR-D?

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Background and Goal of Study: At our hospital, data from cardiopulmonary resuscitation and defibrillation (CPR-D) is collected using a form according to Utstein's model. Some forms are filled up improperly and plenty of them are not returned. In 2009, out of 28 returned forms most frequently missing data were time when resuscitation alarm was made (16), cause of terminating resuscitation (9) and last time seen alive (8). Rarely missing data were the place (0), date (1), patient name (2) and ward (2). The goal is to create a form which includes Utstein's models information and is easy to fill in.
Materials and Methods: In the first part of the survey, a questionnaire was distributed to the resuscitation trainer nurses attending a seminar (N = 97). There were two questions in the questionnaire: which three things do you fill in first in the form and which are the three most important things in the form. There was also space for free comments. In the second part of the study, resuscitation forms were gathered from different hospitals in Finland. They were evaluated descriptively and content was compared with Utstein's model.
Results and Discussion: Sixty-two trainers returned the questionnaire (60%). The first data written down was time when resuscitation started, initial rhythm and given medication. The most important things in the form were found to be initial rhythm, given medication and all time labels. In the free comments nurses wished for a form that is easier to fill in and more space for notes. In the second part of the study altogether eight different forms were collected from different parts of Finland. There was a high variation between forms and they contained 40-85% of desired data compared to Utstein's model. Most frequently filled data ie date, patient's name and ward were on a top of the every form. Missing data were resuscitation time at the beginning (3) or middle (2), cause of terminating resuscitation at the middle (3) or the end (4) and last seen alive at the beginning (5) and the middle (2).
Conclusion(s): It seems that the data collection forms are designed to serve the administration and not the users. A resuscitation form could serve as a cognitive aid (1) guiding CPR-D. Writing down the action times on a form seams to bee challenging. Resuscitation training should include practise how to fill up a resuscitation form.
Reference:
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1AP3-11

Association of blood pressure and BIS with one-year postoperative mortality in patients sensitive to inhalational anesthesia

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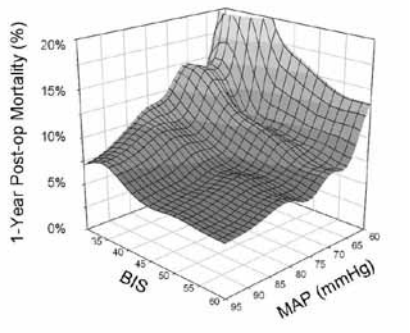
Background and Goal of Study: Low mean arterial pressure (MAP) and duration at low Bispectral Index (BIS) values are independent risk factors for one year postoperative mortality.(1,2) Prior work confirmed these findings and reported that minimum alveolar concentration (MAC) of volatile anesthetic was lower in postoperative non-survivors than survivors.(3) Recent work demonstrated that increasing duration in a 'Triple Low' of Low BIS, Low MAP and Low MAC was associated with worse postoperative outcomes, including 1-year mortality(4). We investigated the impact on postoperative mortality of spending up to 15 min in a Triple Low condition for a range of MAP and BIS thresholds when MAC < 0.50.
Materials and Methods: With IRB approval BIS, MAP and end-tidal volatile anesthetic concentration in MAC-equivalents, and mortality (1-year) were extracted from the Cleveland Clinic perioperative registry. The duration that each patient spent with BIS < BIS_threshold and MAP < MAP_threshold and MAC < 0.50 was calculated for all combinations of BIS thresholds (30 to 60) and MAP thresholds (60 to 95). The incidence of 1-yr postoperative mortality was tabulated for all patients who spent 1-15 minutes below each combination of thresholds.
Results and Discussion: Data from 23,999 adult non-cardiac patients were available for analysis. Baseline one year mortality was 4.5% in patients who spent no time in the 'Triple Low' condition. One-year mortality increased substantially as BIS decreased and as MAP decreased. The increase in mortality was especially great when both BIS and MAP were low (e.g., BIS=40 and MAP=65). Note that a high mortality rate was associated with values of BIS and MAP that are common during surgery and do not currently provoke much concern.



Conclusion(s): The combination of low BIS and low MAP at low minimum alveolar concentration (MAC) is associated with increased 1-yr postoperative mortality. This result is especially concerning since the average low values for each state were well within the range that many anesthesiologists tolerate routinely.
References:
1 Monk T, Anesth Analg 2005; 100: 4-10.
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3 Searleman AC, Anesthesiology 2008; 109: A1.
4 Saager L, Anesthesiology 2009; 111: A225.

1AP4-1

Neoadjuvant chemotherapy does not contribute to postoperative renal dysfunction after thoracic oesophagectomy

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Background and Goal of Study: Oesophageal carcinoma (OC) is an aggressive malignancy, with rapidly increasing and, despite significant treatment advances, both short and long-term mortality remain high. Most patients are now offered 'neoadjuvant' chemotherapy (NAC) preoperatively. The cytotoxic agent cisplatin is commonly used and nephrotoxicity is its chief dose-limiting side effect. We hypothesised that patients receiving NAC suffered a greater degree of postoperative renal dysfunction after thoracic oesophagectomy. This retrospective observational study sought to investigate this hypothesis.
Materials and Methods: After regional ethical committee approval was waived, a retrospective case note review was undertaken. All patients undergoing surgery during a three-year period commencing in January 2005 were included. Patients were identified as having chemotherapy or not from a computerised database and confirmation from the oncology notes. Estimated creatinine clearance was calculated from perioperative blood samples (preoperatively and on days 2 and 7 postoperatively) using the Cockcroft-Gault formula. Data are expressed as [mean, SD] and the unpaired Students t test was used for data comparison.
Results and Discussion: 180 patients were identified. Of these, 174 sets of notes were available; 7 were subsequently excluded due to missing data, leaving 167 sets of notes for review. Groups were split according to treatment with NAC (NAC, n=66) or not (NOT, n=101). Baseline characteristics between groups were similar. No patient had pre-existing (NKF Stage 5) renal failure. The baseline Estimated Creatinine Clearance (ECC) [ml.min-1, mean, SD] in NAC [73, 17] was not significantly different from NOT [68, 20] p=0.112. Postoperatively, mean ECC improved in both NAC and NOT groups on day 2 [79, 20] vs [73, 27], p=0.130 and day 7 [95.4, 25] vs [88.3, 28], p=0.096 respectively.
Conclusion(s): Neoadjuvant chemotherapy did not appear to influence perioperative renal function in our cohort of patients. It is reassuring that in a group of patients undergoing major surgery with large fluid shifts, parenteral fluid restriction and pre-operative treatment with nephrotoxic agents, renal function appears well-preserved.

1AP4-2

Breast reconstruction with pedicled transverse rectus abdominis muscle (TRAM): Perioperative management – A retrospective study

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Background and Goal of Study: TRAM reconstruction after mastectomy is a long lasting procedure not devoid of complications such as prolonged pain, infection and flap necrosis. Careful screening of patients (pts) is mandatory. Anaesthesia and postoperative (PO) analgesia may play a role in the occurrence of these complications.
Materials and Methods: We performed a retrospective study on pts submitted to TRAM reconstruction with the objectives to substantiate the complications and possible influence of anaesthetic and perioperative management on patient outcome and length of hospital stay (LOS). Eighty files were retrieved. Thanks to the existence of a computerized medical file, a substantial amount of data could be analysed: medical history, anaesthetic charts, including fluids used, anaesthesia method and analgesia, as well as PO fluid and analgesia management, records of complications and LOS. For statistical analysis (Statview5, SAS), descriptive statistics were computed and after analysis of variance, comparative tests with t-tests or non parametric tests, chi-square or regression analysis were used where appropriate. $p \leq 0.05$ was considered significant (* in table).
Results and Discussion: Anaesthesia method was equally distributed with volatile agents or propofol based TIVA. Sufentanil or remifentanil was used to provide analgesia. Combined intraoperative epidural analgesia was used in 1/2 cases. Patients were admitted to our postanaesthesia high care unit for 1 to 12 days, with a median stay of 3 days. Median PO LOS was of 11 days (range: 6-31) PO epidural analgesia with local anaesthetics combined or not with opioids was provided in 60/80 cases. The most frequent complications were *respiratory*. Pts BMI was a significant factor for respiratory complications. Partial flap necrosis was found more often when opioid analgesia was used ($p<0.05$) but no effect of analgesia method neither on occurrence of respiratory problems nor on LOS was evidenced. LOS was prolonged with respiratory ($p=0.026$) and wound ($p<0.0001$) problems and also in pts having a haemoglobin (HbD1) level below 9 g/dl on the 1st PO day ($p< 0.05$).
Conclusion(s): Avoidance of postoperative anaemia and the use of epidural analgesia may reduce LOS and flap healing problems. These findings should be confirmed in large prospective studies using specific guidelines. The relatively low number of serious complications denotes an adequate preoperative screening and stresses the importance of adequate maintenance of parameters throughout the perioperative process.

1AP4-3

Outcome and quality of life after hepatectomy

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Background and Goal of Study: Hepatectomy is commonly performed for malignant hepatic diseases, benign diseases and living donor. Most studies documenting beneficial outcomes after hepatectomy have been limited to mortality and morbidity rates, costs and length of hospital stay (LOS). Few studies have examined the dependency of patients and their perception of their own health changes after surgery. The aim of the present study was to evaluate outcome after hepatectomy and to study its determinants.
Materials and Methods: This retrospective study was carried out in the multidisciplinary Post-Anaesthesia Care Unit (PACU) with five intensive care beds. Out of 1597 intensive care patients admitted to the PACU among a period of 2 years, 54 were submitted to hepatectomy and admitted to the intensive care unit (ICU) beds. Preoperative characteristics and outcome were evaluated by comparing hepatectomy for benign or malign disease. Six months after discharge, the patients were contacted to complete a Short Form-36 questionnaire (SF-36) and to evaluate their dependency in Activities of Daily Living (ADL). Patient's characteristics and postoperative follow-up data were compared using Mann-Whitney U test, *t* test for independent groups, chi-square or Fisher's exact test. Patient preoperative characteristics were evaluated for associations with mortality using a multiple logistic regression analyses.
Results and Discussion: The mortality rate was 11% at six months. Univariate analysis identified intra-operative amount of crystalloids administrated as an independent determinant for mortality. Patients submitted to hepatectomy for malignancy diseases had worse SF-36 scores in general health perception and social functioning. Patients submitted to hepatectomy had worse SF-36 scores for all domains except for pain when compared to a urban population and had better scores for physical functioning when compared to other PACU patients. 35% of patients were dependent in at least one activity in instrumental and 8% in personal ADL, but 57% reported having better general health than before surgery.
Conclusion(s): This study identifies intra-operative amount of crystalloids administrated during surgery as an independent risk factor for mortality after hepatectomy. Survivors, who were submitted to hepatectomy surgery, perceive an improved quality of life although they are more dependent in ADL tasks and have worse scores in almost all SF-36 than the population to which they belong.

1AP4-4

Post-anaesthetic follow up: Are we wasting an opportunity for improving and training?

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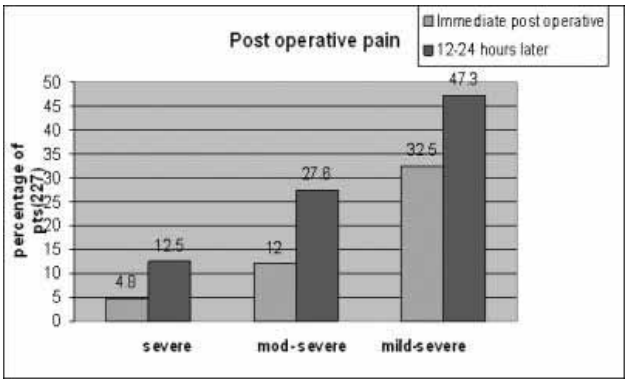
Background and Goal of Study: The regular assessment of the anaesthesia services is recommended by various organisations across the world. This audit focuses on the anaesthetic follow up and highlights the need for this as part of the good practice.
Materials and Methods: After institutional approval, the follow up audit planned to include all adult inpatients who underwent surgical procedures under anaesthetic during a three week period. It involves the assessment of the recovery profiles by the staff and a patient questionnaire completed by the patients after 12-24 hours of the operation. This contained the questions about the pre operative visit and the anxiety reduction achieved by the anaesthetist's visit, assessment of the pain levels, nausea and vomiting, sore throat and the satisfaction score.
Results and Discussion: 224 patients were followed up post operatively during a 3 week period. 94.5% patients were visited by the anaesthetist pre operatively in the ward. 92% patents said they got enough time to talk to their anaesthetist. 82% patients admitted that the pre operative visit helped with the anxiety and stress. The incidence of severe post operative pain increased from 4.8% in the theatre recovery to 12.5% in the ward with in 24 hours. Post operative nausea and vomiting among gynaecology patients was 25.7%. 34.3% patients had sore throat post operatively. Only 9.8% patients were followed up after the anaesthetic by their own anaesthetist. More than 75% patients scored either excellent or very good to their anaesthetic. Anaesthesia and the quality of the care delivered to patients should be assessed regularly in every institution. Follow up of the patients could provide excellent training experience. All ASA III and IV patients should be seen by the anaesthetist in the following 24 hours as recommended. It is possible to develop a regular ward based follow up as similar to the critical care out reach team.



Conclusion(s): Follow up after the anaesthetic could bring into picture many issues. Ward based anaesthetic follow-up is part of good practice and care. It also contributes towards anaesthetic training.
Reference:
1 Audit recipe book – 2006 by Royal College of Anaesthetists.

1AP4-5

Anesthesia in "extreme liver surgery"

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Background and Goal of Study: Involvement of inferior vena cava by hepatic tumors is considered inoperable by standard resection techniques. Hepatic and vena cava resection is required to improve the survival of these patients. We present the intraoperative management of four cases of liver metastases resected using "extreme liver surgery".
Materials and Methods: Primaries tumors were colorectal carcinoma in two cases, apocrine tumor and neuroendocrine tumor. CT scan showed bilateral liver metastases with compromise of hepatic veins and vena cava. All patients underwent extended liver resections with total vascular exclusion, veno-venous by-pass (V-V by-pass) and hypotermic liver perfusion. Induction was accomplished by administration of propofol, remifentanyl and cisatracurium. Anesthesia was maintained giving a mixture of oxygen and desfluorane,

cisatracurium and remifentanyl infusion. N-acetylcysteine was used as antioxidant agent to minimize ischaemia/reperfusion injury in the liver. Tranexamic acid was administered with continuous infusion to inhibit fibrinolisis during all the procedure. We performed a complete and continuous hemodynamic profile using a pulmonary artery catheter (Edwards Lifesciences), and coagulation profile.

Results and Discussion: Hemodynamic variations were common, secondary to surgical events such as vascular clamping, sudden blood loss and hepatic reperfusion. Cross-clamping of inferior vena cava and portal vein produces a decrease in venous return, reduction of cardiac output and arterial blood pressure. A V-V by-pass limits the fall in cardiac output because improves the return of blood from infrahepatic inferior vena cava to the heart. Reperfusion was characterized by decrease in heart rate and peripheral resistances, causing arterial hypotension. Hypotension was treated with bolus of ephedrine and continuous infusion of norepinephrine. Three patients underwent resection and replacement of the vena cava and one resection of 3 hepatic veins and reconstruction of the right hepatic vein with autologous renal vein. V-V by-pass flow (1.5 litre min^{-1}), V-V by-pass time was 122±15 min. Total vascular exclusion was 101±7 min. Cold ischaemia was 86±6 min and normothermic ischaemia 25,5 ±5 min. Intraoperative transfusion was 12± 4,8 PRBC. 30 days mortality was nil.

Conclusion(s): Cardiovascular instability, significant blood loss, electrolyte, acid-base and hemostatic disturbances are common during extreme liver surgery. Safe anesthesic care is based in well establish surgical protocol and early recognition of the causes.

1AP4-6

Comparison of anesthesia data management patterns between anesthetic services of tertiary care and local community hospitals

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Background and Goal of Study: The absence of unified anesthesia data management systems in many countries leads to significant variations in anesthesia related data management from country to country or even within a country. The goal of the present research was to investigate whether the type of hospital may affect the data management patterns in anesthesia departments.

Materials and Methods: The rate of usage of different types of documentation and records routinely used by anesthetic services during their activity was investigated in 41 tertiary care and 64 local community hospitals, which present 93% of all 110 anesthetic services deployed in Armenia. Statistical difference between figures found in two groups was confirmed by chi-square test using Pearson's or Fisher's criteria as applicable.

Results and Discussion: The number of services using preanesthetic records, anesthesia and postanesthesia care unit (PACU) charts, registers of anesthetic procedures and service activity reports in both types of hospitals is presented in the table. Because of the absence of administratively approved set of documentation to be used in anesthetic services the use of anesthesia related documentation largely varies between services. Definite number of services in both types of hospitals do not use anesthesia charts to describe anesthetic procedure, in all of these services narrative description is used instead. The only type of documentation, which is used by all types of investigated services is preanesthetic record. Anesthetic services functioning in tertiary care hospitals surpass those of community hospitals by the use of all types of investigated document forms except preanesthetic records.

The number of anesthetic services using different types of documentation in tertiary care and local community hospitals, n (%)

Hospitals/ Documents	Preanesthetic records	Anesthesia charts	PACU charts	Anesthesia register	Activity reports
Tertiary care	41 (100)	38 (93)*	35 (85)*	39 (95)*	20 (49)*
Community	61 (100)	9 (15)*	6 (10)*	39 (64)*	9 (15)*
Total	102 (100)	47 (54)	40 (45)	78 (85)	29 (32)

* Statistically significant difference (p<0.05) between both groups.

Conclusion(s): Documentation management in anesthetic services of investigated community hospitals is not sufficient to evaluate and benchmark their overall performance, which may be explained by inadequate management of services and requires immediate improvement by appropriate administrative measures.

1AP4-7

Anesthesic management and transoesophageal ecocardiography control in percutaneus extraction of pacemaker and desfibrillation leads. Our experience from 2004 to 2009

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Background and Goal of Study: There is an increasing need for endocardial pacing and defibrilator leads to be removed. The procedure has some risk. The control of extracction with echocardiografy allows ton depet intraoperative serius complicatins, as cardiac tamponade, accute tricuspid regurgitation and others. Anesthesiologist is becoming an important part in this kind of surgery controling not only the patient anesthesia but also the cardiac state.

Materials and Methods: Betwen 2004 and 2009 we extracted electrodes in a total of 143 patientes.The causes of removing were: infection (26%), dysfunction(22.9%), erosion(25%), endocarditis(20.7%), and bacteriemia(2.7%) We control the procedure by trasoesophageal echocardiography, with a Phillps machine. The electrodes were extraccted by different tecniques. simple traction(24.3%) and countertractionwith or without radiofrequency current support (75.7%).

Results and Discussion: We controlled with echocardiography te removal of 240 electrodes fron 143 patients.The medium age was 69.6 years and 68.4% of them were males.The medium number of electrodes by procedure was 1.57 (betwen one and four). The echocardiographic control allowed us to detect in real time serius complications that made neccesary changing the surgical technique. This complications were cardiac arrest with death(1), cardiac tamponade(2), and accute severe tricuspid regurgitation(1) and pulmonary embolism(1). In this cases an emergency esternotomy was made. We used the ASA recommended views, using during the procedure the bicaval plane or the RV inflow-outflow plane, to control, electrode trombi or endocarditis signs, and the tricuspid valve,that allows to measure the accute damage of this valve and the embolism of the electrode waste. After the procedure or if hemodinamic inestability occurred, we looked for transgastric LV plane to measure pericardic effusion, and the possible evolution of cardiac tamponade.

Intraoperative complications

death	1	0.5
tamponade	2	0.5
pulmonary embolism	1	0.5
Severe tricuspide regurgitation	1	0.5

Complication related factors

	total number	n(%)	probability
age < 60 years	33	4(12.1)	0.041
Right side implantation	8	3·7.5)	0.007

Conclusion(s): The new uses for transoesophageal echocardiography include the control of pacemaker an defibrillator electrodes removal. The intraoperative use allows to diagnosticate early complications and change the surgical tecnique in the same time that it occurs. Anesthesiologist has an important role controling this thecnique.

1AP4-8

Impact of standardized prescriptions of haemoglobin on postoperative anaemia in major orthopaedic surgery

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Background and Goal of Study: Inadequate management of blood losses is one of the leading causes of postoperative morbidity, mainly after major orthopaedic surgery [1]. In a previous study, we retrieved a positive impact of postoperative care's improvement on long term cardiac outcome with decreased incidences of both postoperative myocardial ischemia (MI) and long term major adverse cardiac event (MACE) – respectively 9.2% vs 2.9% (p= 0.017) and 8.6% vs 1% (p=0.001) [2]. In this study, we studied the effects of this standardization of postoperative prescriptions (PP) on the incidence of postoperative anaemia.

Materials and Methods: We performed a post-hoc analysis of minimal haemoglobin (Hb) levels following 378 major orthopaedic surgeries (MOS) performed through a 3 years period. During the first part of the study (P1), PP were let at the discretion of the attending anaesthesiologist. After 16 months of study, postoperative care was improved (P2). The corrective measures were: 1) The definition of transfusion thresholds during preoperative evaluation and its communication on PP 2) A daily Hb measurement during the first 3 postoperative

days 3) An early telephone warning from laboratory in case of anaemia.We compared the minimum Hb levels between P1 and P2 and surgical blood losses.
Results and Discussion: Standardization of PP resulted in a decreased incidence of postoperative anemia. The total blood losses were identical by type of surgery in P1 and P2.

Table 1 : lowest haemoglobin according to the phase of the study.

minimum Hb levels	P1 n=123 n(%)	P2 n=255 n(%)	p
≤ 7 g/dl	6 (4.9)	9 (3.9)	0,0027
[7-8 g/dl]	27 (22.1)	32 (13.7)	
[8-9 g/dl]	39 (32)	48 (20)	
≥ 9 g/dl	50 (41)	144 (61.8)	
Lowest Hb's average	8.9 g/dl	9.4 g/dl	0,0041

Conclusion(s): The improvement of postoperative care after MOS trough standardized PP results in a decrease of the incidence of postoperative anaemia.
References:
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1AP4-9

Changing trends in bariatric surgery at the Whittington Hospital, London, UK

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Background and Goal of Study: Obesity rates in the UK have doubled in the last 25 years with 1 in 4 people classed as obese and increasing numbers presenting for surgery to aid weight loss. Our institution began providing a bariatric service in 2007 and is one of nine recognised Bariatric Centers in the South East of England. We provide a multi-disciplinary team approach utilising a patient care pathway. We aimed to monitor and record the bariatric cases performed between 2007 & 2009, to determine the demographics of the population treated, duration and type of surgery and need for postoperative critical care.
Materials and Methods: Data was collected retrospectively for patients admitted between July 2007-June 2008 & July 2008-June 2009. They were identified from the theatre log, and data collected from both hospital and critical care databases.
Results and Discussion: 69 patients were treated between 2007-2008 & 98 between 2008-2009. Demographics were similar for both years. During the 2 years there was a shift from mainly Laparoscopic Band surgery (53% vs 17%) to predominantly Laparoscopic Gastric By-pass surgery (42% vs 63%), consistent with current trends. There was also a reduction in mean duration of surgery (334.46 min vs 266.41 min for laparoscopic gastric bypasses). Post-operative critical care admissions remained similar, the majority admitted overnight for close observation.

Percentage of Patients Admitted to Post-operative Critical Care

	Lap. Gastric Band	Lap. Gastric By-pass
2007-2008	11.42%	89.29%
2008-2009	26.67%	98.44%

Duration of Post-operative Stay on Critical Care (% patients)

	1 Night	2-5 Nights	> 5 Nights
2007-2008	68.75%	15.63%	12.5%
2008-2009	66.67%	25.93%	4.94%

Conclusion(s): As expected with establishing a new specialist service, there were changes and improvements over the 2 year period most notably in type and duration of surgery. Changes in use of critical care services corresponded to changes in type of surgery. To continue to strive for a high quality service we should now aim to risk stratify our patients to decrease our requirements for post operative critical care. This could be achieved with more in depth analysis of pre-assessment data including CPEX testing, and by using an enhanced-recovery pathway for bariatric surgery.
References:
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1AP4-10

Evaluation of POSSUM system for surgical treatment of fractured neck of femur

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Background and Goal of Study: The Physiological and Operative Severity Score for the Enumeration of Mortality and Morbidity (POSSUM) system takes into account the patient's physiology as well as surgical factors. The aim of this study was to evaluate the applicability of modified POSSUM system for orthopaedic use in patients operated on for a fractured neck of femur.
Materials and Methods: A total of 152 patients, consecutively admitted to urgent surgical treatment of fractured neck of femur during 1 year, were retrospectively analysed using the modified POSSUM system. Then observed to expected ratios (O:E) of both mortality and morbidity were calculated.
Results and Discussion: Mean age of the patients was 76,9 years (range 14 – 99 years). There were 38 men (mean 67,1 years) and 114 women (mean 80,1 years). Comparison between observed and predicted morbidity and mortality was made within 30 days after surgery. We observed 5 deaths (3,29%) and 73 patients (48,0%) had a post-operative complication. The modified POSSUM system equations yielded an overall predicted mortality of 24 patients and morbidity in 84 patients, which gave an observed to expected (O:E) ratios of 0,21 and 0,87, respectively.
Conclusion(s): We concluded that, in the studied population, the modified POSSUM system may be used to predict the morbidity in patients submitted to surgical treatment of fractured neck of femur, but over predicts the overall risk of death.

1AP4-11

Evaluation of POSSUM system for surgical treatment of fractured neck of femur in different age groups

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Background and Goal of Study: The POSSUM (Physiological and Operative Severity Score for the Enumeration of Mortality and Morbidity) system is a two part scoring system that takes into account the patient's physiology as well as surgical factors, and predicts both mortality and morbidity at 30 days. We intended to evaluate the applicability of the modified POSSUM system for use in orthopaedic surgery, in different age groups, in patients operated on for a fractured neck of femur.
Materials and Methods: A total of 152 patients, consecutively admitted to urgent surgical treatment of a fractured neck of femur, over 1 year at a general hospital, were retrospectively analysed using the modified POSSUM system. Patients were divided in 4 groups based on age: group A (<60 years), group B (60 – 74 years), group C (75 – 89 years), group D (> 89 years). Then observed to expected ratios (O:E) of both mortality and morbidity at 30 days, for each group, were calculated.
Results and Discussion: Mean age of the patients was 76,9 years (range 14 – 99 years). There were 38 men (mean 67,1 years) and 114 women (mean 80,1 years). The 152 patients analysed were distributed according the following: 17 patients in group A, 24 patients in group B, 91 patients in group C and 20 patients in group D. We observed 5 deaths (0 in group A, 1 in group B, 3 in group C and 1 in group D) and 73 patients had a post-operative complication (5 in group A, 9 in group B, 48 in group C and 11 in group D). Calculated observed to expected (O:E) ratios for mortality and morbidity were, respectively, 0 and 1,00 for group A, 0,33 and 0,75 for group B, 0,17 and 0,86 for group C, 0,33 and 0,92 for group D.
Conclusion(s): The modified POSSUM system may be appropriately used to predict the morbidity in patients with femoral neck fractures, in different age groups, in the studied population, but over predicts the overall risk of death in all the age groups analysed. We couldn't find an age group in which this scoring system applies better, predicting morbidity or mortality.

1AP5-1

Can leadership influence the care quality climate and/or the job satisfaction? A survey using a validated questionaire in an anaesthesiological department

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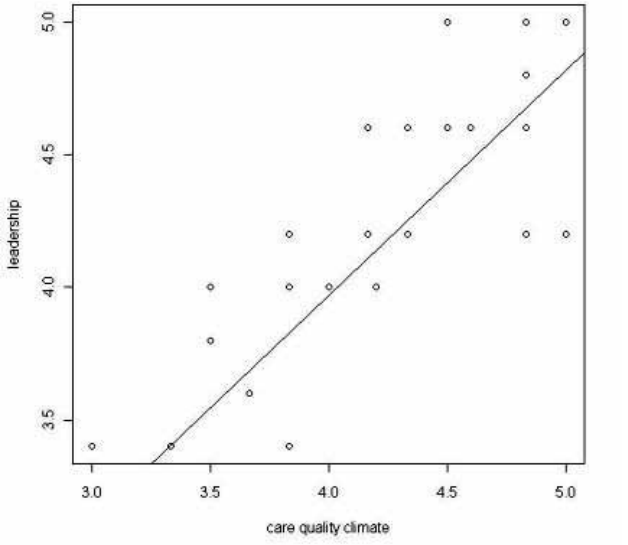
Background and Goal of Study: Study objective: To analyse the influcence of leadership on the quality of care climate and the employee's job satisfaction in

a anaesthesiological department by using an employee survey. As the findings were not actually linked to the defined working roles but in particular related to the quality culture it is perceived that the survey is valid.

Materials and Methods: All physicians of an anaesthesia department of a major Swiss teaching hospital recieved by email a validated questionnaire. The key parts of the questionnaire covered leadership, quality of care climate and job satisfaction. Each section contained six questions. Each question had the possibility of five gradings varying from strongly agreeing to absolutely disagreeing. All hierarchical levels were covered The online survey was anonymous and took approximately ten minutes.

Results and Discussion: The requested survey had a 53.2% response rate-33 from 62 physicians answered the questionnaire: 18 residents (48.6%) and 15 senior staff members (62.5%). The mix between the two levels had no significance on the results. The results were as follows with a maximum grade of 5 being possible. The leadership grading correlated significantly with the quality of care climate (p<0.0001) and in addition the job satisfaction also correlated well with ratings for leadership. (p<0.001).

	leadership scale	95% CI	care quality climate	95% CI	job satisfaction	95% CI
Resident	4.36	(4.12-4.59	4.22	(3.97-4.48))	3.87	(3.61-4.13)
Senior Resident	4.37	(4.12-4.62)	4.31	(4.02-4.60)	4.18	(3.89-4.47)



Conclusion(s): The three dimensions leadership, job satisfaction und quality of care climate are correlated in a signifcant manner. However leadership is the only direct influencing factor and has the power to influence the other two items. Investing in leadership development may be an investment in both the quality of care climate and the employee's percieved job satisfaction. Leadership determines the cultural values in a anaesthesiological department.

Acknowledgements: (1) The impact of leadership and quality climate on hospital performance. Shipton H. Armstrong C. West M. Dawson J.International Journal for Quality in Health Care. 20(6):439-45, 2008 Dec.

1AP5-2

Anaesthesia for interventional radiology: Time to take a lead

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Background and Goal of Study: Interventional radiology (IR) came of age with the medical profession's desire to develop minimally invasive therapies1. Some of these procedures cause significant patient discomfort, and yet require relative patient immobility for optimal results calling for an increasing need for sedation and anaesthesia. Our study aimed to assess the provision of sedation service in IR.

Materials and Methods: 101 radiology departments in acute hospital trusts in England and Wales responded to a telephone survey using a standardised questionnaire which was analysed.

Results and Discussion: 76% of respondents were from the district general hospitals, 80% of which have dedicated IR lists. These provide services for hepatobiliary (84%), vascular (82%), cancer (68%), Gynaecology (61%), neuroradiology (23%) and miscellanous (25%). In 88% of the departments, a dedicated person, which may be a nurse (52%), radiologist (41%), anaesthetist (35%) and others (10%), provides sedation. Half of the departments have a sedation protocol and 49% of departments require a competency-based training for giving sedation. 20% of departments have a lead anaesthetist responsible for IR. 52% of the IR lists have anaesthetic cover and 81% of them have a dedicated anaesthetic assistant. Concerns about the safety and need of training of non-anaesthetic staff in the provision of sedation, monitoring and recovery of patients have been widely publicised1. Our survey revealed suboptimal involvement of anaesthetic departments in IR, and the lack of training for sedation provision. This may be due to poor inter-departmental co-operation and a general lack of resources. The Royal College of Radiologists 2 and the Joint Commission for Accreditation of Healthcare Organizations recommend that sedation practice throughout the hospitals be 'monitored and evaluated by the Department of Anaesthesia'3

Conclusion(s): We identified the need for further participation of anaesthetists in IR to provide a service, support, and to develop training for sedation provision by non- anaesthetists. This can be achieved by a lead anaesthetist in IR who maintains close links between the departments especially with regard to producing local protocols.

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1AP5-3

Comparison of cost effectiveness using low flow anesthesia with an oxygen/nitrous oxide carrier gas sevoflurane versus using high flow anesthesia with an oxygen/nitrous oxide carrier gas sevoflurane during 2 hours anesthesia in abdominal surgery

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Background and Goal of Study: Health care reform has placed increasing pressure on anesthetists to consider the costs of current anesthesia strategies. Inhalator Anesthetic drugs constitute only a small proportion of hospital pharmacy expenses. We evaluated the inhalator anesthetic costs, sevoflurane and nitrous oxide that are related to amounts used were measured during high and low fresh gas anesthesia in 2 hours anesthesia in adult patients.

Materials and Methods: In our prospective study we recorded 208 adult patients ASA I or II that performed 2 hours general anesthesia with nitrous oxide and sevoflurane for elective lower abdominal surgery. They were randomly allocated to two groups:low flow anesthesia (LFA) patient group(n=104) and high flow anesthesia (HFA) patient group (n=104). Initial fresh gas flow was 3l/min of nitrous oxide and 1.5l/min of oxygen in both groups. This flow of 4.5l/min was maintained in the HFA group. After 10 min of HFA, the flow was reduced to 0.5l/min of nitrous oxide and 0.5l/min of oxygen in LFA group. During anesthesia, the amount of inhalator anesthetic was measured. Data are presented as means values in% and standart deviation. Multiple tail t-test analysis was performed and p≤0.05 was considered significant.

Abstract 1AP5-5

Substance	HFA(4.5l/min)	LFA(1l/min)	Costs per2h/euro	Costs per2h/euro	Mean difference(I-J)	Mean difference(I-J)	Std.error mean
Price Euro/l	Consumptionl/2h	Consumption l/2h	104 patientsHFA	104 patientsLFA	HFA	LFA	
O2 0.01	180	60	187.2	62.4			
N2O 0.008	360	60	299.52	49.92	-10223.76	-2426.3426	225.72
Soda Lime 4	0	0.372	0	154.72			
Sevoflurane 668	0.1152	0.0288	8003.17	2000.79	-9719.76769	-1922.34269	102.04
Sums			8489.89	2267.83			

Results and Discussion: In both groups patients' profile was similar. Sevoflurane expenditure during LFA was about 1/4 compered with HFA. Costs of sevoflurane anesthesia are in the table.[table1]In the study p<0.001and the costs of LFA (24.9%) with sevoflurane was significantly smaller than costs of HFA with sevoflurane. Std.Error was 37.48679.Total costs of LFA with sevoflurane was 73.3% smaller compared with total cost of HFA with sevoflurane.
Conclusion(s): Our data suggests that sevoflurane used in LFA 0.5l/min of nitrous oxide and 0.5l/min of oxygen resulted in a significantly reduced sevoflurane expenditure compared to HFA. LFA is a simple method but much more effective in minimizing costs of sevoflurane anesthesia for operations lasting 2 hours or more.

1AP5-4

Factors influencing poor theatre utilisation: An objective and subjective comparison

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Background and Goal of Study: There are sixteen theatres in the central operating department at Leicester Royal Infirmary. Over a six month period, less than 2.5% of elective theatre lists started on time according to data collected on the theatre tracking system ORMIS®. The goal of this prospective study was to investigate this poor statistic using objective and subjective methodology.
Materials and Methods: First cases on morning theatre lists were followed over a three month period from the surgical admissions ward. Detailed analyses of these randomised patient journeys were made to highlight recurrent issues leading to delays in theatre starts. Two standards were set relative to the scheduled theatre start time; the first regarding the time when a patient should be ready to leave the surgical admissions ward (20 minutes before); and the second the time the patient should reach the theatre arrivals suite (ten minutes before). A questionnaire study was conducted to obtain subjective data regarding reasons for late theatre starts.
Results and Discussion: Forty two theatre starts were followed (n=42). Twenty seven cases (64.3%) and thirty cases (71.6%) did not achieve the first or second standards, respectively. Thirty five cases (83.3%) did not start at the scheduled start time. Common factors for late theatre starts include patients arriving late to the surgical admissions ward (twelve cases, 28.6%) and patients not pre-assessed for the operation (fifteen cases, 35.7%). Fifty four personnel participated in the questionnaire study (n=54); including anaesthetists (14), surgeons (19), theatre staff (11) and ward nurses (10). Only fifteen participants (27.8%) believed the first case started later than scheduled. One question asked participants to rank the top three reasons for the first case arriving late to theatres. The commonest factor identified was inadequate preparation of patients on the admissions ward (40 participants, 74.1%). Fifteen participants (27.8%), including all ten nurses surveyed, stated inadequate pre-assessment of patients. Five participants (9.3%) believed patients' arriving late was an issue.
Conclusion(s): The disparity in objective and subjective data demonstrates poor recognition of the issue of poor theatre start times. Patients not attending pre-assessment clinics may be a predictor of patients attending late on the day of surgery. Improved attendance of pre-assessment clinics would prevent the unsafe and disruptive practice of frequent pre-assessments on the day of surgery, thus leading to improved theatre utilisation.

1AP5-5

Cancellation of surgeries – The numbers and the reasons

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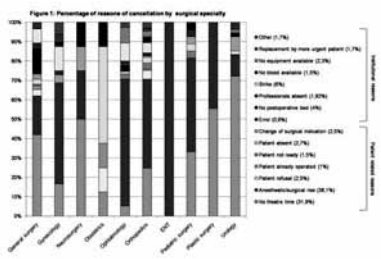
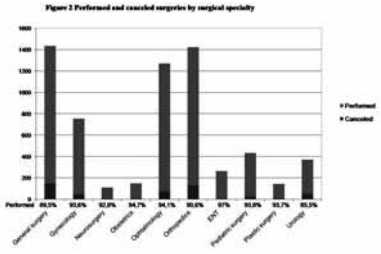
Background and Goal of Study: Beyond the impact on patients,cancellation of scheduled surgery has financial and logistical implications for institutions. Knowing the reality of a service is a major step to increase efficiency,allowing identification and correction of errors.Similar published studies show cancellation rates from 5.6% to 33%,averaging 15%. Goal:to identify the rate and reasons of cancellations of elective surgery in our hospital.





Materials and Methods: We did a retrospective study of elective surgeries scheduled for 1year.Data collected,obtained from OR listings and clinical records,was:surgeries scheduled,performed and canceled by specialty;timing and cause of cancellation;clinical reason and preventability when anesthetic/surgical risk (ASR) was evoked.
Results and Discussion: In the study period,6354elective surgeries were scheduled,of which 520 (8%) were canceled,mostly due to no theatre time (32%) or ASR (38%). 60 were canceled in the OR,mostly due to acute events.Ear Nose and Throat (ENT) experienced the least cancelations (3%,all by ASR) and Urology (15%) the most (mainly by no theatre time), followed by general surgery (10%) and orthopedics (9%) (Figure2).54% of ASR cancellations were deemed potentially avoidable (preexisting decompensation of chronic disease,lack of important exams).These could probably have been prevented by observation and timely guidance to anesthesia appointment.
Conclusion(s): Although our cancellation rate is lower than most centers report,better adjusted surgical plans and timely guidance of selected patients can probably further improve it.

1AP5-6

Lean Six Sigma improves OR supply chain management for first case on-time start

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Background and Goal of Study: The goal of this study was to demonstrate that Lean and Six Sigma are excellent quality tools for the operational improvement of OR supply chain management, one of our determining factors affecting first case on-time start.
Materials and Methods: A team comprised of employees representing different functions within the value stream map was assembled, with an outside consultant serving as a facilitator. A team charter defined five expected outcomes: 1) implementing a clear visual system for organizing equipment, instruments, and supplies 2) reducing storage space 3) improving accuracy of inventory levels 4) reducing total inventory cost and 5) improving workflow and OR on-time start. Improvements in these metrics were linked to an incentive plan for the OR employees. Following the Lean Six Sigma improvement methodology DMAIC, several process improvement tools were used to define the "target system," analyze the current state, and design the future state. A SIPOC diagram and a cross-functional process flowchart helped define the target system. Structured

Abstract 1AP5-5 – Table 1. Reasons for cancellation of elective surgeries

	Total	Total canceled	Canceled in the OR (% of canceled)	Patient related reasons	Institutional reasons	Other
General surgery	1433	150	11,3%	110	40	0
Gynecology	754	48	14,6%	35	10	3
Neurosurgery	111	8	0,0%	7	1	0
Obstetrics	150	8	0,0%	7	1	0
Ophtalmology	1270	75	0,3%	56	17	2
Orthopedics	1421	133	12,8%	110	19	4
ENT	265	8	12,5%	8	0	0
Pediatric surgery	434	27	3,7%	25	2	0
Plastic Surgery	144	9	22,2%	9	0	0
Urology	372	54	14,8%	50	4	0
Total	6354	520	11,5%	417	94	9

process walk-through, cause-and-effect diagrams, spaghetti diagrams and Pareto chart were used to define the current process. The data obtained were analyzed using statistical tools from the Six Sigma toolbox allowing us to identify variances and its causes and to modify processes to optimize output. The team then used this information to conduct brainstorming sessions to determine specific solutions to the problems identified, using tools from the lean toolbox. Examples of brainstormed solutions were: the acquisition of a kanban system, standardization of the ordering process, reduction of daily inventory needs, grouping of instruments and supplies by case location, storage according to "runners, repeaters and rarities" and a re-engineered supply process. Focused improvement sessions were then conducted by targeted work area.
Results and Discussion: As a result of this formal process improvement a Kanban system with "just-in-time" dynamics was implemented resulting in a 20 % inventory and 25% storage space reduction. Total inventory cost was reduced by 21%. In addition workflow improved substantially reducing first-case set-up time by 30%.
Conclusion(s): Using a formal process improvement and Lean and Six-Sigma methodologies, we were able to improve our supply chain management, reduce inventory and decrease cost while improving workflow and staff satisfaction.

1AP5-7

Preoperative anxiety as influential parameter on postoperative nausea and vomiting (PONV) in patients undergoing laparoscopic cholecystectomy

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Background and Goal of Study: Postoperative nausea and vomiting (PONV), is an unpleasant experience that leads to adverse metabolic and psychological effects for the patient.The scientific objective of this study, was to investigate if postoperative nausea and vomiting is related to patients' preoperative anxiety.
Materials and Methods: The study included 80 women, aged 40-50, with ASA physical status 1 and 2, who underwent laparoscopic cholecystectomy. All patients had similar characteristics. The anesthetic, analgesic and surgical parameters were the same.Patients with a history of PONV or motion sickness,obesity and smoking were not included in the study.Spielberger's State-Trait Anxiety Inventory (STAI), for evaluation of preoperative anxiety, was administered to the patients one day before the operation. Patients were evaluated for postoperative nausea and vomiting in the recovery unit and for 24 hours after surgery.
Results and Discussion: Preoperative anxiety was directly related to postoperative nausea and vomiting (PONV).The higher was the level of preoperative anxiety, the higher was the frequency of PONV incidence. Patients with less preoperative anxiety experienced less frequently PONV or not at all.
Conclusion(s): The results of this study, incriminate preoperative anxiety as playing a significant role in postoperative nausea and vomiting (PONV), making anxiety an important predictor of PONV.These results, indicate the importance of a correct preoperative evaluation and the value of premedication and psychological support in order to decrease the frequency or eliminate the unpleasant side effect of anesthesia and surgery, which is postoperative nausea and vomiting.

1AP5-8

Occupational stressors and burnout syndrome of nurses working in a closed or open environment

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Background and Goal of Study: Nurses deal with many occupational stressors. The purpose of the present study was to examine whether nurses working in a "closed" environment (CE) experience different levels of stress and burnout syndrome compared to nurses working in an "open" environment (OE) and which stressors have the highest impact.
Materials and Methods: A three part questionnaire was administered to 102 nurses working in a CE, like the operating theatre or the ICU, or in an OE, like a surgical or medical ward, of a university general hospital. The first part included questions about demographic data and the second about stressors identified in previous interviews, such as the need for constant vigilance and updating knowledge, responsibility, effects of working hours in personal life, distressed relatives, involvement in decision making and management, dealing with death, sleep deprivation, fear of mistaking, intra-personnel conflicts, lack of recognition, work control, menial or repetitive tasks. The third part used the Maslach Burnout Inventory Human Services Survey [1, 2] that examines emotional exhaustion, depersonalisation and reduced personal accomplishment. The chi-square test and regression analysis were used for between groups statistical comparisons.
Results and Discussion: The majority of the stressors examined had a severe impact on both groups. Nurses of CE suffered more from dealing with patient's death (x^2= 0.032, p<0.05) and conflicts with other doctors (x^2= 0.006, p<0.05), while nurses of OE mainly experienced stress from talking to distressed relatives (x^2= 0.000, p<0.05). Women suffered more from sleep deprivation (x^2= 0.036, p<0.05) and from inter – personnel conflicts (x^2= 0.031, p<0.05), comparing to male nurses. Both groups scored for substantial levels of burnout syndrome. There was a slightly higher level in nurses of CE, statistically minor though. Regression analysis showed that emotional exhaustion was related strongly with depersonalisation, but weakly with reduced personal accomplishment.
Conclusion(s): Nurses of both groups (CE and OE) suffer from almost all examined occupational stressors and a high level of burnout syndrome. Measures that would improve the quality of occupational enviroment are needed to be taken.
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1AP5-9

Cognitive performances and subjective sleepiness among Croatian anesthesiology residents before and after 24-hour shift

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Background and Goal of Study: Fatigue, sleepiness and cognitive disorders caused workload limitations for USA anesthesia residents to 80 hours per week (1). Since 2003. these regulations are under debate considering the incidence of medical errors, the quality of education process and hospital costs (2). Aim of our study was to test the hypothesis that workload of 60 hours per week in anesthesia residents in Croatia still causes sleepiness and cognitive disorders after a 24 hour shift.
Materials and Methods: A total of 26 anesthesiology residents (6 males, age range 26-35 yrs.) participated in the study. Inclusion criteria were: last two years of residency, less then 4 hours of sleep during the shift, and without any medication. Meal two hours prior to testing was not allowed. Room temperature was kept at 20 ° C during the testing. Caffeine intake was not controlled. The participants completed a set of psychological instruments in the morning at the begining and at the end of the 24 hours shift (Digit Span Test, Auditory Verbal Learning Test and Stanford sleepiness scale). Testing lasted more then 30 minutes. Multivariate ANOVA was used for statistical analysis. Statistical significance was set at P = 0.05.
Results and Discussion: There was a significant decline in cognitive performance measured by AVLT (a measure of immediate memory span) after the shift (F=3.19, p<.002). There were no differences in the Digits forward test (a measure of concentration), while Digits backward test (a measure of working memory) even showed an improved performance after the shift (F=4.74, p<.04). Participants reported being significantly sleepier after the shift (F=13.3, p<.001).
Conclusion(s): Sleepiness and cognitive disorders after a 24 hour shift in anesthesia residents are still present even workload is reduced to 60 hours per week.
References:
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2 Biller et al The 80-Hour Work Guidelines and Resident Survey Perceptions of Quality, Journal of Surgical Research 135, 275–281, 2006.

1AP5-10

Comparison of outcome data in liver transplant: Deceased donor versus live donor from domino transplant

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Background and Goal of Study: Our Liver Transplant Center performed 30 % of Domino Transplantation. Patients aged 50 and older, and with malignant disease or virus, are transplanted with domino donor. The goal of the study is to compare the survival rates between the two groups.
Materials and Methods: We studied prospectively all the patients submitted to Liver Transplantation in our center during the last three years (from June 2006 till June 2009). All the data was recorded in a computerized database. Retransplanted patients were excluded from the analysis. We compared demographics data (age, sex, body mass index), surgical time, blood products consumption, bleeding, amount of adrenergic drugs used and survival rates (90 days, 1 year). Mann-Whitney and X2 tests were used for statistical analysis of numeric or categorical variables, respectively. The level of significance used was P <0.05.
Results and Discussion: We studied 125 patients and divided them in two groups: domino donor (DomD) (n=59) and the cadaveric donor (CD) (n=66) In our study, regardless of the patients select to received a organ from a domino donor are older, there aren´t statically differences in intra-operative complications (hemorrhage, blood produts, administration of adrenergic drugs)and in survival rates (90 days and 1 year). Probably the domino liver because is a live donor favors the "worst" patients.

Comparison 2 groups

	DD n=59	CD=66	P value // test
Age, median	56 (51-61)	47,5 (37,8-55,2)	<0,001 % Mann-Whitney
Hemorhage (ml)	3695 (1600-5250)	3200 (2000-5025)	0,874 % Mann-Whitney
Blood products (ml)	890 (0-1400)	890 (0-1400)	0,390 % Mann-Whitney
Noradrenalin (mg)	1,5 (0,9-3,4)	1,7 (0,8-4,2)	0,469 % Mann-Whitney
Organ 90 days (%)	80,0	80,0	0,926 % $\chi 2$
Survival rate 90 days	72.2	84.3	0,911 % $\chi 2$

Results are median (interquartil range), or %

Conclusion(s): This results support the use of domino donor in selected patients which resolve the problem of harvest organ offer.

1AP5-11

Preanaesthesia evaluation of non-cardiac surgery patients: A survey amongst European anaesthesiologists

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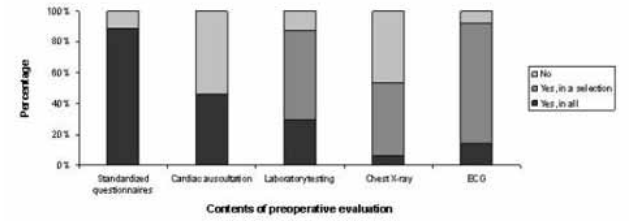
Background and Goal of Study: In order to document and understand the current clinical practice of preoperative testing for non-cardiac surgery in Europe, we designed a survey evaluating current guidelines. We also assessed the opinion of the questioned anaesthesiologists on the practice of routine testing and the possibility of eliminating routine tests.
Materials and Methods: We created a web-based survey aimed at members of different anaesthesiology societies throughout Europe. The survey investigated 1) organizational aspects; 2) the practice of preoperative testing and 3) the opinion on the elimination of routine preoperative testing. The representatives of all national societies registered to the ESA were asked to distribute the survey-website link to their members by email.
Results and Discussion: We received 393 completed questionnaires from 15 countries (figure 1), all from different hospitals. The anaesthesiologist has the final responsibility for the preoperative evaluation in 83% of practices and in 14 % the surgical specialist (mostly Baltic states, 42%). There is a remarkable variation in test-ordering fashion in different practices and between different countries (figures 1 and 2).50 % indicated that they order tests in accordance with guidelines. Most respondents (86%) indicated they would support a development towards minimization of preoperative testing and 70% would support the elimination of routine ECGs. 44 % mentioned patient safety as most important concern when routine testing should be eliminated.

Figure 1. Test ordering and routine electrocardiography in the different countries

Country (response n)	Routine lab testing (%)		Routine chest X-ray (%)		Routine ECG (%)	
	In all	In a selection	In all	In a selection	In all	In a selection
Germany (222)	19	65	2	47	7	85
Austria (33)	47	44	9	47	31	66
Finland (20)	25	70	0	60	0	100
Baltic States (19)	53	42	0	47	11	84
Spain (26)	81	13	44	38	50	38
Czech Republic (20)	22	78	0	78	12	88
Greece (19)	89	11	89	11	95	5
Belgium (13)	8	67	0	33	0	82
Hungary, Bulgaria, Ukraine (8)	62	38	0	88	62	38
United Kingdom (8)	13	50	0	25	0	88
Switzerland (5)	0	100	0	60	0	100



Conclusion(s): Our survey shows a remarkable variety in organization and practice of preoperative medicine throughout Europe and that practice is often not in accordance with guideline recommendations. Furthermore, our survey confirms that there is a shift towards selective testing and also that the majority of the respondents support the development towards minimization of preoperative testing.

1AP6-1

Attempt to shorten preoperative fasting time in Japan

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Background and Goal of Study: In Japan "NPO after midnight" has been of common practice for a long time before an elected surgical operation under general anesthesia(1). Recently several clinical studies suggested that a fasting period for clear liquids of 2 hours might be enough duration to empty gastric contents. Our trial aimed to demonstrate the benefits of shortening the fasting period and to inform other doctors in our hospital of this new idea.
Materials and Methods: Patients (ASA PS: I-II) older than 18 years undergoing scheduled non-cardiac surgery and general anesthesia were included. Patients were fasted from intake of meals from 21 pm the day before elective procedure, and these patients consumed an oral rehydration solution of 1000 ml 3 hours before entering operation room. Before inducing anesthesia, we accessed the volume of the gastric contents using bedside ultrasonography(1).
Results and Discussion: Patients who were scheduled for gastric or intestinal surgery were excluded, because we were not able to get the agreement of gastroenterological surgeons. A total of 52 patients were included, and the sonographic study showed that in 90 % of patients the gastric contents were empty and that in 10% of patients the gastric content were gas and small volume of fluid. No typical "frosted-glass appearance" was found in all patients. The overall incidence of vomiting at the induction of anesthesia and at the extubation was none. Only five patients complained of feeling thirsty when they entered the operation room.
Conclusion(s): Our results were consistent with previously published data and intake of clear liquid reduced preoperative thirst to about 10%. Shorter fasting period during preoperative care increased patient's comfort and satisfaction with anaesthesia services. Furthermore this protocol was useful to reduce nurse's work. We should make an effort to announce to other surgeons that decreased fasting period is useful for attenuating preoperative discomfort.
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1AP6-2

Ondansetrone and lidocaine: Comparative analysis for pain on injection of microemulsion propofol

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Background and Goal of Study: Propofol is frequently used as an induction agent. The pain caused by injection of propofol is known to be related to the concentration of aqueous free propofol. Microemulsion propofol (Aquafol™; Daewon Pharmaceutical Co., Ltd, Seoul, Korea) can cause a serious pain because it has 7 times higher concentration of microemulsion propofol. Many methods to reduce injection pain have been investigated. Ondansetron is a Na-channel blocker, 5-hydroxytryptamine-3-receptor antagonist, and μ-opioid agonist which has effect on reducing pain. We used ondansetron and lidocaine as pretreatment to compare the effect for microemulsion propofol injection pain.
Materials and Methods: We enrolled 50 patients, ASA physical status I or II, randomly allocated into Group L (n=25) received 2% lidocaine 40 mg and group O (n=25) received ondansetron 4 mg as pretreatment. After instituting standard monitoring, the venous drainage was occluded using a pneumatic tourniquet (pressure inflated to 70 mmHg) at 25 cm proximal to venous line. The patients were pretreated over a period of 15 sec with one of the pretreatment drug. After releasing the tourniquet, microemulsion propofol was injected (0.5 mL/sec). We asked the patient injection pain until loss of consciousness, by using VRS. In the recovery room, we asked the patient whether they memory injection pain.
Results and Discussion: There were no significant differences in age, sex, injection site, angio-catheter size between the two groups. These incidence values were estimated from the ratio of patients experiencing pain on injection (VRS >30) to all patients in each group. The incidence of pain on injection of Aquafol with lidocaine and ondansetron was 52% and 84%, respectively Pearson's Chi-squared test (x^2=5.88, P=0.01) The median (25%, 75%) VRS scores for pain on injection of Aquafol with lidocaine and ondansetron were 40 (10, 70) and 90 (80, 100), respectively Wilcoxon rank sum test (P=0.0002). Correlation between IV-route and VRS for pain score is significant. Correlation coefficient(kendall's tau=-0.253, P=0.033).
Conclusion(s): Premedication of Lidocaine (2% 2 ml) is more effective than ondansetron (4 mg) for reducing pain on injection of microemulsion propofol (2 mg/kg).

1AP6-3

Retrospective evaluation of postoperative medical complications and mortality after reconstructive scoliosis surgery

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Background and Goal of Study: In this study, we aimed to investigate the postoperative morbidity and mortality in patients who have undergone scoliosis surgery in our institution.
Materials and Methods: Retrospective evaluation was performed from the patients who have undergone scoliosis surgery in our institution between 2000-2009. The effects of comorbidities, Cobb index, etiology, duration of the surgery, preoperative and postoperative hemoglobin level, instrumentation level, the amount of blood loss, blood transfusion requirements, preoperative pulmonary function tests, arterial blood gas analysis, duration of hospital and and ICU stay on postoperative complications were evaluated with univariate analysis and multivariate logistic regression.
Results and Discussion: The medical records of 209 patients were evaluated. 141 female and 68 male patients were diagnosed as congenital (72 patients) or idiopathic (137 patients) scoliosis. The Cobb index was 50±18° and the instrumentation was performed on 6±2 vertebrae. The mean preoperative and postoperative hemoglobin levels were 13±1.8 and 10.7±1.48 respectively. The mean intraoperative and postoperative blood losses were 1038±789 ml, and 314±207 ml, respectively. Intraoperatively, 3078±1341 ml of crystalloid was infused and the mean urine output was 438±372ml. Preoperatively, the mean FEV1/FVC ratio was 89.5, the mean partial pressure of carbondioxide was 36.8±6.3 and the mean partial pressure of oxygen was 85±18. The mean duration of hospital stay was 19±15 days, and that of ICU stay was 0.86±1.8. Two patients (1%) died intraoperatively and 1 patient (0.5%) died postoperatively. Postoperative complications were reported in 14 (%6.7) patients: Pneumothorax (6 patients), bradycardia (1 patient), meningitis (1 patient), hemiparesis (1 patient), and infection (3 patients). Ten of these 14 patients had at least one comorbidities. In multivariate analysis, the only significant independent factor on the postoperative complications was the existence of comorbidities.
Conclusion(s): The most important factor on postoperative complications is the existence of comorbities together with scoliosis. In order to decrease the incidence of postoperative medical complications after scoliosis surgery especially in patients with comorbities, the perioperative management should include careful preoperative preparation, vigilant intraoperative anesthesia management and postoperative management in the intensive care unit (ICU) by experienced teams.

1AP6-4

Incidence of intraoperative tissue hypoxia in high and low risk surgical patients

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Background and Goal of Study: Tissue oxygenation may be jeopardized during high risk surgery, particularly in high risk patients. We monitored and compared intraoperative tissue oxygenation obtained in high and low risk patients undergoing high and low risk surgery.
Materials and Methods: Tissue oxygenation was measured intraoperatively on the thenar eminescence by near infrared spectroscopy (StO2, InSpectra, Hutchinson Tech.) in a total of 152 patients. Patients were stratified as high risk (HRP, ASA status ≥III, age >65yr, n=82) or low risk patients (LRP, ASA status ≤II, age <65yr, n=70) and to receive high risk (HRS, tumor surgery, n=121) or low risk surgery (LRS, kidney transplantation n=31). We defined a cut-off StO2 value of 80% to separate normal tissue oxygenation (StO2≥80%) from tissue hypoxia (StO2<80%).
Results and Discussion: Tissue hypoxia occurred in 39% of HRP and in 19% of LRP at any time during surgery ($p<0.05$, Wilcoxon test). The difference was even greater when looking at the occurrence of more severe forms of tissue hypoxia (StO2<70%): 8 vs. 3%, $p<0.01$. In addition, tissue hypoxia occurred significantly more often in HRS compared to LRS (19 vs. 6%).
Conclusion(s): Tissue hypoxia occurs frequently in the intraoperative setting, particularly in high risk patients undergoing high risk surgery. Further studies should look at the impact of intraoperative tissue hypoxia on postoperative patients' outcome.

1AP6-5

Pre and post operative values of hs-CRP and prediction of 30-day morbidity in patients undergoing endovascular repair of abdominal aortic aneurysm

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Background and Goal of Study: Inflammatory markers such as C-reactive protein (CRP) are associated with an increased risk of cardiovascular events. The aim of the present study was to investigate the predictive value of CRP measured by high-sensitivity assay (hs-CRP) on 30 day outcome after endovascular repair (EVAR) for abdominal aortic aneurysms (AAA).
Materials and Methods: From May 2007 to September 2009 108 patients underwent EVAR for AAA were entered in a prospective observational study. No patient had clinical evidence of coexistent inflammatory disease. Hs-CPR levels were measured the day before surgery (pre-CRP) and on the 1st postoperative day (post-CRP). All patients were followed-up for 30 days and any death or major morbidity was recorded.
Results and Discussion: There were 6 cardiovascular events and no deaths during the follow up period. The median value of pre-CRP was 4.04mg/L (range 0.2-133), while the median value of post-CRP was 76.6mg/L (range 9.9-274). Using ROC analysis there was no correlation between pre-CRP and the 30 day morbidity (AUC 0.595, p=0.44), while a cut-off point of 3.66mg/L showed a sensitivity of 66.7% and specificity of 50% in predicting major adverse events. Post-CRP ≥95.8 mg/L (cut-off point obtained by ROC analysis) was related to a higher risk of post-operative cardiovascular events having a sensitivity of 80% and specificity of 65%. Additionally the post-CRP values were significantly correlated with the 30 day morbidity (AUC: 0.742, p=0.05).
Conclusion(s): According to the findings of this study preoperative hs-CRP could not predict 30-morbidity after EVAR for AAA. For the same issue, the predictive value of postoperative hs-CRP levels should be further investigated.

1AP6-6

Comparsion of efficacy of tramadol in preventing postoperative shivering when use with thiopental and propofol as an induction agent

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Background and Goal of Study: Postoperative shivering (POS) is a common and distressing experience occurs in patients recovering from general anesthesia. Many pharmacological modalities are used to control and prevent POS. Tramadol, a synthetic opioid with good analgesic activity, have emerged as a potent and effective agent in prevention of shivering. The objective of the study is to compare the efficacy of tramadol when used with two different induction agent, propofol or thiopental, in preventing postoperative shivering.
Materials and Methods: After institutional ethical committee approval and written informed consent,124 ASA I and ASA II patients undergoing short duration (1 to 3 hours) gynaecological, orthopaedics and general surgical procedures were included. Patients were randomly divided by sealed envelope technique to receive either thiopental or propofol as an induction agent. Each group was further sub-divided in to Thiopental + Tramadol (TT), Thiopental + Saline (TS), Propofol + Tramadol (PT) and Propofol + Saline (PS), with 31 patients in each group. Patients included in PT and TT group received intravenous(IV) tramadol 1mg/kg while patients in PS and TS groups received equal volume of saline 15 minutes before wound closure. Presence of POS after extubation till discharge from post anesthesia care unit(PACU) was recorded at different time intervals.
Results and Discussion: The highest incidence was observed in TS group (77.4%) and lowest incidence was observed in PT group (12.9%) with p-value <0.001. The maximum increase of POS was observed on arrival at PACU (37.1%). The significant POS was absent in PT group.

COMPARISON OF POSTOPERATIVE SHIVERING AMONG STUDY GROUPS AT DIFFERENT TIME INTERVAL

TIME INTERVALS	TT (n= 31)	TS (n= 31)	PT (n= 31)	PT (n=31)	TOTAL (124)
Extubation	11 (35.5%)	13 (41.9%)	1 (3.2%)	7 (22.6%)	32 (25.8%)
PACU	10 (32.2%)	21 (67.7%)	2 (6.5%)	13 (41.9%)	46 (37.1%)
15 min	6 (19.3%)	13 (41.9%)	1 (3.2%)	10 (32.2%)	30 (24.2%)
30 min	4 (12.9%)	4 (12.9%)	2 (6.5%)	2 (6.5%)	12 (9.7%)
45 min	0	2 (6.5%)	0	0	2 (1.6%)
Discharge	0	0	0	0	0

n = number of patients

Conclusion(s): The prophylactic use of tramadol 1mg/kg with propofol as an induction agent, significantly reduces the incidence of POS, with less requirement of postoperative analgesia in patients recovering from general anesthesia.

1AP6-7

Preoperative estimated glomerular filtration rate and subsequent perioperative major adverse cardiovascular events in noncardiac surgery

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Background and Goal of Study: Estimated glomerular filtration rate (GFR) is accepted as the best measure of kidney function. Serum creatinine ≥ 2mg/dL is an independent risk factor for perioperative major adverse cardiovascular events (MACE). We analysed the relationship between preoperative GFR and MACE in noncardiac surgery.
Materials and Methods: A prospective multicentre cohort study (ANESCARDIOCAT study) was performed in 23 hospitals during 6 randomized weeks in 2007-2008. Eligible subjects were patients ≥ 40 yr undergoing elective or

emergent intermediate or high risk noncardiac surgery. We collected demographic data and preoperative clinical risk factors. GFR was calculated with both the abbreviated Modification of Diet in Renal Disease Study (MDRD) and the Chronic Kidney Disease Epidemiology Collaboration (CKD-EPI) equations. According to GFR (ml/min per 1.73m2), 6 different categories were defined: 1) GFR>90; 2) GFR =60-89.9; 3a) GFR= 45-59.9; 3b) GFR=30-44.9; 4) GFR=15-29.9; 5) GFR<15. Dependent variables were MACE until hospital discharge. $\chi 2$ test was used to compare qualitative variables and t test to compare quantitative variables.

Results and Discussion: We analyzed 3387 patients. GFR was available in 2323 patients. 93.2% underwent nonemergent surgery. Median age 67 years (percentile 10-90: 47 – 81), 49.5% male. MACE occurred in 4.5% and cardiac related mortality was 0.3%. Preoperative clinical risk factors increased with declining GFR. MDRD and CKD-EPI resulted equally useful to predict MACE. A rise in MACE was observed with declining GFR (Table 1) with a significant increase from stage 3b onwards (OR 1.8 vs. 3.9 in 3a and 3b respectively, p=0.047). Table 2 shows details of MACE.

Table 1. Distribution of patients according to GFR and perioperative MACE

	GFR MDRD		GFR CKD-EPI		
GFR (ml/min per 1.73m^2)	n	% MACE	n	% MACE	p
1 (> 90)	611	3.3	703	2.8	0.714
2 (60 - 89.99)	1126	3.8	1077	4.1	0.801
3a (45 - 59.99)	360	5.0	320	5.0	0.860
3b (30 - 44.99)	133	**9.8**	127	**10.2**	0.920
4 (15 - 29.99)	55	**10.9**	57	**12.3**	0.949
5 (< 15)	38	**10.5**	39	**10.3**	0.730

Table 2. Perioperative cardiovascular events (CKD-EPI)

GFR	1	2	3a	3b	4	5
Cardiac death	0.0%	0.3%	0.0%	1.6%	1.8%	0.0
Noncardiac death	1.4%	0.8%	3.1%	2.4%	12.3%	7.7%
Nonfatal cardiac arrest	0.1%	0.1%	0.3%	2.4%	0.0%	0.0%
Angina	0.9%	0.6%	0.6%	3.1%	3.5%	2.6%
Acute myocardial infarction	0.0%	0.2%	0.0%	1.6%	1.8%	2.6%
Congestive heart failure	0.9%	1.1%	1.6%	2.4%	7.0%	0.0%
Arrhythmia or AV block	0.9%	2.3%	2.5%	4.7%	3.5%	5.1%
Acute cerebrovascular event	0.4%	0.3%	0.3%	0.8%	0.0%	0.0%

Conclusion(s): As in previous studies, poor kidney function was associated with MACE in noncardiac surgery. Preoperative estimation of GFR would help identifying those patients with higher risk of MACE in noncardiac surgery.

1AP6-8

Is obesity a risk factor for anesthesic-surgical morbimortality?

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Background and Goal of Study: Obesity is associated with an increase of general morbidity and mortality, but the contribution to the anaesthetic-surgical risk is debatable. Our objective is to analyze the incidence of perioperative morbimortality of the obese patients in the catalan adult surgical population.

Materials and Methods: Our data proceed from the ARISCAT study, a multi-institutional prospective cohort study, performed in 2006 at 59 catalan hospitals. This study collected pre-, intra- and postoperative information on a random sample taken on 7 different days in each hospital until three months after surgery. The sample includes elective and emergency surgery (except obstetrics) under general or regional anaesthesia. We determined the prevalence of obesity (Body Mass Index (BMI) ≥30 kg/m^2) and compared intra and postoperative complications and the 30 and 90 days mortality between obese and non-obese patients. The SPSS 15.0 statistical package was used to compile descriptive statistics and compare qualitative variables with a χ^2 test and quantitative variables with a T test. Bivariable and multivariable analysis (binary logistic regression) were performed.

Results and Discussion: From the 2464 included patients, 532 were obese (21.6%) and 43 (1.7%) were morbidly obese. In the obese group, the intraoperative complication rates were significantly higher: hyperpressure of airway (10.9 vs 4.2%), arterial oxygen dessaturation (3.6 vs. 2%) and hypertension (8.8 vs. 5.1%). The incidence of total postoperative complications were 13.5 in obese group vs. 13.7% in non obese group. Analysis of subgroup complications were: respiratory (4.9 vs. 5%), cardiovascular (4.5 vs. 4.1%), neurological (1.7 vs. 2.6%), renal (0.6 vs. 1.3%), infections (2.6 vs. 3.4%), surgical wound (4.9 vs. 4.7%), reoperations (1.7 vs. 2.7%) and ICU admission (0.6 vs. 1%) were statistically similar between obese and non-obese patients. The mortality at 30 days was lower (0.4 vs. 1.7%) and at 90 days was statistically similar (0.4 vs 1.1%). The logistic regression model does not include the obesity as an independent risk factor for respiratory postoperative complications or mortality.

Conclusion(s): In the obese patients the incidence of intraoperative complications is higher, but not the one of postoperative complications nor surgical mortality.

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1AP7-2

Palonosetron in the prevention of postoperative nausea and vomiting (PONV): A quantitative systematic review

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Background and Goal of Study: Palonosetron is a "second generation" 5-hydroxytryptamin-3 receptor antagonist newly approved for the prevention of PONV since March 2008 and is characterized by high receptor binding affinity (pK_i=10.45) and a prolonged mean elimination half-life (40 hours) after intravenous administration. From this a superior effect in case of PONV has been deduced. The aim of this study was to analyse efficacy and safety of palonosetron by using a random effects model.

Materials and Methods: Available literature was reviewed systematically. Original data were extracted with regard to the following endpoints for palonosetron 0.075 mg vs. placebo : "complete response" (CR = no emesis, no rescue medication) within the 0 – 24 h and 24 – 72 h period, and "vomiting", "nausea", and "headache" within the 0 – 24 h period postoperatively. A pooled data analysis was done by using a random effects model (Review Manager 5, RevMan, Cochrane Center) to determine the relative risk (RR) with 95%-confidence interval.

Results and Discussion: Data could be extracted from 3 published studies and 1 abstract for the 0 – 24 h period (ref.1,2,3,4). Only 2 clinical studies reported about late PONV (24 – 72). 370 patients received palonosetron 0.075 mg and 369 patients received placebo. Pooled data analysis of the CR rates revealed efficacy in the 0 – 24 h period (RR = 1.67 [1.38-2.02; p<0.001, n=370]) and the delayed period (24 – 72 h) of PONV (RR = 1.29 [1.10-1.51; p=0.002, n=273]). The RR for "vomiting", "nausea", and "headache" within the 0 – 24 h period was 0.68 [0.57-0.80] (p<0.001), 0.69 [0.60-0.80] (p<0.001), and 1.35 [0.65-2.80] (p=0.43), respectively.

Conclusion(s): In clinical trials palonosetron 0.075 mg is statistically superior to placebo in preventing PONV. Efficacy in the delayed period of 24 – 72 hours postoperatively is not as overwhelming as expected. This may be attributed mainly to a low general incidence of PONV in this period. We still lack comparative trials with older 5-hydroxytryptamin-3 receptor antagonists, trials with combined PONV prophylaxis and trials in the paediatric population. The safety profile of palonosetron seems to be favourable to date, but further studies are needed to permit general recommendations.

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1AP7-3

Efficacy and safety of paravertebral blocks for breast surgery: A quantitative systematic review of randomised controlled trials

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Background and Goal of Study: Thoracic paravertebral blocks are performed for unilateral postoperative analgesia in breast surgery since 1995. Aim of the present quantitative systematic review was to assess efficacy and possible adverse effects of paravertebral blocks alone or in combination with general anaesthesia compared with other analgesic treatments in women undergoing breast surgery.

Materials and Methods: Included were all randomised controlled trials investigating the efficacy and safety of paravertebral blocks in comparison to other analgesic and anaesthetic strategies for women undergoing breast surgery. The systematic search, data extraction, critical appraisal and pooled analysis were performed according to the PRISMA statement. Relative risk (RR), mean differ-

ence (MD) and the consecutive 95% confidence intervals (CI) were calculated using the Revman® as statistical software.

Results and Discussion: Fourteen randomised controlled trials (published between 1999–2009) including 867 patients met the inclusion criteria. There was a significant difference in severe postoperative pain scores between paravertebral blocks alone and general anaesthesia at <2h (MD: -2.68; 95% CI: -3.33 – -2.02; P < 0.0001), 2-24h (MD: -2.34; 95% CI: -3.38 – -1.30; P < 0.0001) and 24-48h (MD: -1.62; 95% CI: -3.09 – 0.16; P < 0.00001) after surgery. Similarly, lower pain scores were observed for combined paravertebral blocks with general anesthesia compared to general anaesthesia alone for <2h (MD: -1.32; 95% CI: -1.75 – -0.9; P < 0.0001), 2-24h (MD: -1.90; 95% CI: -2.28 – -1.52; P < 0.00001), 24-48h (MD: -1.80; 95% CI: -2.92 – 0.68; P = 0.002) after surgery. Furthermore, women undergoing breast surgery with a paravertebral block alone required postoperatively a lower total amount of systemic morphine at 0-24h (MD: -3.59; 95% CI: -6.28 – -0.89; P = 0.009). The RR for adverse events like nerval damage, transient horner syndrome, vascular pucture or pneumothrax following paravertebral block were very low.

Conclusion(s): There is considerable evidence that paravertebral blocks in addition to a general anaesthesia or alone may provide a better postoperative pain control with little adverse effects compared to other analgesic treatment strategies in women undergoing breast surgery. However, these results were limited by clinical heterogeneity due to the application of different surgical techniques and the use of diverse types and doses of local anaesthetics.

1AP7-5

Perioperative warming is an under performed target despite excellent guidelines: An audit of the recovery room practice

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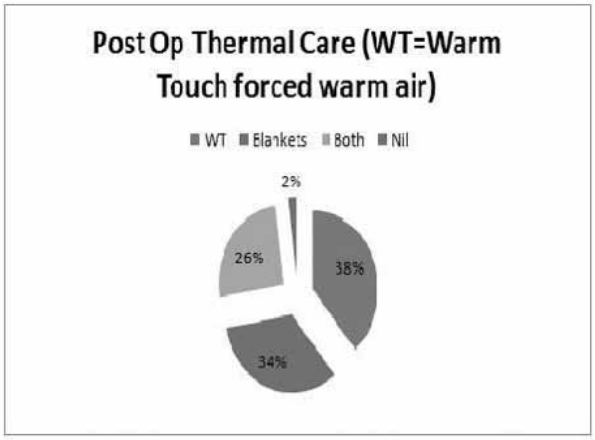
Background and Goal of Study: Despite the guidelines which advocates 100% compliance, inadvertant hypothermia remains a major problem. This prospective clinical audit looked into the temperature management of patients in the perioperative care unit (PACU) of a large teaching hospital.

Materials and Methods: We looked into the core body temperatures of all adult patients admitted to PACU following operations during a period of one week. The temperatures are recorded during admission and discharge from perioperative care unit. Infrared ear thermometers were used to record temperatures.



Results and Discussion: 77 adult patients underwent operations during the study period and the average duration of operation was 103.3 minutes. Average age of the patients was 54.6 years. 27(35%) patients were admitted to the PACU with temperatures below 36^{0}C. 5% patients were discharged from PACU with temperature below 36^{0}C. Patients with temperatures above 36^{0}C on admission to PACU stayed in for an average duration of 90minutes. On the other hand, average length of stay in PACU was increased by 30minutes to a total of 120 minutes for hypothermic patients before discharge to the ward. More than 50% of the patients did not receive any active warming measures during their operation. 98% of the patients admitted to PACU required some form of the warming measures. This was the re-warming time for the hypothermic patient which was about 30 minutes per patient above the routine PACU stay time. Based on the National Institute for Health and Clinical Excellence (NICE) guidance, patients with temperatures below 36^{0}C should be warmed before induction of anaesthesia. Patient risk should be assessed with regard to hypothermia. Starting temperature should be at least 36^{0}C and intraoperatively check temperature every 30 minutes. Discharge patients only with temperatures above 36^{0}C. Above all, awareness about the adverse effects of hypothermia and the cost implicarions could potentially limit the wastage of the resources.

Conclusion(s): Inadvertent hypothermia is a serious complication with surgery and anaesthesia. The guidelines help to make rational decisions with respect to the management of the patient. Awareness seems to be lacking despite all these.

1AP7-6

Anaesthesia and the patient's comfort

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Background and Goal of Study: Finding how comfortable a patient (P) is during post-surgery period is one of anaesthesiologist's priority objectives.The P's comfort may be defined as conformity of the P's expectations to the standard of the provided medical care. The purpose of this research was assessing the level of comfort during anaesthesia service.

Materials and Methods: The research was done in 2 stages: 1 stage: creating the test, the pilot research, and its psychometric diagnostics 2 stage: a research with the final complete versions of the tests. For an assessment of fears in the pre-surgery period, the P were offered to complete a test that consisted of 2 pasts; 1 part provided for an assessment of pre-surgery fears and was done on the day before the surgery, and 2 part determined who the P really felt before, during, and after the surgery, and it was done on the 3 day after the surgery. In the course of psychometric diagnostics, αCronbach's was calculated, which can vary from 0 to 1. In our case αCronbach's equalled 0.79, i.e. the test that we created is valid.

Results and Discussion: The average rate of the P's pre-surgery fears amounted to 74.2%; in the P group aged before 65 it was 74%, and after 65,7%. Regardless of the anaesthesia type, the P were divided into three groups depending on their level of education, namely, higher, secondary professional, and secondary. As a result, the following data were obtained: P with higher education were the calmest, the date of their preoperative anxiety was 78.2%; they were followed by P with secondary professional education with 73.3%, and P with secondary education came last with 71.1%. When P were questioned, it was found that the greatest anxiety was caused by the fear of not waking up after the surgery, the fear of feeling pain after the surgery, and the fear of waking up during the surgery. Fears about the anaesthesiologist's skills and experience and his presence in the surgery room were only expressed if pointed questions were asked. It especially important to discuss such P' fears as waking up during surgery and post-surgery pain and to explain the anaesthesiologist's role and objectives during surgery including monitoring and maintaining homeostasis parameters.

Conclusion(s): Pre-surgery expectations of the P do not correspond with the real flow of the post-surgery period. A close correlation was found between the level or anxiety and agitation and the level of education. A detailed discussion of the anaesthesia and the early post-surgery period can improve the P' quality of life.

1AP7-7

Opioid dose ratios in pain therapy – An evidence-based contemplation

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Background and Goal of Study: If one opioid doesn't suffice in pain therapy, an opioid rotation is necessary. The dose ratio tables currently used are based on **references** from pharmaceutic companies and books. The aim of our study was to evaluate the evidence available for the opioid dose ratios and assessing a potential gender aspect.

Materials and Methods: We collected data from electronic databases (PubMed, Ovid, Embase) from 1950 to September 2009. These data were statistical analysed and presented as medians plus range. The results were compared with currently used tables.

Results and Discussion: Concerning i.v. therapy, our evidence based table corresponds in 33% with the empiric tables, and 50% in p.o.-therapy. No publication focussed on the gender aspect of opioid dose ratios.

Conclusion(s): The existing opioid dose ratio tables are showing less evidence resulting. In 33% in i.v.-application and 50% in p.o.-application the empiric and evidence-based tables match. Therefore, unfavourable side effects can occur. The gender aspect was disregarded. New opioids should be tested obligatory regarding their does ratio, potency and regarding the gender differences prior to the licensing process.

Opioid rotation

Agent	Ratio (range)	Ratio (range)
	Opioid rotation from i.v. to i.v	Opioid rotation from p.o. to p.o
Morphine	1(i.v).	1(p.o.)
Pethidine	MO/PET = 1:10	n/a
Hydromorphone	MOS/HM=5,11:1(3:1 to 6,67:1)	MOS/HM = 5,15:1 (4:1 to 7,5 :1) HM/MOS = 3,65:1(3,6:1 to 3,7:1)
Piritramid	MO/PIR = 0,7:1	n/a
Methadone	MOS/MET=6,1:1(1:1 to 11,2:1)	MOS/MET = 9,48:1 (7,75:1 to 11,20:1) MET/MOS= 8,25:1
30-90mg p.o		MOS/MET = 3,7:1 (2,5:1 to 8,8:1
90-300mg p.o		MOS/MET = 7,75:1(4,0 to 10:1)
300mg p.o		MOS/MET = 12,25:1(10 to 14,3:1)
Buprenorphine	MOS/BUP=32,5:1(25:1 to 38,5:1)	
Fentanyl	MOS/FEN=90:1(70:1 to 100:1)	
Alfentanil	n/a	
Sufentanil	FEN/SUF=10:1(3,75:1 to 20:1)	
Remifentanil	MO/REM = 100:1 ALF/REM = 25:1(20:1 to 30:1	
Oxycodone	MOS/OXY=1:1,15(1:1 to 1:1,43)	MOS/OXY = 1,5:1(1,48:1 to 2:1) OXY/MOS = 1,20:1 (0,75:1 to 1,65:1)
Tramadol	MO/TRA = 1:10	MO/TRA = 1:5
Oxycodone/Naloxone		MOS/OXY&NAL =1:0,6
Morphine i.v.:p.o.	1(i.v.):6 (p.o.)	

Table 1: i.v.-intravenous, p.o.- per os, MO-Morphine, PET-Pethidine, HM-Hydromorphone, PIR-Piritrinamid, MET-Methadone, BUP-Buprenorphine, FEN-Fentanyl, SUF-Sufentanil, REM-Remifentanil, OXY-Oxycodone, TRA-Tramadol, ALF-Alfentanil, NAL-Naloxone, n/a-not applicable

Reference:

1 Shaheen PE et al., JPSM 2009;38:409-417.

1AP7-8

Non-steroidal anti-inflammatory drug (NSAID) for preventing post-operative sore throat: A meta-analysis

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Background and Goal of Study: Sore throat is a common side effect of having a general anesthesia (30-80%). It is usually caused by the tube placed in the airways to make sure a person breathes properly. It may be possible to use drugs such as steroids, a local anesthetics, non-steroidal acid to help prevent postoperative sore throat. The objective of this study was to evaluate the effectiveness and harm of topical and systemic non-steroidal anti-inflammatory drug (NSAID) for the prevention of postoperative sore throat in adults undergoing general anesthesia with endo-tracheal intubation.

Materials and Methods: Search Strategy We searched systematically CENTRAL (The Cochrane Library, Issue 2, 2009), MEDLINE (January 1966 to November 2009), CINAHL (1980 to November 2009). We We identified additional studies from the bibliographies of retrieved reports and reviews **Selection Criteria** We included all randomized controlled trials of topical and systemic prophylactic NSAID therapy for post-operative sore throat versus control that reported the incidence and intensity of postoperative sore throat as an outcome. **Data collection and analysis** The included studies were assessed trial quality and extracted data. The quality assessment was done from 4 points of view.(random allocation, concealment, blinding, follow up) The Data was combined as meta-analysis by fixed effect model if the heterogeneity(I2statistics) is less than 30%, If it is more than 30% the data was combined by random effect model.

Results and Discussion: Finally, we included five studies, total 541 patients to analysis. The five combined studies were all about topical NSAIDS therapy.279 patients were allocated to NSAID therapy and 262 patients to control. Data was combined by using fixed effect model. The NSAID therapy significantly reduced incidence of post-operative sore throat from 35% to13%. (Risk Ratio: 0.4, 95% Confidence Interval [0.28, 0.55] I^2=0%) Number needed Treatment was 4.5 The adverse effect was not reported in this study. **Discussion** There are some limitation of our study. All included study was topical NSAID therpy.However, there were different given root of NSAID such as transdermal,transoropharynx or buccal capsule. There were different kind of surgery and anesthesia.The quality of all included studies were not high. These factore may be effect the result of analysis.

Conclusion(s): Our meta-analysis showed the effectiveness of NSAID for preventing post-operative sore throat.The harm of the intervention was not reported.

1AP7-9

A systematic review of the efficacy of wound catheters for postoperative pain management in general and thoracic surgery

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Background and Goal of Study: The aim of this systematic review of the literature was to assess whether peripheral catheters used for intermittent injection or continuous infusion of local anaesthetics and/or analgesics provide pain relief compared to a control group of patients receiving saline.

Materials and Methods: A Literature search was done including the following databases: Medline via PubMed, EMBASE and the Cochrane database from 1980 until November 2009. The search strategy included the following key words: pain, postoperative, catheters and local anaesthetics in all possible permutations and combinations. Two co-authors (SF and AP) independently read every article that was initially included and extracted data according to a pre-defined study record form. When discrepancy was seen in the extracted data, the senior author (AG) resolved this through discussion. Data was then entered into a statistical programme for meta-analysis, Revman version 5.0 and analysed.

Results and Discussion: A total of 813 studies fitted our search criteria of which 170 were related to general and thoracic surgery. Of these, only 47 studies could be included in the analysis, and only 29 studies had some VAS/NRS data presented in a way that could be included in a statistical analysis. A significant heterogeneity was found between the studies and I^2 (a measure of heterogeneity) was > 50% in most parameters and > 75% in many suggesting that these studies may not be homogenous and even vary largely in the assessment of a common end-point. Data was often difficult to extract and therefore the meta-analysis excluded a sizeable number of studies. Significant but mild analgesia was found (~ 1 cm difference in VAS/NRS) in the treatment group at most time periods and morphine consumption was lower in those studies that could be included in the meta-analyses.

Conclusion(s): Although the technique of LA administration via catheters is simple in its application, this meta-analysis was characterized by marked heterogeneity between studies suggesting that it is difficult (if not impossible) to pool these studies together. Furthermore, a substantial number of studies could not be included in the meta-analysis due to the absence of relevant data, thus questioning the results of such an analysis. Finally, the small differences seen between the treatment and control groups in those studies that could be analysed quantitatively may be more of academic rather than clinical significance in the individual patient.

1AP7-10

Pharmacological and non-pharmacological interventions to reduce propofol injection pain during induction of anaesthesia – A quantitative systematic review

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Background and Goal of Study: Propofol injection pain during induction remains an unsolved problem. The purpose of this work is to provide the clinician with an update of a previously published systematic review [1] on the best available evidence of how to reduce the intensity and severity of propofol injection pain.

Materials and Methods: We conducted a quantitative systematic review of the literature using PubMed, EMBASE, the Cochrane library and hand search. All available evidence from RCTs that compared the use of any drug, pharmacological intervention, or a combination of both with an active or inactive control in order to reduce the incidence and severity of pain in patients receiving intravenous propofol were reviewed.

Results and Discussion: We analyzed data from 182 randomized controlled trials (24,191 patients), 19 drugs and 8 different non-pharmacological interventions and combinations. The most efficacious intervention was IV lidocaine with venous occlusion before the injection of propofol with odds ratio (OR) of 0.07. The next best interventions were lidocaine mixed with propofol OR 0.19; lidocaine pretreatment OR 0.21, and opioids pretreatment OR 0.20. In addition, newer propofol emulsions such as Propofol Lipuro when used without lidocaine

OR 0.63 or in combination with lidocaine OR 0.50 were equally effective in mitigating pain from propofol injection. There were insufficient data for other interventions.

Conclusion(s): IV lidocaine with manual venous occlusion is the most efficacious intervention to reduce propofol injection pain. Other effective interventions are IV lidocaine pretreatment, lidocaine admixture, IV opioid pretreatment, and novel propofol emulsions.

Reference:

1 Picard P, Tramer MR: Prevention of pain on injection with propofol: a quantitative systematic review. Anesthesia and Analgesia 2000; 90: 963-9.

1AP8-1

Predicting patterns of droperidol use in postoperative nausea and vomiting: A Delphi study

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Background and Goal of Study: Droperidol, a butyrophenone D2 antagonist, was introduced in 1970 and widely used as an antiemetic. Concerns about QT prolongation/Torsades de pointes led to withdrawal of the drug outwith the US in 2001. However, few data support this and the intravenous presentation has now been launched in the UK by another manufacturer. Comparative analysis of antiemetic efficacy demonstrates no statistically significant difference between droperidol, ondansetron or dexamethasone(1)(2),while droperidol uniquely is licensed for addition to PCA syringes and is effective in reducing emesis(3). The aim of this study was to gauge the extent to which anaesthetists would want to use the drug so that its pharmacoeconomic impact could be considered.

Materials and Methods: A three round Delphi process was used. The respondent group comprised 25 anaesthetists considered expert in their field. In round one, the experts were interviewed to determine the place of droperidol in PONV prophylaxis and treatment, use with PCA opioid, and safety. This generated 212 statements which were collapsed into 8 domains (prophylaxis in low risk/moderate risk/high risk, treatment of PONV, use with PCA, QT prolongation, prophylaxis timing, multimodal therapy). In round two, a structured questionnaire examined views in each domain. For the first 5 domains, respondents were also asked to rank the following on a 7 point scale from 1(most likely to use) to 7(least likely to use): dexamethasone 4mg, dexamethasone 8mg, ondansetron 4mg, ondansetron 8mg, cyclizine 50mg, prochlorperazine 12.5mg and droperidol (dose unspecified). In round three, an anonymised summary was circulated for comment.

Results and Discussion: 22(88%) responded in the second round, 21(84%) in the third. There was a consensus that:-[br]• droperidol is effective for prophylaxis and treatment of PONV[br]• for both prophylaxis and treatment, droperidol was unanimously ranked 2nd or 3rd line and hence is unlikely to be used as sole agent[br]• in high risk or refractory patients, droperidol is highly likely to be used in multimodal therapy[br]•QT prolongation is not a barrier to use No consensus was achieved for use with PCA opioid Overall, migration from existing drugs was considered to be modest with a limited budgetary impact.

Conclusion(s): The Delphi process can be used to predict patterns of clinical drug use. This may facilitate horizon scanning of the budgetary impact of new drugs.

References:

1 Cochrane database of systematic reviews,4,2009.
2 Apfel C et al.NEJM 2004;350:2441-51.
3 Tramer M.Anaes Analg1999;88:1354-61.

1AP8-2

Risk factors for early and delayed PONV after thyroid and parathyroid surgery

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Background and Goal of Study: Postoperative nausea and vomiting (PONV) are among the most disturbing postoperative symptoms, reported to be frequent after thyroid and parathyroid surgery. The goal of our study was to determine the incidence of PONV and to identify the risk factors for early (0-2 hours postoperatively), delayed (2-24) and overall PONV (0-24) in patients undergoing thyroid and parathyroid surgery.

Materials and Methods: We conducted a prospective cohort study to obtain pre-,intra-, and postoperative data from 471 adult patients who underwent elective thyroid and parathyroid surgery in tertiary care teaching hospital. All patients were operated under GA with standardized anesthetic technique: propofol for induction, and sevoflurane/N2O/opioid for maintenance of anaesthesia. Postoperative pain management was achieved by using NSAIDs, and not opioids. Logistic regression analysis was applied to identify and quantify the impact of relevant risk factors.

Results and Discussion: Patient characteristics were: age 51.85±13.66, 80.7% females, 66.2% non-smokers, 12.3% had a history of PONV after a previous anesthetic.The most frequent surgical procedures were: total thyroidectomy (64.3%), hemithyroidectomy (19.5%), and parathyroidectomy (11.0%). By 24 hours after surgery 38% of patients developed PONV; 27.4% experienced early PONV (0-2) and 21.4% suffered delayed PONV (2-24). Logistic regression analysis identified two independent predictors of early PONV (odds ratio; 95%CI): history of PONV (2.56; 1.44-4.54) and parathyroidectomy (0.1; 0.02-0.42). Independent predictors of delayed PONV were: female gender (4.44;1.84-10.71), BMI (1.06; 1.01-1.12) and history of PONV (4.54;2.50-8.25), while those of overall PONV were: female gender (2.37;1.34-4.19), non-smoking status (1.69;1.1-2.6), history of PONV (4.12;2.24-7.60) and parathyroidectomy (0.25;0.11-0.60). Duration of surgery, age, history of motion sickness and difficult intubation were not significant predictors of PONV.

Conclusion(s): Our results showed a substantial incidence of PONV after thyroid and parathyroid surgery under general inhalational anaesthesia and non-opioid postoperative analgesia. There is a difference in risk factors for early and delayed PONV. Our results are consistent with previously published data concerning patient-related risk factors, but we add parathyroidectomy as surgery-related predictor of PONV.Female gender,history of PONV, non-smoking and higher BMI increase the risk for PONV, which is substantially higher in thyroid than in parathyroid surgery.

1AP8-3

Predictive model and postoperative nausia and vomiting

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Background and Goal of Study: Nausea and vomiting are common complications during the postoperative period. They cause great discomfort to the patient and may increase morbidity: increasing bleeding, suture dehiscence etc. Its etiology is multifactorial and the prevalence is high, ranging from 20% to 80% in high risk patients. The objective of our study is to determine the prevalence of postoperative nausea and vomiting (PONV), what factors influence their appearance and obtain a predictive model by logistic regression, in order to identify the prophylaxis of PONV for each patient.

Materials and Methods: We have performed a prospective observational study of 201 patients undergoing major orthopedic surgery. After collecting the personal, perioperative data, the incidence of PONV and antiemetic use (according to the protocol of the unit), a predictive model was built using logistic regression.

Results and Discussion: The prevalence was 39.8% of patients. The 46.6% of women in the study had PONV. 75% of patients with a history of previous PONV had some episode. It was more prevalent in Reprótesis Hip and Knee Surgery and thoracolumbar instrumented considered more aggressive surgery. In 11.5% of cases of PONV had to reach the second step of our protocol and only 1.5% in the third step is reached. We obtained the following predictive model: Y=-1.334+0.753*S + 1.5602*PHNV + 0.769*ASI. S is Sexo (female 1, male 0), PHNV is Previous history of Nausea Vomiting; ASI is aggressive surgical intervention (Yes 1, No 0). The odds ratio (OR) were: females 2.12 (p = 0.024) for PHNV of 4.7 (p = 0.005) and ASI

Abstract 1AP7-10 – Table 1. Efficacy of interventions to reduce propofol injection pain

Intervention	Control	Studies (n)	Patients (n)	Odds Ratio	Confidence Interval (95%)
Venous Occlusion (Manual/Tourniquet)	Without venous occlusion	14	1072	0.07	0.05-0.10
Lidocaine Admixture	No admixture	26	3694	0.19	0.17-0.22
Lidocaine pre-treatment	No pre-treatment	23	2044	0.21	0.18-0.26
Opioids pre-treatment	No pre-treatment	19	2377	0.20	0.17-0.24
MCT/LCT propofol (1%)	LCT propofol (1%)	31	3414	0.63	0.65-0.72
Propofol emulsions with lidocaine	Propofol emulsions without lidocaine	14	3143	0.50	0.04-0.58

2.16 (p = 0.017). We found that there was no difference in morphine consumption between aggressive surgeries and others surgeries that were studied.

Conclusion(s): A rational approach to postoperative nausea and vomiting includes three steps: identification of patients at risk, keeping the baseline risk low, and prophylactic administration of anti-emetics in those patients who are most likely to need them [1]. Our predictive model allows us to identify high-risk patients and proper anti-emetic prophylaxis. In this survey, we have seen that the intensity of surgical aggression is a risk factor of PONV regardless of the needs of opiates.

Reference:

1 Tramer MR. Strategies for postoperative nausea and vomiting. Best Pract Res Clin Anaesthesiol 2004; 18: 693-701.

1AP8-4

An audit of the incidence of postoperative nausea and vomiting following elective laparoscopic cholecystectomy

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Background and Goal of Study: Laparoscopic cholecystectomy (LC) carries a high incidence of postoperative nausea and vomiting (PONV). Aetiological factors include peritoneal gas insufflation, bowel and biliary tree manipulation, as well as the use of perioperative opioids, volatile anaesthetic agents and nitrous oxide. PONV is sufficiently common after LC that antiemetic prophylaxis is routine, and is standard practice at our institution. Our aim was to quantify the incidence of PONV in LC and to identify the factors which can be modified in order to reduce this incidence.

Materials and Methods: All cases of elective LC were identified over a nine month period. A retrospective review of the patients' medical charts was performed. Patient age, sex, ASA status, anaesthetic technique, antiemetics and analgesics administered intraoperatively and postoperatively were recorded. The charts were analysed for evidence of PONV and postoperative antiemetic use.

Results and Discussion: 50 patients underwent elective LC over the nine month period. 42 patient charts were available for study. 8 charts were unavailable as they were in use in other departments during the audit period. All received standardised general anaesthesia using sevoflurane in a carrier gas consisting of either oxygen/air or oxygen/nitrous oxide. Intraoperative antiemetics were administered to patients as follows: 34 (81%) received dexamethasone and ondansetron, 4 (9.5%) received dexamethasone, ondansetron and metoclopramide, 3 (7.1%) received dexamethasone alone and 1(2.4%) received ondansetron and metoclopramide. Patients received intraoperative analgesics as follows: paracetamol in 41 (97.6%), NSAIDS in 34 (81%) and morphine in 42 (100%). Postoperatively, 14 patients (33.3%) had nausea or vomiting. Of these, 8 patients had nausea, 4 had vomiting and in 2 patients it is unclear whether one or both occurred. 12 received postoperative antiemetics. Of these 14 patients, 8 received postoperative opioid analgesics on the ward; however all episodes of PONV commenced before postoperative opioid administration.

Conclusion(s): PONV remains a significant problem in our institution despite consistent antiemetic prophylaxis. Contributing factors include the use of morphine, volatile anaesthetics and nitrous oxide. We plan to substitute morphine for short acting opioids both intraoperatively and in the postoperative period, and are considering changing to propofol-based total intravenous anaesthesia. A repeat audit will evaluate whether these changes impact the incidence of PONV.

1AP8-5

Titration of anesthesia using bispectral index monitoring does not reduce postoperative nausea and vomiting

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Background and Goal of Study: A Cochrane review of the benefits of Bispectral Index (BIS) on postoperative recovery reported less postoperative nausea and vomiting (PONV) when the BIS value was titrated to >45.(1) We previously conducted a large factorial multicenter trial (2) with a subset of patients randomized to low and high BIS targets and analyzed this data to arrive at a definitive answer as to whether high BIS values (55-65) can reduce PONV.

Materials and Methods: We analyzed 2,105 patients that were randomized to either a BIS target value of 30-40 or 55-65. The incidence of PONV was recorded for 24 hours post-anesthesia and calculated for the early (up to 2 hours after anesthesia), late (2-24 hours) and overall (0-24 hours) period.

Results and Discussion: Demographic characteristics of these 2,105 patients were similar in both groups (p>0.05). Average BIS values for the 30-40 and 55-65 groups were 38.4 and 51.0, respectively (p<0.001). Propofol (137.4 vs 111.6), sevoflurane (1.26 vs 0.92), isoflurane (0.77 vs. 0.65), and desflurane (3.50 vs. 3.62) usage also differed significantly between the two groups. The incidences for PONV over 24 hours were 40.2% in the 30-40 BIS group and 40.4% in the 55-65 BIS group (p=0.96). The incidences of nausea, vomiting or PONV were also similar between the other comparisons (see table 1). These findings were confirmed by logistic regression analysis.

Table 1: Intention-to-treat analysis. There was no statistically significant difference between groups (p>0.05).

	Group 30-40; n=1055	Group 55-65; n=1050	p-Value
Overall Period (0-24h)			
PONV	40.2%	40.4%	0.96
Vomiting	15.8%	15.8%	0.99
Nausea	39.3%	39.1%	0.96
Early Period (0-2h)			
PONV	18.8%	19.3%	0.82
Vomiting	4.6%	5.2%	0.55
Nausea	18.2%	18.8%	0.74
Late Period (2-24h)			
PONV	35.6%	34.1%	0.49
Vomiting	12.9%	12.3%	0.69
Nausea	34.6%	32.8%	0.38

Conclusion(s): Anesthetic requirements for patients randomized to a BIS of 50-65 were significantly less than those for patients randomized to a BIS of 30-45, yet the incidence of PONV was similar.

References:

1 Punjasawadwong Y et al., Bispectral index for improving anaesthetic delivery and postoperative recovery. *Cochrane Database of Systematic Reviews* 2007.

2 Apfel CC et al., A factorial trial of six interventions for the prevention of postoperative nausea and vomiting. NEJM 2004 (350) 24: 2441-51.

AP8-6

Effect of intraoperative intravenous crystalloid infusion for the prevention of postoperative nausea and vomiting

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Background and Goal of Study: Postoperative nausea and vomiting remains one of the most common postoperative complications. Intravenous fluid administration has been shown to reduce postoperative nausea and vomiting, however the optimum dose is yet not clarified. The goal of the present study was to test the hypothesis that administration of high dose intravenous crystalloids reduces the incidence of postoperative nausea and vomiting, compared with low dose administration of same intravenous fluids.

Materials and Methods: Forty two ASA I and II adult patients, undergoing thyroidectomy were included in our study. Anaesthesia was inducted in all patients using Propofol (2-3mg/kg) and Fentanyl (0.1-02mg bolus) or Remifentanil (0.25mg/kg/min) and neuromuscular blocking using Rocuronium (0.6mg/kg). Anaesthesia was maintained using total intravenous anaesthesia with Propofol and Remifentanil. After randomization patients were divided in four groups, in order to receive either 10ml/kg (groups I and II) or 30ml/kg crystaloid infusion (groups III and IV). Groups II and IV were also co-administered droperidol 1.25mg during anaesthesia induction. Vomiting and postoperative nausea were recorded immediately after full recovery was achieved, 2 and 24 hours later. Statistical analysis was conducted using Analysis of Variance and Kruskal Wallis tests.

Results and Discussion: According to our results, vomiting and postoperative nausea scores upon recovery and 2 hours later were statistically significant lower in groups receiving 30ml/kg comparing with those receiving 10ml/kg crystalloid infusion. Twenty four hours postoperatively the patients had the same vomiting results, while in nausea they continued to appear more improved in groups III and IV, comparing with group I. Further analysis revealed that patients from group III receiving 30ml/kg crystalloid infusion had the same vomiting and postoperative nausea scores with groups II and IV that received droperidol after 2 and 24 hours. Moreover, vomiting and postoperative nausea scores were not changed during time in groups III and IV, while in groups I and II were improved only after 24 hours postoperatively.

Conclusion(s): The present prospective randomized study has shown a beneficial effect of 30ml/kg compared with 10ml/kg crystalloid intraoperative infusion in reducing the incidence of postoperative vomiting and nausea after thyroidectomy. Our results suggest that there is a dose-response relationship for perioperative infusion of fluids affecting vomiting and nausea even 24 hours postoperatively.

Acknowledgements: None.

1AP8-7

Risk factors for postoperative nausea and vomiting in ophthalmological surgery

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Background and Goal of Study: Postoperative nausea and vomiting (PONV) are common in ophthalmological surgery and may cause serious damage. Risk factors for PONV in this setting are unknown and the most effective prophylactic strategy is not identified. The goal of our study was to identify risk factors for PONV in ophthalmological surgery and to compare the prophylactic efficacy of droperidol-metoclopramide (Dr-M) and dexamethasone-metoclopramide (Dx-M).
Materials and Methods: Single-centre randomized double-blinded trial. Adult patients without previous history of PONV, proposed for ophthalmological surgery under general anaesthesia, were enrolled after informed consent. A questionnaire for demographic, clinical and laboratory characterization was applied. Prophylaxis with Dr-M (1.25+20 mg) or Dx-M (5+20 mg) was administered according to a randomization ratio of 1:1. Logistic multivariate analysis was used to evaluate the association of risk factors and PONV.
Results and Discussion: About 80 patients were enrolled (54±17 years-old; females: 62.5%). The surgical procedure was extra-ocular in 28.8% and the duration of anesthesia was 114±40 min. No significant differences were found between Dr-M and Dx-M groups in basal clinical and laboratory characteristics. In the studied population, 17.5% had postoperative nausea and vomiting. The risk score of Apfel didn't identify the patients who suffered from postoperative nausea and vomiting. PONV risk was higher in young adults (<40 years-old: OR 3.71; 95%CI 1.12-12.36; p=.026) and in ASA-class I patients (OR: 3.36; 95%CI 1.28-8.86; p=.029), and was reduced by 29% in obese subjects (BMI >30kg/m^2; OR: 0.71; 95%CI.61-.84; p=.042). PONV was less frequent among patients treated with Dx-M (12.8%) than in those undergoing prophylaxis with Dr-M (22%), but the difference was not statistically significant.
Conclusion(s): Conventional scores for stratification of PONV risk are not appropriate in ophthalmological surgery. The association Dx-M may eventually be not only as effective as Dr-M, but possibly higher. Studies on a larger scale in this field are needed.

1AP9-1

A simple technique to improve oxygenation and prevent severe desaturation in deeply sedated patients during colonoscopy

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Background and Goal of Study: A simple plastic sheet has been shown to convert a nasal cannula (NC) to a face tent at no cost.[1-2] It improves oxygenation in deeply sedated patients during upper GI endoscopy.[2] This technique has been used in our Endoscopy Suite. We wish to confirm its effectiveness in improving oxygenation while ascertaining FiO_2 during colonoscopy.
Materials and Methods: This retrospective review of patients undergoing colonoscopy identified 2 groups. Group 1 received NC O_2 (NC, n=59). Group 2 received NC O_2 plus a face tent (FT, n=121) using a clear specimen bag (n=88) or a plastic shield (n=33).[1-2] It covered the eyes, nose and mouth. Monitors included ECG, BP cuff, pulse oximetry and capnography+/-oximetry. Patients received NC O_2 (3-5 l/min or higher as needed) and only iv propofol for sedation. Data collected for analysis included age, weight, height, room air (RA) O_2 saturation (Sat), O_2 Sat at 5-min intervals, the lowest O_2 Sat, the need for assisted ventilation, the amount of propofol, O_2 levels and the duration. 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: There were no differences in age (NC: 56±16 yrs; FT: 57±14), BMI (NC: 27.1±4.1; FT: 27.6±5.8), ASA status (NC: 2.0±0.6; FT: 2.2±0.7), RA O_2 Sat, the duration (NC: 26±13 min; FT: 28±12) and propofol dosages. There were significant differences in the highest O_2 flow and O_2 Sat after 5 min with O_2, the lowest O_2 Sat, severe O_2 desaturation (Desat) (O_2 Sat ≤ 85%) and the need for assisted ventilation between groups. Five NC patients experienced severe O_2 Desat (O_2 Sat: 82±12%) with sedation and O_2 Sat was greatly improved to 99±1% after adding this face tent. FT patients (n=40) had high O_2 levels (FiO_2:68±14; FeO_2:79±14%) with O_2 flow at 4.4±0.8 l/min.

Effects of Face Tent on O2 Saturation during Colonscopy

	RA O2 Sat	Highest O2 Flow (l/min)	O2 Sat after 5 min O2	Propofol (ug/kg/min)	Lowest O2 Sat	Severe Desat (O2 Sat < 85%)	Assisted Ventilation
Group 1 NC (n=59)	99±1%	5.4±1.8	99±3%	206±61	94±7 % #	6/59	3/59
Group 2 FT (n=121)	98±2%	4.5±1.2 *	100±1% *	206±74	97±1% *#	0/121*	0/121*

*Significantly different from NC; #Significantly different from 5-min O2

Conclusion(s): Data show that this technique improves oxygenation, reduces severe desaturation and reduces the need for assisted ventilation in deeply sedated patients during colonoscopy. It increases O_2 delivery without increasing O_2 flow or cost.
Reference:
1 Anesth 102:484, 2005. #2. Anesth 107:A922, 2007.

1AP9-2

Facial draping: Effects on arterial blood gases and cardiovascular parameters in patients undergoing ophthalmic surgery under peribulbar block and sedation

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Background and Goal of Study: Facial draping for ophthalmic surgery is common practice. Rise of CO2 under drapes in spontaneously breathing patients leads to hypercarbia. We studied effects of facial draping on ABG and cardiovascular parameters in patients scheduled for vitrectomy under local block.
Materials and Methods: Prospective study in 40 ASA I patients 30-50 years, scheduled for vitrectomy. Patients received peribulbar block and i.v. sedation with midazolam and fentanyl. In Group I (Control group), drape passed over screen allowing exposure of face to atmosphere. In Group II (Study group), standard drape (15x20 cm) covered face from nose to neck. In both groups,O2 supplemented under drapes. SpO2, NIBP, Heart and Respiratory rate, ABG and Holter monitoring undertaken. Mean ± SD calculated, results compared using paired and unpaired 't' tests.
Results and Discussion: Demographic data comparable. PaCO2 values in Study group increased significantly (p< 0.005) at 20,40 and 60 minutes (Fig 1). No difference in systolic BP but a significant increase in diastolic BP in study group observed. No change in heart rate or rhythm noted in both groups. Respiratory rate increased significantly at 30 min after draping. PaO2 remained constant in both groups. Several studies reported CO2 increase under ophthalmic drapes in spontaneously breathing patients. Significant rise in PaCO2 seen in our Study group. Increase in respiratory rate correlated with PaCO2 rise. No hypoxia observed. Holter monitoring showed no arrythmias. Rise in diastolic BP in study group corresponded with high PaCO2.

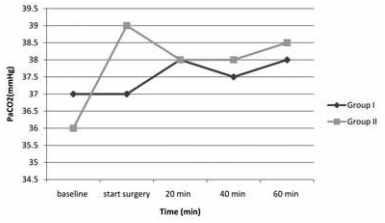

Fig 1: PARTIAL PRESSURE OF CARBON DIOXIDE (PaCO2)

Conclusion(s): Study carried out in spontaneously breathing patients under facial drapes during ophthalmic surgery under block and sedation. Significant rise in PaCO2 observed at and after 20, 40 and 60 minutes of facial draping. Respiratory rate and diastolic BP were also raised. No change in heart rate and rhythm in Holter analysis. Oxygen supplementation prevented hypoxia.
Reference:
1 Schlager,Luger TJ. Br J Ophthal 2000;84:399-402.

1AP9-3

Impact of laparoscopy on the abdominal compliance is determined by the duration of the pneumoperitoneum, the number of gravidity and the existence of a previous laparoscopy or laparotomy

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Background and Goal of Study: We found in a previous study that in some patients the pneumoperitoneum volume increased at the end of the surgery. We found also that patients who had multiple pregnancies, laparoscopies or laparatomies had a larger abdominal compliance at the start of the pneumoperitoneum. Our hypothesis is that a pneumoperitoneum changes the abdominal compliance more in long procedures and in patients who have never been pregnant, never had a laparoscopy or laparotomy.
Materials and Methods: Female patients scheduled for a laparoscopic procedure and who did give informed consent were included in this study. The number gravidity, previous laparotomies, laparoscopies and the length of the pneumoperitoneum was recorded. The abdominal pressure volume relation

was measured with three data points (1) at the start and at the end of the pneumoperitoneum allowing the calculation of the inflated volume at 15 mmHg. A multivariate analysis on the effect of time, gravidity, previous laparoscopy, laparotomy for the change in laparoscopic volume at 15 mmHg was performed.
Results and Discussion: 64 female patients were included in this study having primarily gynecologic or bariatric surgery procedures. The abdominal compliance did change less if the patient had a previous laparotomy, laparoscopy, multiple gravidities or a very short pneumoperitoneum. The inflated abdominal volume rose in all the other patients indicating a rise in abdominal compliance during pneumoperitoneum. As the intra abdominal pressure was set almost identical in most patients no conclusions could be made on the impact of this factor. These results might indicate that previous abdominal wall overstretching is permanent. This group of patients had indeed a larger abdominal compliance at the start of a laparoscopy as previously described (2) with a smaller increase in abdominal compliance at the end.
Conclusion(s): The abdominal compliance increased after laparoscopy but less if the patient had a previous laparotomy, laparoscopy, multiple gravidities or a short duration of pneumoperitoneum.
References:
1 Mulier J On the abdominal pressure volume relationship. ISPUB 2009;21:1.
2 Mulier J, Dillemans B Determinants of the abdominal pressure volume relation in non ACS patients. In: Acta Clinica Belgica 2007; 62.

1AP9-4

Conditioning the CO2 for pneumoperitoneal insufflation: Combination of humidification, heating and drug delivery

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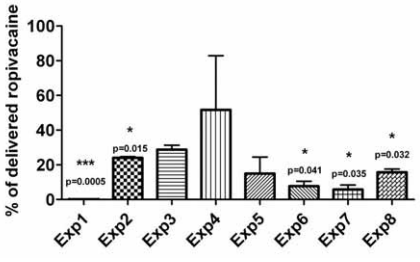
Background and Goal of Study: The MR860* device (MR, Fisher-Paykel, New Zealand) allows for humidification and heating of the insufflated CO2 in laparoscopic surgery. The Aeroneb* nebulizer (A, Aerogen, Ireland) permits ropivacaine (R) administration along with the CO2 insufflation 1). Aiming at the combination of these 2 devices, this bench study evaluates the best setting in terms of timing of use (simultaneous or sequential) and position on the insufflation line.
Materials and Methods: 8 experiments (exp) were conducted in duplicate. A constant CO2 flow of 75L/h (Karl Storz Thermoflator*) was maintained through a MR system connected to a 10cm catheter submerged in a calibrated vial containing 50% methanol in water. The A filled with 10mL of 0.2% R was added on the line. Exp 1 and 8 consisted of the exclusive operation of the MR and the A respectively (controls). Exp 2, 3, and 4 were conducted with the A placed at the outlet of the humidifier chamber of the MR and exp 5, 6, and 7 with the A placed at the inlet of this chamber. In exp 2 and 5, the A was first activated 30min followed by 60min of MR function. In exp 4 and 7, the MR was working 60min followed by 30min of A activation. In exp 3 and 6, both devices were operated simultaneously 90min. The concentration of R collected in the vial was measured in duplicate (HPLC) every 10min during 90min for calculation of the total amount of R delivered by the system. The amount of R left over in the system was determined by rinsing at the end of the 90min.
Results and Discussion: When A operates first, 24,06% of R is found with the A in outlet position, and 14,98% with the A at the inlet of the MR chamber. When A and MR worked simultaneously, 28,81% of the R is transported with the A in outlet position vs. 7,74% with the A at the inlet of the MR chamber. Turning on the MR first yields 51,68% of R with the A in outlet position and 5,78% when the devices switch positions. Isolated nebulization yields 15,74% of retrieved R.



Conclusion(s): Placing the A at the outlet of the chamber of the MR with sequential operation of the MR before the A (exp 4) seems to be the most efficient combination of the 2 devices and should now be evaluated in the clinical setting.
Reference:
1 Anesth Analg 2008.107:549-51.

1AP9-5

A comparison of venous thromboembolism prophylaxis in elective and emergency patients for major abdominal surgery

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Background and Goal of Study: Venous Thromboembolism (VTE) is a major cause of mortality and morbidity. Thromboprophylaxis is effective and guidelines exist.[1] Patients for laparotomy are at risk of VTE and epidurals are frequent in this population, however timing of regional blockade is crucial to prevent epidural haematomas.[2] The aim of this study was to compare risk factors and compliance with current VTE guidelines for emergency and elective patients undergoing laparotomy for bowel resection.
Materials and Methods: Case note review of 50 elective and 50 emergency laparotomy patients undergoing bowel resection. Notes were randomly generated over 6-months in 2008. Risk factors were assessed according to NICE Guidelines[1] and adherence to evidence based VTE protocols recorded.
Results and Discussion: High-risk patients were very common in both groups although there were significantly more high-risk patients in the elective group. Compliance with VTE prophylaxis guidelines in high-risk patients was better in the elective group. Most patients received pharmacological VTE prophylaxis. All patients received doses at safe intervals with respect to the timing of epidural procedures and subsequent doses post epidural. 8/89 (9%) of patients received the wrong dose of enoxaparin (20mg vs 40mg) suggesting that some clinicians were unaware of current guidelines.

VTE Risk factors

	Emergency Patients	Elective Patients
≥ 1 risk factors *	18/36 (50%)	41/53 (77%)
≥ 2 risk factors	4/36 (11%)	9/53 (17%)
Major surgery for cancer	11	36
Previous VTE	0	0
Obesity, BMI>30	4	11
Thrombophilia	7	3

(* $\chi 2$: $p<0.001$)

VTE Prophylaxis

	Emergency Patients	Elective Patients
Graduated compression stockings	13/18 (72%)	33/41 (80%)
Calf compressors intra-op & post op	15/18 (83%)	37/41 (90%)
Enoxaparin daily until discharged	10/18 (56%)	33/41 (80%)

Conclusion(s): Patients undergoing laparotomy for bowel resection represent a high-risk group for VTE. More elective patients were deemed to be high-risk however compliance with VTE guidelines was better in this group. The introduction of local VTE guidelines has ensured safe standards with respect to timing of pharmacological doses but some clinicians are unaware of the correct dose.
References:
1 Reducing the risk of VTE in Inpatients Undergoing Surgery. NICE Guidelines CG46. April 2007.
2 Regional anaesthesia in the anticoagulated patient: defining the risks. Second ASRA Consensus Conference on Neuraxial Anaesthesia and Anticoagulation, 2002.

1AP9-6

Colic surgery – A retrospective study

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Background and Goal of Study: Colic surgery is a major cause of morbidity in the post-operative period. In the literature, risk factors and anaesthetic techniques associated with complications are discussed. Goal: identify risk factors for perioperative morbidity in colic surgery and the relationship between anaesthetic technique and postoperative prognosis.
Materials and Methods: Retrospective analyses of elective colic surgery performed in last 2years. Exclusion criteria: emergency surgery, confection of a stoma and metastasis requiring extension of the resection. Considered complicated: hospitalizations more than 4days in laparoscopy and 7days in classic colectomy, unscheduled admission in ICU, need of re-admission/re-intervention or death in the first 30days postoperatively. Statistics: chi-square with continuity correction, $p<0,05$ significant. Performed a descriptive assessment of the complications.
Results and Discussion: 128patients, 23 to96 years, ASA I to IV, mean duration 236min. Characterization of population. Complications in 50% of patients: prolonged hospital stay-52, re-admission-10, re-intervention-17, unexpected ICU admissions-6, death-4. Incidence of complications in different age and ASA groups was not statistically different. No statistical significance between complications and analgesic technique (epidural or intravenous)p=0.077, type

of surgery p=0.430 and duration of procedure p=0.534. Relationship between the incidence of complications and anaesthetic techniques is close to statistical significance, which could be confirmed with the enlargement of the sample. Although no statistical relationship between the anaesthetic techniques and the incidence of complications is similar to recent studies, can also be explained by the onset of the fastrack program and by sample diversity.

Patients features

	Complicated	Non complicated
≤50, 51-74,≥75years	8,38,18	10,43,11
ASAI,II,III,IV	5,24,18,7	9,37,17,1
GA,GA+Epi.	33,31	24,40
Laparotomy,Laparoscopy	36,28	34,30
≤2,2-4,4-6,≥6 hours	6,29,20,9	8,32,24,0

Legend:GA:General anesthesia; AG+Epi. GA+Epidural analgesia

Conclusion(s): High incidence of complications is consistent with that described in literature. Bias: quality of postoperative analgesia and patient satisfaction were not analysed; variability of study population features. The aim is to achieve another year of study in order to clarify the results, increase the statistical reliability and allow a differential analysis of the groups studied.

1AP9-7

A general overview of xenon based anesthesia in routine use in 313 patients from the European database RegiXuser

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Background and Goal of Study: Since the end of 2007, Xenon (Xe) based anesthesia is allowed in Europe. An association was created by Xe users (RegiXuser) and was founded in March 08 to collect information about Xe in routine use.
Materials and Methods: Registered anesthesiologists fill a 2 side A4 form/case to report pre-operative conditions, surgical procedures types, anaesthesia administration mode and safety data observed in the per- and peri-operative regime. Full analyses is provided.
Results and Discussion: From March08 to Oct09 313 cases were included, 81% in Germany. 64% were ASA I/II patients. Median values[range] of age was 61yrs[18-97], BMI 26.2kg/m2[16.2-53.7]. Surgery: orthopaedic26,2%, visceral 22%, neurosurgery17%, cardiac/vascular 13%, plastic/reconstructive13%. **Patients history**: 41% APFEL-score >2, 58 %; any cardiovascular history: *54% treated hypertension, 24%* βblockers, 41% other drugs; 15.2%PONV; 12.5%NIDDM; *6% IDDM;* 11.2% COPD; 10.4% POCD. **Anesthetic procedure**: Xe inhalational anaesthesia, overall median length 210min[61-910], 45% 150-250min(cardiac,neuro,uro and plastic surg), 30%≤150min (orthopaedic and vascular), 25%>250min (reconstructive, visceral surg). Xe median target concentration was 60%(50% cardiovascular), associated with either remifentanil (72.2%), fentanyl (22.4%), sufentanil (2.9%). **Safety data: Per-op:** 30 cases of hypnotic add-on(14 for insufficient hypnosis, mainly in orthopaedic surg), 33 cases of adverse events (AE), only 18 anesth. related, and 3 serious events (SE) not anesth. related. **Post-op:** 200 patients had at least one event, 29 anaesthesia related: 17 nausea, 9 vomiting, 9 pain, 6 hypertension, 5 hypotension, 2 hyperglycemia,1 arrythmia, 1 sweating. Post op-pain: 114 pts, median VAS=2, [1-4] 66.4%, [5-7]17.2%, [>8] 16.4%). No post-op SAE was observed.
Discussion: From these data, in patients with ASA I-IV status the routine use of Xe didn't reveal safety issues. Per-op blood pressure and hypnosis must be analysed independently. Post op AEs seem less frequently than mentioned in the literature.
Conclusion(s): Xe based inhalational anesthesia is a new procedure. Anesthesiologist must consider the use of this agent not only as a change in hypnotic drugs but Xe may also be an improvement of their "routine" management of anesthesia and a change of their habits to consider hypnosis, haemodynamic stability, recovery and pain management.
Acknowledgements: French, Italian, Portugueses, and German anaethesiologists who fullfiled this database on their personal time.

1AP9-8

Perioperative anaesthesiological management in hyperthermic intraperitoneal chemotherapy (HIPEC): Our experience

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Background and Goal of Study: Surgical treatment of peritoneal carcinomatosis with HIPEC is a complex methodology which brings significant pathophysiological changes with important repercussion on coagulative, metabolic and hemodynamic systems. The aim of our study was to evaluate, through a retrospective analysis, these changes in order to improve the perioperative management of patients undergoing HIPEC. [/bold]
Materials and Methods: In the last 3 years we treated 40 patients, ASA II-III, for recurrent pelvic or digestive malignancies complicated by peritoneal carcinomatosis. Anaesthesia was induced with propofol and fentanyl and maintained with sevofluorane.15 patients received a thoracic epidural anaesthesia with ropivacaine 0.75%.The monitoring, both intra- and post-operatively in ICU, included: ECG, SaO2, IBP, CVP, esophageal T, ematochemical and emogasanalitical sampling, hydric balance.
Results and Discussion: Data (considered as mean and SD) were analyzed with ANOVA test. We evidenced:large intra-operative fluid turnover,with 72% of patients undergoing transfusion;during HIPEC with closed-abdomen, Paw and PVC increase,while SaO2 decreases as a result of increased abdominal pressure;HR, EtCO2 and the level of arterial lactate increase as a result of the increasing body temperature, with mild metabolic acidosis (p<0.05).We also noticed intraoperative emocoagulative parameters disorders,corrected with FFP in all the patients. The use of thoracic epidural anaesthesia, in 15 patients,reduced total consumption of opioids and the need of mechanical ventilation in PACU (p<0.05).
Conclusion(s): This study has highlighted two aspects binding the proper perioperative management: encouraging renal elimination of anticancer drugs,through an intensive hydro-electrolytic turnover, especially cisplatin,absorbed into the circulation during HIPEC,in order to prevent acute renal failure, cardiomyopathy,bone marrow toxicity and/or immunodeficiency from chemotherapy;re-establishing normovolemia optimal conditions through careful and prolonged monitoring,in particular regarding the protein component in both the colloid-osmotic and the blood coagulation and immunology sides.
Reference:
1 Schmid C et al.Anesthesia,2008,63,389-395.

1AP9-9

The influence of steep Trendelenburg position and CO_2 pneumoperitoneum on cardiovascular, cerebrovascular and respiratory homeostasis during robotic prostatectomy

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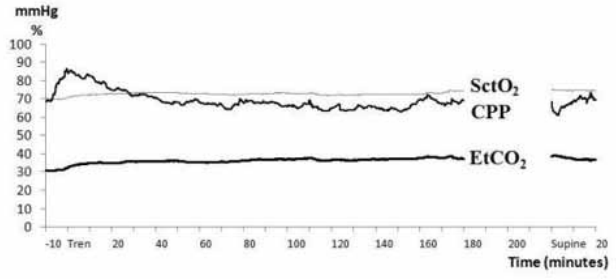
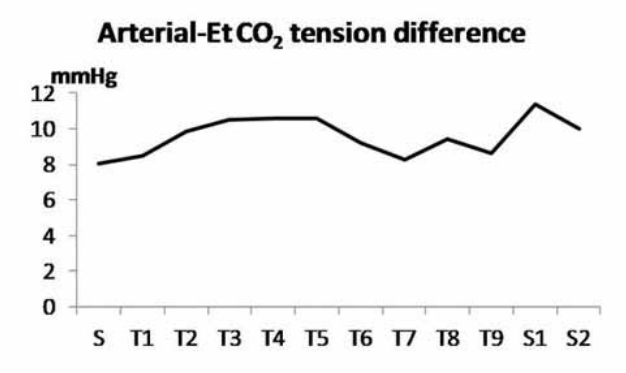
Background and Goal of Study: The steep (40 degrees) Trendelenburg position optimizes surgical exposure during robotic prostatectomy. The goal of the current study was to investigate the combined effect of this position and CO_2 pneumoperitoneum on cardiovascular, cerebrovascular and respiratory homeostasis during these procedures.
Materials and Methods: Physiologic data were recorded during the whole operative procedure in 31 consecutive patients who underwent robotic endoscopic radical prostatectomy under general anaesthesia. Monitoring included HR, MAP, CVP, SaO_2, $EtCO_2$. Arterial blood samples were taken at 30 minute intervals to determine the Arterial-to-End-Tidal CO_2 gradient. Continuous regional cerebral tissue oxygen saturation ($SctO_2$) was determined by near-infrared spectroscopy.
Results and Discussion: While patients were in the Trendelenburg position, all investigated parameters remained within a clinically acceptable range. The Cerebral Perfusion Pressure decreased from 77 mmHg at baseline to 71 mmHg (p=0.07), and $SctO_2$ increased from 70 % to 73 % (p<0.001). Figure 1 shows the evolution of the average values in 31 patients. There were 178 paired $EtCO_2$-$PaCO_2$ values. The $EtCO_2$ increased from 31 mmHg to 36 mmHg (p<0.001) and the arterial-to-$EtCO_2$ tension difference increased from 8.0 mmHg in the normal position to a maximum of 10.6 mmHg (p<0.001) after two hours in the Trendelenburg position.



Conclusion(s): The combination of prolonged steep Trendelenburg position and CO_2-pneumoperitoneum was well tolerated by the patients. Hemodynamic and pulmonary parameters remained within safe limits. $SctO_2$ remained well

above the safe threshold value of 55% in each patient. The cerebral perfusion pressure remained within the limits between which cerebral blood flow is usually considered to be maintained by cerebral autoregulation. Maintaining an $EtCO_2$ between 30-35 mmHg will result in a $PaCO_2$ between 35-45 mmHg.



1AP9-10

The prognostic value of biomarkers for acute kidney injury after major surgery

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Background and Goal of Study: Intraoperative renal dysfunction is a risk factor for morbidity and mortality after major surgery [1]. Urine α1-microglobulin, β2- microglobulin and albumin are considered sensitive and specific biomarkers for acute kidney injury (AKI) [2]. The aim of the present study was to evaluate the prognostic value of serum creatinine and cystatin C as well as urine α1-microglobulin, β2- microglobulin and albumin for AKI after major surgery.

Materials and Methods: Forty four patients, ASA I-IV, 47-83 years of age, undergoing major abdominal surgery (open aortic repair, colorectal resection, hepatectomy, gastrectomy) were studied. Patients with preoperative renal failure, thyroid disorder or receiving corticosteroids were excluded from the study. Acute kidney injury was defined as >25% decrease of preoperative Glomerural filtration rate (GFR) in the first postoperative day (RIFLE classification). GFR was estimated using the simplified version of Modification of the Diet in Renal Disease formula [3]. Blood samples were collected preoperatively, in the recovery room and the first postoperative day, for measurements of creatinine and cystatin C. Urine samples were collected concurrently to measure α1-microglobulin, β2- microglobulin and albumin.

Results and Discussion: Eight patients developed AKI in the first postoperative day. A receiver operator characteristic curve analysis showed 76% sensitivity and 76% specificity of the ratio urine albumin to serum creatinine to predict AKI in the first postoperative day (AUC = 0.76, p = 0.02, cut off value > 18.14). For the remaining urine biomarkers, a tenfold increase was found on the first postoperative day without significant differences between the patients with or without AKI.

Conclusion(s): The present study showed that urine albumin to serum creatinine ratio is a sensitive and specific marker of renal dysfunction in the early postoperative period. In contrast, urine α1-microglobulin and β2- microglobulin are sensitive, but not specific biomarkers of postoperative AKI.

References:

1 Mahon P, Shorten G. Current Opinion in Anaesthesiology 2006; 19:332–338.
2 Waikar SS, Bonventre JV. Current Opinion in Nephrology and Hypertension 2007;16:557-564.
3 Levey AS, Bosch JP, Lewis JB, *et al. Annals of Internal Medicine* 1999; 130(6): 461-470.

1AP9-11

CO2 homeostasis during surrenectomy: Retroperitoneoscopic versus transperitoneal approach

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Background and Goal of Study: Previous studies demonstrated that the absorption of CO2 during retroperitoneoscopy surgery (RPS) may be greater than that in trans peritoneal laparoscopy (TP). Moreover, as far we know, there are not in literature studies that address the time necessary to return to baseline values of CO2 output and PaCO2 after the load of CO2 in these surgical procedures. The aim of the present study was to evaluate CO2 homeostasis of patients undergoing RPS (group I) and transperitoneal surrenectomy (group II).

Materials and Methods: After Ethical committee approval and written informed consent were obtained, 30 patients scheduled for elective unilateral surrenectomy were enrolled and allocated in two groups (RPS 18 pts and TL 12 pts) according to surgical indications. The two groups of patients were similar with respect to age, body weight and length of anesthesia. All patients were given the same anesthetic regimen and monitoring; mechanical ventilation was adjusted in order to achieve an ETCO2 between 35 and 40 mmHg. Data were continuosly collected during surgery, and were presented at standard times : -1) after tracheal intubation;0) at beginning of pneumoperitoneum;1)at maximum CO2 output; 2)10 min after desufflation; 3)20 min after desufflation; 4)30 min after desufflation; 5) just before extubation. Results were analyzed by two way ANOVA for repeated measurements.

Results and Discussion: Data are shown in tab. No patient developed uncontrolled hypercapnia and acidosis during surgery. As far as intraoperative pulmonary gas exchange, we observed a progressive increase in PaCO2 during surgery in both groups; however group I patients (RPS) achieved higher values of PaCO2 than group II (TP) ones in spite of a more intense mechanical ventilation. Oxygenation indexes were satisfactory in both groups. In addition, CO2 output (VCO2)declines more slowly in RPS procedures. * p<0.05 compared to time -1); VM and VCO2 are considered equal to 100% at time -1).

times	type	PaCO2	SD	%VCO2	SD
-1	TP	33	3.5	100	
-1	RPS	31	1.6	100	
0	TP	35	4	104	25
0	RPS	34	1.7	114	11
1	TP	35	3.5	109	21
1	RPS	46*	1.5	190*	9.7
2	TP	36	4.9	99.5	26.1
2	RPS	43*	1.8	186*	11.6
3	TP	41	2.9	110	6.4
3	RPS	42*	4.9	147*	24.5
4	TP	40	2.2	105	8.1
4	RPS	38	4	159*	20.2
5	TP	39	3.1	103	5.1
5	RPS	38	2.7	113	4.9

Conclusion(s): In RPS procedures mechanical ventilation should be continued at least for 20 minutes beyond desufflation in order to control postoperative hypercapnia.

1AP10-3

Comparison of different rapid sequence induction protocols in isolated systolic hypertensive patients

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Background and Goal of Study: Hypertensive patients are at risk for increased hemodynamic responses to intubation, particularly in rapid-sequence induction. This study was designed to determine the effects of four different anesthesia induction protocols on hemodynamic response to laringoscopy and tracheal intubation during rapid-sequence induction in patients with isolated systolic hypertension.

Materials and Methods: 120 systolic hypertensive patients (ASA II-III) were enrolled in this randomised, double-blind study. Patients were allocated into four groups: Group TL received thiopenthal-lidocaine, Group TR received thiopenthal-remifentanil, Group PL received propofol-lidocaine, and Group PR received propofol-remifentanil. Succinylcholine was used as muscle relaxant. After preoxygenation, boluses of 1 mg/kg lidocaine to the Groups TL and PL, and 1 µg/kg remifentanil to the Groups TR and PR were injected, in 30 seconds. Subsequently, anesthesia induction was performed by using 5 mg/kg thiopental in the Groups TL and TR, likewise 2 mg/kg propofol in the Groups PL and PR. After 1 mg/kg succinylcholine injection, patients were intubated at the end of 60 seconds. Intubation scores were noted. Hemodynamic data were obtained at the baseline level, before induction, at intubation, at the first, 3rd, 5th and 10th minutes after intubation.

Results and Discussion: There were no differences between groups in patient characteristics and in intubation scores. 1 minute after intubation, systolic (125 mmHg±27 in Group PR, 153 mmHg±35 in Group TR, p<0.01) and mean (87 mmHg±18 in Group PR, 105 mmHg±25 in Group TR, p<0.05) blood pressure measurements were significantly lower in Group PR compared to Group TR; likewise seen in the measurements of diastolic blood pressure for these two groups at intubation (72 mmHg±17 in Group PR, 88 mmHg±22 in Group TR, p<0.01). At intubation, and in all the following 10 minutes after intubation, the mean heart rate did not exceed the baseline value in Group PR. In both groups, which remifentanil was used as an adjunct, systolic, diastolic, and mean blood pressures were lower at intubation, and 1 minute after intubation, compared with the groups inwhich lidocain was used as an adjunct.

Conclusion(s): Remifentanil is a better adjunct for the attenuation of the response to laringoscopy and intubation compared to lidocaine, whereas propofol-remifentanil combination appears to be more beneficial in terms of hemodynamic stability, during rapid-sequence induction in systolic hypertensive patients.

1AP10-4

Effects of parapharyngeal tampon usage on postoperative nausea, vomiting and sore throat in patients undergoing nasal surgery

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Background and Goal of Study: Nausea, vomiting and sore throat are common postoperative complaints in patients undergoing nasal surgery. In this study we aimed to analyze effects of using different kinds of parapharyngeal tampons on these complications.

Materials and Methods: We analyzed findings of 75 patients (27 female, aged; 33.2 ± 12.5 yrs). All patients have received general anesthesia for nasal surgery procedures. Duration under general anesthesia and intraoperative period were recorded for all patients. Hemodynamic findings (systolic and diastolic blood pressures, heart rate) during induction, intubation, intraoperative and anesthesia termination periods were recorded. All patients were inquired for presence of nausea, vomiting and sore throat complaints at postoperative tenth minute and first, second, fourth, sixth, twelfth and twentyfourth hours. Also a visual analog scale (VAS) scoring was acquired during each inquiry. Patient groups were as follows; no parapharyngeal tampon (group I, n:15), dry tampon (group II, n:15), tampon with chlorhexidine (group III, n:15), tampon with 0.9% NaCl (group IV, n: 15) and tampon with lidocaine (group V, n:15).

Results and Discussion: Comparison of groups with history for usage of any kind of tampons (groups II-V) with group I revealed that patients in group I had higher VAS scores at twelfth and twentyfourth hours (p<.05). These patients also had more frequent sore throat complaint compared to others (38.9% vs 16%, p<.05). Comparison of all groups with each other revealed that patients in group IV (tampon with 0.9% NaCl) had more frequent nausea and vomiting complaints (p<.05) while sore throat was more common in group II (dry tampon, p<.0001). VAS scores were also higher in group II patients, especially in early postoperative period (first and second hours, p<.01). However in late postoperative period (twelfth and twentyfourth hours) group I patients (no tampon) had significantly higher VAS scores (p<.05).

Conclusion(s): So we found that; not using any or using dry parapharyngeal tampons during nasal surgery procedures are associated with more frequent sore throat complaints especially in late postoperative period. On the otherhand using tampons doused with NaCl might cause nausea and vomiting in postoperative period. As a conclusion we think that using tampons doused with chlorhexidine or lidocaine during nasal surgery procedures are advantageous and safe options with less side effects and postoperative complaints.

1AP10-5

Anesthesia management for hepatic resection: Combined versus general anesthesia

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Background and Goal of Study: Hepatic resection is often the treatment for benign and malignant primary hepato-biliary tumors, as well as for colorectal hepatic metastases without evidence of more distant spread, the latter remaining the commonest indication for liver resection. Various anesthetic strategies have been adopted and still remain a challenge to the anesthesiologist. The purpose of this study is to determine if there is difference in the number of transfusions; length of hospital stay; mortality and medical complications between two different anesthetic management techniques (general vs combined general-epidural anesthesia) for hepatic surgery.

Materials and Methods: This was a retrospective study which included all patients submitted to hepatic surgery in our hospital between January and December 2008. These patients were divided in 2 groups according to the anesthetic technique: group general anesthesia (GA) and group combined anesthesia (CA). The GA group was submitted to a standard general anesthesia involving tracheal intubation and controlled ventilation. In the CA group an epidural catheter (lombar or thoracic) was placed just before induction or immediately after the induction of general anesthesia, according to the p**references** of the attending anesthesiologist. Statistical analysis was performed using SPSS® 17.0 software package. Numerical data are presented as mean and standard deviation, Fisher and two-sample Student t-test were used to group comparisons of the appropriate variables.

Results and Discussion: In the study period of one year 2008;98 patients underwent hepatic surgery, 60 patients were submitted to GA and 38 to CA. The groups were similar in relation to age 66,4 (std-d. +/- 12,7) and total time of vascular occlusion 10,3 min (std-d. +/- 13,9). There was no significant difference in relation between anesthetic management and the number of transfusions (p<0,69); length of hospital stay (p<0.9); mortality (p<0,24) and medical complications (p<0,236).

Conclusion(s): Concerning to the outcomes we proposed to study we didn´t found differences between the two anesthetic techniques. We propose ourselves in the future year to study the relation between postoperative pain and anesthetic management for this surgery.

1AP10-6

Phaeochromocytoma: Operating time schedule and “fast track post anaesthesia care unit” (PACU)

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Background and Goal of Study: There is no data in the litterature on the duration in the PACU for patients scheduled for phaeochromocytoma.

Materials and Methods: Data from a cohort of 20 consecutive patients operated on phaeochromocytoma were analyzed. Patients were divided into two consecutive groups for comparison (p<0.05) : G1, last 10 patients and G2, previous 10 patients.

Results and Discussion: Before surgery, 18 out of 20 patients received anti hypertensive drugs. Remifentanil/isoflurane plus invasive radial artery and pulmonary artery catheter (n=18) monitoring were used in all the patients(1). Except for 2 items the 2 groups were similar. There was no difference (mean (SD)) for age: 59(20) years, size of the tumor : 3,9(2) cm, per and post operative cardiovascular drugs, fluid infusion : 2.4(0.7)L, cardiovascular profile (T0-Tend), time to tumor resection : 97(52) min, duration of surgery : 138(64) min, tracheal extubation : 14 immediate and 6 in the POCU after 74(35)min, postoperative complications, and time to discharge from hospital(median) : 6.5 days. Before tumor resection cardiovascular drugs consisted of : nicardipine 6.5(6.4) mg, esmolol 31(90) mg in respectively 16 and 6 patients, but also norepinephrine NE 12(25)µg in 7patients. After resection NE was useful, 201(603)µg in 9 patients; it was prolonged in the PACU in 3 of them. Two patients requested again nicardipine at H 4 and H 12. Post operative complications were hypoglycemia detection in 6 patients, either immediately or until H11. After a caesarian section, hypoglycemia lasted until day 4. Others complications(n=3) were non specific and just one patient with pulmonary embolism on day 3 needed to be transferred to ICU. The only 2 items which differed significantly between G1 and G2 were : 1) arrival in operating room : G1, median 8h(25-75% : 8-8) and G2, median 11h(8.2-12)(p:0.003), and 2) the PACU length of stay which was reduced to 391(265) min in G1 vs 1015(673)min in G2 (p:0.02). The correlation is significant between both items (R spearman : 0.67; p:0.014).

Conclusion(s): For phaeochromocytoma surgery early schedule in the operating room, in addition to remifentanil, allowed to safely divide by 2.6 the length of stay in PACU. Specific postoperative hypoglycemia remains however to be detected and treated (2).

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1AP10-7

The influence of the initial type hemodynamics on the flow of anesthesia and development of complications in patients with concomitant cardiovascular diseases

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Background and Goal of Study: To compare the flow of anesthesia and postoperative period in patients with concomitant cardiovascular diseases, depending on the initial type of hemodynamics.

Materials and Methods: 93 patients at the aged 30 – 80 years have been operated on for gastrointestinal diseases. 53 patients had concomitant ischemic heart disease (IHD), 27 – arterial hypertension (AH), 13 – a combination of IHD and AH. The status corresponded to II-III class on ASA. Depending on the initial type hemodynamics the patients were divided into groups: the I (n = 51) – CI 2,5 l/min/m2 and below and TPVR 1500 dyne × c × cm5 and above; the II (n = 42) – CI above 2,5 l/min/m2 and TPVR below 1500 dyne × c × cm5. Premedication: diazepam – 0.14 mg/kg and atropine 0.01 mg/kg. The operations were performed under the total intravenous anesthesia (TIA, n = 29 – diazepam, ketamine, fentanyl), or under the combination of TIA with epidural blockade (EB) 0.5% ropivacaine (n = 21) or under inhalation anesthesia sevofluranom or izofluranom supplemented by fentanyl, (n = 26), or under the combination of inhaled anesthetics with EB (n = 17). Length of the operations – from 5 to 14 hours.

Results and Discussion: During the operation the patients of the I group haved an increase of the CI and decrease of the TPVR, although under the TVA, high indices of TPVR preserved, which points to the preservation of the tension in the

compensatory-adaptive mechanisms. These were not significant hemodynamic changes in the II group (the Friedman,s criterion). 19 patients from the I group and 14 of the II for maintain hemodynamics received infusion of inotropes. In the I and II groups hemodynamic differences between patients were significant (the Kruskal-Uolisa,s criterion). Low levels of hemodynamics led to an increase in the length of hospitalization (from 6 to 36 days – the I group, and from 7 to 23 days-the II group) and the number of postoperative complications. Only in the I group these were one death and the development of cardiac complications (3.5% of cases). In the II group did not observe deaths and cardiovascular complications. The development of other postoperative noncardiac complications in the I and in the II groups were 26 and 15% respectively. The frequency of postoperative complications did not depend on the type of anesthesia.

Conclusion(s): Thus, the development of complications during surgery and in the early postoperative period, and the length of hospitalization depend on the initial type hemodynamic and not the type of anesthesia.

1AP10-8

The effect of preoperative aprepitant on postoperative nausea and vomiting in patients undergoing laparoscopic hysterectomy

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Background and Goal of Study: Laparoscopic gynecologic surgery has a high incidence of postoperative nausea and vomiting (PONV). We conducted a prospective, randomized, double blinded, placebo-controlled study to determine the complete response effects of aprepitant for preventing PONV in patients undergoing laparoscopic hysterectomy.

Materials and Methods: 123 females aged 21-60 yr were allocated randomly to receive normal saline(control) or aprepitant 80mg(A80), 125mg (A125) p.o at 2h before induction. Patients with severe liver disease, neurologic, active pulmonary disease, and cardiac arrhythmia were excluded. Anesthesia was maintained with isoflurane, rocuronium and O_2/air (FiO_2 0.5). Episodes of PONV (nausea, retching, and vomiting) and/or use of rescue therapy were recorded. Efficacy was assessed at 0-48 h (at 0,1, 2,6,24 and 48h) after surgery. Complete response is defined as no vomiting, no nausea, no rescue.

Results and Discussion: 2h complete response was significantly higher in A80, A125 than in the control (83% in A80 and A125, 58% in control). The incidence of no vomiting (0-24h) was higher only with aprepitant 80mg (83%) versus with aprepitant 125mg (65%) and control (54%).

[table1] Baseline characteristics

	Control	A80
Age(yr)	46(6)	46(5)
Weight(kg)	59(8)	58(9)
Height(cm)	156(6)	157(4)
PONV history	0	1
History of smoking	3	2
History of emesis	2	3
Operation time(min)	102(54)	102(33)
Anesthesia time(min)	126(53)	123(37)
Awakening time(min)	6(3)	6(3)
PACU score	10(0)	10(0)

Values are expressed as mean(SD) or number of patients. There were no significant differences between groups.

[table2]Percent of complete response and proportion of no vomiting

group	Control	A80	A125
CR0	28(65)	31(78)	33(83)
CR1	25(58)	29(73)	28(70)
CR2	25(58)	33(83)†	33(83)†
CR6	28(65)	27(68)	34(85)
CR24	37(86)	32(80)	33(83)
CR48	42(98)	38(95)	37(93)
No vomiting24	23(54)	33(83)†	26(65)

Values are expressed as number of patients (%). CR0: complete response(CR) of PACU 1 min, CR1: CR of postoperative 1hr CR2: CR of postoperative 2hr CR6: CR of postoperative 6hr CR24: CR of POD 1 CR48: CR of POD 2, No vomiting 24: no vomiting 0-24h after surgery, †P < 0.05, compared with control group.

Conclusion(s): Preoperative aprepitants were effective at preventing PONV during the first 2h after surgery in female undergoing laparoscopic hysterectomy with isoflurane without N_2O.

1AP10-9

Improving patient care in a regional hospital – Multimodal rehabilitation programs in colorectal surgery

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Background and Goal of Study: Major surgery induces metabolic, neuroendocrine and inflammatory stress, leading to increased postoperative complications, organic dysfunction and long hospital stay. In July 2009 we started a multi-modal rehabilitation approach [Fast-Track (FT)] to patients undergoing colorectal surgery, aiming improved outcome. Our goal was to implement evidence based clinical practices and enhance postoperative recovery for patients undergoing major colorectal surgery. We describe a case series of patients submitted to major colorectal surgery under FT approach.

Materials and Methods: A perioperative FT management protocol, involving both Anesthesiology and Surgery Departments, was created and applied. Postoperative period was assessed concerning: pain score [Numeric Rating Scale (NRS) 0-10]; sustained stable hemodynamic status (less than 20% variation of admission values); day of first food intake; duration of hospital stay; existence of perioperative complications and need for Hospital readmission.

Results and Discussion: Sixteen patients [mean age 65,0 (ranging 44-85 years) years; female/male: 10/6; ASA I-III) underwent major colorectal procedures and FT management over a four month period. On surgery day, 43.8% of the patients were able to take liquids orally and 50% presented sustained hemodynamic stability; postoperative pain was rated mild (NRS 0-3) on 62.5% of the patients and moderate (NRS 4-6) on 37.5%. Two days after surgery, 81.3% of the patients were able to take enteral nutrition. By day 3, 98.8% of the patients showed stable hemodynamic status. Four days after surgery 93.8% of the patients referred mild postoperative pain. Six patients (37.5%) had postoperative complications [Surgical (N=4) or Medical cause (N=2)]. Patients were discharged from hospital 9.8 (ranging 3-25 days) days after surgery, with 62.5% being discharged in the first week. One patient was readmitted 40 days after discharge for treatment of a subphrenic abscess.

Conclusion(s): In our Hospital, FT rehabilitation program for colorectal surgery was feasible, concerning adequate pain management, early enteral intake and discharge. Further research is needed to establish outcome in our population.

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1AP10-10

Effects of inhalation anaesthesia with sevoflurane on cytokine response in patients submitted to othorhinolaryngological surgery

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Background and Goal of Study: Patients have stress when submitted to anaesthesia and surgery, characterized by inflammatory response because of the surgery trauma[1], and possibly due to the anaesthetics[2]. The study aimed to evaluate the effects of anaesthesia with sevoflurane (sevo) and surgery on inflammatory cytokines response.

Materials and Methods: The Ethical Committee of the Institution approved the protocol used in the study. This prospective study included ten ASA I patients scheduled for tympanoplasty or septoplasty anaesthetized with sevo at maintenance inspiratory concentrations of 1-1.5 MAC. Blood samples were drawn at 4 moments: before induction of anaesthesia (T1), before surgery (T2), at 120 minutes after anaesthesia induction (T3), and on the postoperative first day (T4). The study also included 15 healthy volunteers, not submitted to anaesthesia and surgery, as controls to T1. Pro-inflammatory interleukins IL-1, -6, -8, -12, and tumoral necrosis factor α (TNFα) and anti-inflammatory cytokine IL-10 were assessed in plasma from patients and volunteers by flow cytometry. All patients and volunteers answered a detailed questionnaire and signed the informed consent.

Results and Discussion: Haemodynamic data did not differ among moments (p>0,05). No statistically significant differences were observed for the levels of all evaluated cytokines at T1, between control group and the patients (p>0,05). These results support the hipotesis that patients have no cytokine elevation due to psycological stress waiting for the surgery. In the patient group there were no statistically significant differences among the moments, for each of the evalueted cytokines (p>0,05). These findings should be explained by the small n.

Conclusion(s): Sevoflurane appears to cause no elevation of pro-inflammatory response per se.

References:

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1AP10-11

CO2 absorption during transanal endoscopic microsurgery (TEM)

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Background and Goal of Study: The Trans-anal Endoscopic Microsurgery (TEM) is a minimally invasive technique for selected rectal tumours treatment. It is associated with low morbi-mortality rate. The aim of the study is stablishing if rectal CO2 insufflation produce C02 absorption, related to patients' position, anal margins tumour distance and pneumorectus quality. CO2 absorption may produce hypercapnia and respiratory acidosis and occasionally respiratory insufficiency and respiratory arrest.

Materials and Methods: This is a prospective descriptive study. We include 100 patients undergoing TEM under general anaesthesia, from April 2005 to October 2009. Before C02 rectal insufflation, patients were ventilated to achieve EtCO2 28-30 mmHg with Fi02 50%. Ventilatory parameters were not changed along surgery. We worked with pneumorectus pressures of 12 mmHg and registered basal EtCO2 before starting pneumorectus and posteriorly every 15 minutes, just surgery's end. We defined CO2 absorption when EtCO2 was increased 10% from the basal level. Statistical test: chi square.

Results and Discussion: Demographic data: middle age 69.4 (range 29-85); sex M/F: 66/34: ASA: I 16, II 44, III 41, IV 9; position: prone 41, supine 30, lateral 29. 32% presented CO2 absorption, no one with clinical manifestation. 78% of the patients presented increased EtCO2 at 30 min since pneumorectus started. Relationship between patients' position and CO2 absorption was statistically significant, with p=0.0012. Relationship between tumour localization and CO2 absorption and relationship between pneumorectus quality and CO2 absorption were not statistically significant.

Patient's position/ CO2 absorption

POSITION	ABSORPTION YES	ABSORPTION NO
PRONE	5 (12%)	36(88%)
SUPINE	12 (40%)	18(60%)
LATERAL	15 (52%)	14(48%)

p=0.0012

Pneumorectus quality and tumours' distance/ CO2 absorption

PNEUMORECTUS QUALITY	ABSORPTION YES	ABSORPTION NO
Good	28 (39%)	44 (61%)
Regular	3 (17%)	15 (83%)
Bad	1 (13%)	7 (87%)
TUMOURS DISTANCE		
> 10 cm	27 (35%)	49 (65%)
< 10 cm	5 (21%)	19 (79%)

p > 0.05 both

Conclusion(s): A significant percentage of patients presented CO2 absorption, but there were not clinically significant in our study. Prone is the position less associated with CO2 absorption (in a statistically significant way).

Ambulatory Anaesthesia

2AP1-2

Continuous popliteal block at home: A postoperative analgesia protocol for outpatient foot surgery patients

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Background and Goal of Study: Postoperative analgesia after single-shot nerve blocks is limited in time and its benefits lost after resolution. Continuous regional analgesia (CRA) represents a way to prolong them, even in outpatient settings. Aim of the study is to evaluate a CRA protocol for outpatient foot surgery.

Materials and Methods: Following ethical approval, we retrospectively evaluated a continuous cohort of 30 patients undergoing outpatient percutaneous allux valgus correction. In all cases an ultrasound (US) guided popliteal block was performed with the same technique: the sciatic nerve was identified with a 12 Mhz linear probe at the popliteal fossa. A bolus of mepivacaine 1.5% was injected through a 5 cm block needle and local anaesthetic spread observed; a perineural catheter was than positioned in close proximity of the nerve. After surgery, an elastomeric pump (Easy-pump, Braun, Germany) with ropivacaine 0.15% 250 ml (infusion rate 5 ml/h) was connected to the catheter and patients discharged to the outpatient clinic. Analgesia with diclofenac 50 mg po td was prescribed. All patients were followed by phone daily and visual analogue scale (VAS), Bromage score and complications recorded. If at the end of infusion pain was still significant (VAS>4), patients were readmitted to have their pump refilled; if VAS <5, they were instructed to remove catheters. Data are presented as means ± standard deviations.

Results and Discussion: A total of 30 patients were studied (22 females/8 males, age 54.5±15.8 years, ASA 1-2). They all underwent US guided popliteal block with mepivacaine (volume 20±5 ml), followed by ropivacaine infusion. At the end of the first infusion (50 hours long), in 15 cases VAS was still >4, requiring a second treatment, 2 patients asking for a further prolongation (overall lenght 4.1±1.6 days). Pain was well controlled both intra- and post-operatively (VAS in PACU: 0.0±0.0, VAS on day 2: 1.1±1.8, VAS on day 3: 1.2±2.0, VAS on day 4: 1.4±1.8). Motor block of the ankle was complete in PACU in all cases and faded in all but 7 patients by day 2. PACU lenght of stay was zeroed. 2 complications occurred: one catheter dislodgement, requiring repositioning and one insertion point infection. No accidental falls were referred. All patients would have asked for the same treatment again.

Conclusion(s): Continuous popliteal block provided optimal outpatient CRA. The precise US catheter positioning allowed a very safe low-dose infusion regimen, with minimal motor block. The complications rate was low and the satisfaction very high.

2AP1-3

Plain articaine 60 mg or plain 2-chloroprocaine 40 mg for spinal anaesthesia in day-case knee arthroscopy

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Background and Goal of Study: Both articaine (A) and 2-chloroprocaine (C) are presently being considered as short-acting spinal anaesthetics (1, 2). These two drugs, however, have not been previously compared in an ambulatory surgery setting. Based on earlier studies and experiences, we hypothesised that spinal A 60 mg and C 40 mg do not differ in block onset, maximal spread, and recovery.

Materials and Methods: This randomised, double-blind study had Ethics Committee and National Agency for Medicines approval. Adult patients (≤65 years, ASA I-II, BMI<36) underwent day-case knee arthroscopy under spinal anaesthesia accomplished by either 60 mg plain A (40 mg/ml) (group A60; n=39) or 40 mg plain C (20 mg/ml) (group C40; n=40). Study parameters included onset, degree, and regression of both sensory (pin-prick) and motor (modified Bromage scale) block. Standardised interviews by telephone on day 1 and 7 aimed at detecting possible transient neurologic symptoms (TNS).

Results and Discussion: The groups were comparable regarding demographic data, onset (e.g., time needed to reach dermatome L1, Table) and maximal spread of spinal anaesthesia, and duration of surgery. All arthroscopies could be performed successfully under spinal anaesthesia except in one patient (C40, unforeseen delay in the start of surgery). Occasionally, small supplementary doses of fentanyl i.v. (50-150 µg) (A60 x1, C40 x3) and propofol i.v. (50 mg, C40 x1) were given during surgery. The duration of sensory block ≥ dermatome L1 was significantly longer in A60 *vs.* C40 and, similarly, complete recovery from both motor and sensory block was significantly slower in A60 *vs.* C40 (Table). Patients from A60 were discharged home later as compared to Group C40 (p<0.0003, t-test). No TNS were noticed.

	Group A60	Group C40
Sensory block ≥ dermatome L1 achieved after (min)	4 (2/6)	6 (2/8)
Duration sensory block ≥ dermatome L1 (min) *	71 (55/86)	55 (39/66)
Complete recovery from motor block (min) *	135 (105/150)	75 (60/90)
Complete recovery from sensory block (min) *	165 (135/180)	105 (105/135)

Data are median (25th/75th percentiles). *π<0.001, MW-Y test.

Conclusion(s): Both A60 and C40 provided rapid onset spinal anaesthesia lasting for about one hour and allowing day-case knee arthroscopy. Recovery, however, was clearly faster with C40. The data support earlier findings that TNS are no, or at the most a very rare problem with articaine and 2-chloroprocaine.

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2AP1-4

A technically simple and effective face tent improves oxygenation and prevents severe O_2 desaturation in deeply sedated patients during retrobulbar block at no additional health cost

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Background and Goal of Study: Patients undergoing vitrectomy or scleral buckle receive deep iv sedation and O_2 via nasal cannula (NC) during retrobulbar block. O_2 desaturation (Desat) may occur while the needle is in place. A plastic sheet has been shown to convert a NC to a face tent at no cost[1-2]. It improves oxygenation in deeply sedated patients during upper endoscopy[2]. It has been used in "Eye Room". We wish to confirm its effectiveness in improving oxygenation while ascertaining FiO_2.

Materials and Methods: This retrospective review of patients undergoing vitrectomy or scleral buckle identified 2 groups. NC (n=66) patients received NC O_2 and FT (n=63) received NC O_2 and a plastic sheet covering the nose and mouth[1]. It was removed after the block. After pre-oxygenation (3-5 l/min), patients received iv propofol to achieve deep sedation for the block. Data collected included age, weight, height, O_2 saturation (Sat), the amount of propofol and O_2/CO_2 levels. Student 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: There were no differences in age (NC: 66±15; FT: 69±14 yrs), BMI (NC: 27.1±5.3; FT: 27.4±4.8), ASA Status (NC: 2.1±0.7; FT: 2.2±0.7), room air O_2 Sat, $ETCO_2$ and need for assisted ventilation. There were differences in O_2 Sat 5 min after O_2, highest O_2 flow, lowest O_2 Sat and severe Desat. Despite receiving higher amount of propofol and lower O_2 flow than NC group, sedation had less depressive effects on oxygenation in FT patients. FT (n=38) had higher FiO_2 (NC: 23±1; FT: 50±14%) and FeO_2 (NC: 45±17; FT: 74±16%) with a lower O_2 flow than NC (n=7) and rebreathed a small amount of CO_2.(NC: 0±0 mmHg; FT: 7±5)

Conclusion(s): Data show that a plastic sheet converts a NC to a face tent that increases O_2 delivery without increasing flow or cost. It improves oxygenation and prevents severe desaturation during retrobulbar block.

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2AP1-5

Single-shot interscalene injection and intravenous analgesic perfusion with elastomeric pump for 48 hours as an alternative to interscalene elastomeric pump with 0.2% ropivacaine in ambulatory shoulder arthroscopy

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Background and Goal of Study: Home analgesia after arthroscopy of the shoulder is a challenge, which we solve with interscalene catheters and a perfusion of 0.2% ropivacaine during the first 48 hours. The rate of failures with this technique, although small (9%), leads to the failure of pain control which is difficult to resolve when the patient is already home. To control this pain we introduced intravenous analgesic perfusion.

Materials and Methods: 52 patients were divided into two groups: Group I: n=38 interscalene nerve block with catheter for continuous perfusion of ropivacaine 0.2% 5ml/h for 48 hours and Group II: single-shot interscalene injection and postoperative continuous intravenous perfusion with Dexketoprofen Trometamol 300mg, Metamizole 1200mg and Ranitidine 3000 mg dissolved in saline at a rate of 5ml/h, for 48 hours. A verbal score was taken on entering PACU, after 24h, 48h, 72h and 7 days.

Results and Discussion: Mean stay in PACU was 67 min, time until oral tolerance was 82 min, time until discharge was 248 ± 62 minutes. There were no statistically significant differences between the 2 groups at any of the timelines studied. The analgesic requirements in PACU were significantly higher in group II. Mean scores for postoperative pain were lower in patients receiving the interescalene pump compared to those receiving intravenous perfusion, at all the time points studied, although this was not significant. Rescue analgesia consumption was the same in both groups. In group II, there was one phlebitis.

Conclusion(s): Postoperative analgesia with an elastomeric pump and continuous perfusion with Ropivacaine 0.2% for 48hours is still the preferred technique in our unit. Endovenous analgesic perfusion is an effective alternative and accepted by patients when the continuous interscalene block is not very effective.

2AP1-6

Recovery discharge criteria after spinal anesthesia with articaine in day care surgery

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Background and Goal of Study: Orthostatic hypotension as a recovery discharge criteria after establishing the height of the sensory block is safe(1). In fast track surgery timely discharge is essential for hospital logistics and patient comfort. Current practice is to discharge patients upon return of motor function. Premature discharge may lead to circulatory complications. We have observed the presence of orthostatic hypotension in time-relation to the return of motor function after spinal anesthesia with hyperbaric articaine.

Materials and Methods: 59 ASA I-II patients in daycare surgery who received spinal anesthesia with hyperbaric articaine 5% were included. Dosing was left to the anesthesiologist. Upon arrival in the recovery ward haemodynamics were monitored and sensory block was evaluated using cold sensation. When the sensory block was below level T5, patients were placed in a sitting position for 5 min and blood pressure and pulse were noted each minute. This was repeated every 15 min until motor function recovered at L5/S1. Orthostatic hypotension was defined as a 10% drop in blood pressure with subjective symptoms.

Results and Discussion: The mean dose of articaine was 75.1 mg (SD10.6). Mean duration of surgery was 34.3 min (SD10.2). Upon arrival in the recovery ward median sensory block height was T7 (SD3.2). 19 (32%) patients had a sensory block above T6. After 21.7 minutes (SD9.1) this block progressed till below T6 and the patients were placed in a sitting position. None developed orthostatic hypotension. The remaining 40 were placed in a sitting position upon arrival in the recovery ward. 36 (61%) experienced no orthostatic hypotension whereas postoperative return of motor function in this group lasted 53.4 min. Four patients had orthostatic hypotension with complaints of dizziness or nausea. There was no significant difference between these 4 and the nonorthostatic group in dose, BMI or surgery duration. After 15 minutes none of the 4 patients had orthostatic hypotension. The mean duration of the spinal anesthesia until motor recovery was 93.9 minutes (SD26.5).

Conclusion(s): An average reduction of recovery ward stay could be achieved of 51.5 min if orthostatic hypotension combined with a sensory block below T6 were used as discharge criteria. Discharge based on absence of orthostatic hypotension rather than on motor charge results in a significant reduction in recovery time (p<0.01).Further research is required to confirm these results and to evaluate this potential benefit with other local anesthetics.

Reference:

1 Knoerl et al.2001.

2AP1-7

Intra-anal catheter analgesia in ambulatory surgery for triple hemorroidectomy

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Abstract 2AP1-4 Effect of Face Tent on O2 Sat during Retrobulbar Block

	RA O2 Sat	Highest O2 flow (l/min)	O2 Sat after 5 min O2	Propofol Dose (mg/kg)	Lowest O2 Sat	Severe Desat (O2 Sat ≤85%)	Assisted Ventilation
Group 1 NC (n=66)	99±1%	5.3±2.4	99±1%	1.15±0.42	92±6%#p<0.0001	10/66	5/66
Group 2 FT (n=63)	98±2%	4.1±0.8*p<0.0001	100±0%*p<0.0001	1.32±0.36*p<0.02	98±4%*#p<0.0001	1/63*p<0.01	1/63

*Significantly different from NC; #Significantly different from 5-min O2

Background and Goal of Study: Postoperative pain in anorectal disease is one of many limiting factors for delay in patient discharge from the postanesthesia care unit (PACU) in ambulatory surgery. Many methods have been used to reduce postoperative pain in triple hemorroidectomy. This study was aimed at assessing the analgesic effects of pump infusion of local anesthetic during 48 h through an intra-anal catheter placed at the end of the operation.
Materials and Methods: 50 patients, ASA I-II, aged 19-66 years, undergoing elective conventional triple hemorrhoidectomy were operated under spinal anesthesia. At the end of surgery multiperforated catheter analgesia was placed intra-analy and 5 ml of ropivacaine 0.5% was administered and pump infusion of ropivacaine 0.2% during 48h was connected. Intraoperatively desketoprofen was administered. Conventional analgesia was done with diclofenac/8h po, and metamizol and tramadol p.o as rescue drugs. We measured: surgical time, recovery time, peri/ postoperative complications, analogic visual scale on arrival in the PACU and before PACU discharge, verbal scale at 24-48h after surgery and on 7th day, rescue analgesia consumption, patients' satisfaction
Results and Discussion: Complications: 4 unexpected admissions by pain, 2 reintervention (bleeding, infection). 6 pump malfunctions, 1 hematemesis, 2 metamizol allergy.

Table 1

Gender F/M	11/29	
Surgical time	30-90'	mean 45±15
Recovery time	60-180'	Mean 120±20'
VAS arrival PACU (rest/move)	0	0 ±2
VAS discharge PACU	0	0 ±2
VS firts nigth	3±3	4±3
VS second night	2±2	3±2
VS third night	2±2	3±2
VS seventh day	1±1	1±13
Rescue analgesia met/tramadol	100%	10%

Conclusion(s): Intra-anal catheter for triple hemorroidectomy is not enough to control analgesia in ambulatory surgery. Most of them need both drugs rescue analgesia during the first 48h. Another analgesia therapy must be given in this kind of surgery.

2AP2-1

Intravenous sedation with midazolam and fentanyl versus propofol and pethidine in colonoscopy: A prospective, randomized study

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Background and Goal of Study: A combination of opioids and benzodiazepines or propofol 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 midazolam and fentanyl versus propofol and pethidine when each regimen is used as sedative agents for colonoscopy.
Materials and Methods: 1,032 patients who underwent colonoscopy in two years, were randomly assigned to MF and PP groups. 514 patients in group MF received midazolam and fentanyl and 518 patients in group PP received propofol and pethidine for intravenous sedation (IVS). The maximum dose of midazolam, fentanyl and pethidine was not higher than 0.08, 0.003 and 2.0 mg/kg, respectively. 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.
Results and Discussion: All endoscopies were completely successfully except for 33 patients (6.4%) in group MF and 11 patients (3.3%) in group PP (p=0.019). Mean total dose of midazolam and fentanyl in group MF was 0.08 (0.05) mg/hg/hr and 0.003 (0.002) mg/kg/hr. Mean total dose of propofol and pethidine in group PP was 5.98 (2.67) mg/hg/hr and 1.74 (1.05) mg/kg/hr. Additional propofol dose in group MF was 86.97 (19.60) mg, and in group PP was 38.82 (17.64) mg (p<0.001). Procedural pain and recovery time in group MF was significantly higher than in group PP (p<0.001), but recovery score at 30 min post-procedure in group MF was significantly lower than group PP (p<0.001). Tolerability of the patient, discomfort during insertion as well as patient and endoscopist satisfaction in group MF were statistically significantly lower than for patients in group PP (p<0.001). Overall, cardiovascular and respiratory adverse events in group PP were also significantly higher than in group MF. However, these adverse events were transient and easily treated with no sequelae.
Conclusion(s): IVS in both regimens provided effective and safe for colonoscopy. No serious adverse events were observed. However, the combination of propofol and pethidine used as sedative agents for IVS had significantly higher efficacy than the combination of midazolam and fentanyl.

2AP2-2

Propofol based sedation does not increase rate of perforation during colonoscopy

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Background and Goal of Study: Sedation related colonoscopic perforation (CP) has been under much debate. Our aim was to assess and compare the CP rate during colonoscopy by using sedation with or without propofol adjuvant.
Materials and Methods: A total of 6,122 patients underwent colonoscopies from the WGO Endoscopy Training Center, Siriraj Hospital, Thailand from March 2005 to October 2007. The patients were divided into group A and B. In group A, 5,610 patients were sedated by using propofol based sedation technique. In group B, 512 patients were sedated by using other sedative agents. The CP rate, perforation site, type of endoscopist and mortality rate were assessed and to be compared between the two groups.
Results and Discussion: There were no significant differences in age, sex, weight, ASA physical status and duration of procedure between the two groups. In group A, nine patients (0.16%) suffered from perforation, and two of them died. In group B, one patient (0.20%) had the CP. No difference in the CP rate with respect to receiving sedation with or without propofol adjuvant was noted (p=0.852). The most common CP site was sigmoid colon. The characteristics of patients and sedative agents used in perforated patients in both groups were not significantly different.
Conclusion(s): Our data showed that colonoscopy under propofol based sedation did not increase the perforation rate. Additionally, colonoscopy is relatively safe and effective when performed by physicians in training. Serious complications are uncommon.

2AP2-3

Out of operating room anesthesia: An organizational challenge

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Background and Goal of Study: Out of the operating room anesthesia (OOORA) provides deep sedation and general anesthesia in non-operating room (NOR) venues. The successful organization of OOORA at a university hospital is described here.
Materials and Methods: There are 14 NOR sites were OOORA have to be provided at our university hospital: Neuroangiography, Body Angiography, Body CT, MRI, Cardioversion, Cardiac catheterization, Cardiac MRI, Electrophysiology, Gastroenterology, Transesophageal echocardiography, Ultrasound, Nuclear medicine, Gamma knife, and Bronchoscopy. Our objectives were safe and reliable anesthesia at these places. We have achieved these objectives by creating a separate directorship for this area.
Results and Discussion: The anesthesiologist director duties includes patient care and administration. The anesthesia department provides equipment, technicians, AACs, CRNAs, or residents, and coverage for late cases and absences. The OOORA director was selected because of knowledge, experience, leadership, ability to interact with various medical groups, and interest in OOORA. The director of OOORA is writing guidelines for room set-up for all areas, as well as usage of the MRI induction/eduction room. Guidelines for sedation by nursing and MRI radiologists—with agreement and cooperation with the department of radiology and nursing—have also been established. The involvement of physicians, nurses and technicians in the different locations have resulted in workflow diagrams where the tasks of all involved is delineated (Fig 1). 651259_image1.png The director's activities have resulted in better acceptances of OOORA assignments by AACs, CRNAs, and anesthesia residents; better understanding, acceptance, and recognition of safe anesthesia as part of the solution to the management of difficult patients and procedures; and greater cooperation among the various medical, nursing, and technical groups that operate in alternative sites.

Time	Patient	Anesthesia Tech	RAC, CRNA Resident	Anesth. Attending	XR tech	XR nurse	XR fellow	XR Attending
6:30	Hospital admission pnrnaaaa patient and transports him to Lakeside B499	Takes A. machine, A-line set up, and Babysafe to Lakeside B423	n Mather OR: Obtains meds and Transport Monitor Procures PAT chart n Mather 2217A Sets up in Lakeside B423					
07:00-07:30	XR waiting room B400		Receives & Interviews Pt.	Receives & Interviews Pt.			Pt. Interview	Pt. Interview
07:30-07:35	XR admission				Set-up	Receives, prepares and takes Pt. to B423		
07:35-08:00	XR procedure room		Monitors, IVs, A-line induction Details below	Monitors, IVs, A-line Induction Details below				
					TIME OUT			
						Foley		
8:00							Case start	Case start

Conclusion(s): The creation of the position of Director of OOORA, and proper departmental support, seems to facilitate and solve the challenges posed by the increasing demands for anesthesia at sites different and far from the main operating room.

2AP2-4

Sedation during colonoscopies, evaluation of comfort and effectiveness criteria. Prospective study

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Background and Goal of Study: To determine comfort and effectiveness criteria during lower endoscopic examinations under sedation, comparing the combination of midazolam and propofol to the use of propofol as unique sedative.
Materials and Methods: Prospective study held from January 1997 to December 2008, with 3.448 patients undergoing colonoscopy. Examinations were performed with video endoscopy equipment Fujinon 200 and 250, standard monitoring (BPM, SBP/DBP, O_2Sat) with monitor Datex Cardiocap 2 and biespectral index (BIS). Patients were randomly assigned in two groups: Group I (1.634p) received propofol 1,5 mg kg^{-1} and on demand bolus of 0,4-0,5 mg kg^{-1}; Group II (1.814p) received midazolam 0,02-0,05 mg kg^{-1} and propofol 1 mg kg^{-1} and on demand bolus of 0,4-0,5 mg kg^{-1} prior informed consent. It was evaluated: demographic data, anesthetic risk (ASA), examination time, hemodynamic parameters, complications and adverse effects to sedation and/or examination, previous examinations under sedation, level of anxiety before the examination, anesthetic depth (BIS), MOAA/S sedation level 5' after examination, amnesia after 10', patient satisfaction and evaluation of the experience.
Results and Discussion: No significant differences were observed referring to demographic data, anesthetic rick, O_2Sat, hemodynamic parameters, MOAA/S sedation level, anesthetic depth (BIS), examination time and side complications to sedation and endoscopy. Average doses used were: Group I: propofol 220 mg; Group II: midazolam 1.7 mg and propofol 115 mg. As for the anxiety level, the majority of patients (33.9%) correspond to level 2 (anxious). Significant differences were observed in: MOAA/S sedation level, where it stands out a higher number of patients level 4 in Group I (38.5% Group I vs. 18.6% Group II), while in level 5 this relation reverses (38.9% Group I vs. 57.7% Group II); level of amnesia at 10' was superior in group II (78%); patient satisfaction and evaluation of the experience when discharged were higher in Group II (47.8% and 91.1% respectively).
Conclusion(s): The synergistic sedation of the anesthetic technique combining midazolam and propofol offers a rapid start of sedation, good anesthetic depth, short recovery time, very good amnesia, high patient's satisfaction and comfort, easy realization, and it does not retard the diagnostic of complications.

2AP2-5

Comparison of intermittant bolus versus target-controlled infusion of propofol sedation for colonoscopy

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Background and Goal of Study: The aim of this study was to evaluate whether the administration of propofol, supplemented with remifentanil, via target-controlled infusion (TCI) method confers any benefits to intermittant bolus (IB) method in terms of vital signs, quality of recovery, propofol requirements during colonoscopic procedures.
Materials and Methods: After obtaining approval from the Ethical Committee, 66 ASA class I and II outpatients, aged 18 to 65 yr., undergoing elective colonoscopy were allocated to one of two groups to receive either a TCI or IB propofol infusion supplemented with remifentanil of 0.05 μg kg^{-1} min^{-1}. In the TCI group, the target plasma concentration of propofol was set to 2 μg ml^{-1} while in the IB group propofol was started as a bolus of 0.5 mg kg^{-1}. After two minutes, propofol was titrated as 0.5 μg ml^{-1} effect-site concentration and as 0.25 mg kg^{-1} bolus increments according to achieve a Ramsey sedation score of 3-4 in Group TCI and IB respectively. Hemodynamic parameters, total propofol requirements, the incidence of recall and dreaming, pain intensity, patient satisfaction, time to opening eyes and recovery were recorded. Data were analysed with Kolmogorov-Smirnov, Student t, Paired Sample T and χ^2 tests.
Results and Discussion: Heart rate increased significantly at first 1.-2. min in Group TCI (p= 0.017, p=0.001), and at all measurement times except at 5. min in Group IB (p=0.001, p=0.002) compared with baseline. Mean arterial pressure was significantly higher in Group IB at 5., 6., 7. and 8. min than the values in Group TCI (p=0.025, p=0.001, p=0.026, p=0.031). Total propofol dose, and time to eye opening and recovery did not change between the groups (p= 0.369, p=0.768, p=0.197). This study demonstrates that propofol TCI provides a smooth hemodynamic profile for sedation in colonoscopy, however, it results in smilar recovery characteristics as IB propofol.
Conclusion(s): As a conclusion, although sedation with TCI propofol does not confer any benefit to IB propofol in the aspect of drug consumption and recovery, it might be particulary advantageous for colonoscopy patients who are at risk for hemodynamic detoriation.

2AP2-6

Patient-controlled sedation with propofol for ERCP: Remifentanil vs alfentanil

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Background and Goal of Study: Deep sedation with propofol and opioid combination is believed to be necessary for successful performance of such complex endoscopic procedures as endoscopic retrograde cholangiopancreatograthy(ERCP). However,deep sedation is associated with increased morbidity and mortality. Delivery of propofol and short-acting potent opioid using self-administration device(patient-controlled sedation, PCS)[1] could be better option for this purpose. Yet it is not known which opioid would be the most suitable for PCS.Also,the controlled studies about PCS during ERCP are lacking.This study was carried out in order to compare remifentanil and alfentanil in PCS during ERCP.
Materials and Methods: 85 elective ERCP patients were randomized to receive PCS with propofol/remifentanil 0,01mg/ml (group remifentanil), propofol/alfentanil 0.04mg/ml(group alfentanil0,04) or propofol/alfentanil 0.08mg/ml(group alfentanil0,08).PCS mixture was prepared immediately before the procedure by adding remifentanil or alfentanil solution to propofol 10mg/ml. Arcomed® self-administration device was programmed to deliver 1ml single-dose without any lockout time, background infusion or dose-limit upon to the patient's desire. Pharyngeal anesthesia was achieved with Lidocain1% spray 5min before endoscopy.Standard monitoring for deep sedation was applied and sedation degree was estimated every 5min throughout the procedure using Ramsay,OAA and Gilhams sedation scores.Total amounts of propofol and opioid were calculated at the end of procedure.Endoscopists and patients assessed their satisfaction with a standard questionnaire.
Results and Discussion: Patient –controlled sedation method was successful in 77/85 (91%)of ERCP sedations without differences between groups. Significant desaturation (SpO2<90%) and post procedural nausea occurred most frequently(p<0.05) in remifentanil group. Patient's and endoscopist´s satisfaction was equally high in both groups.

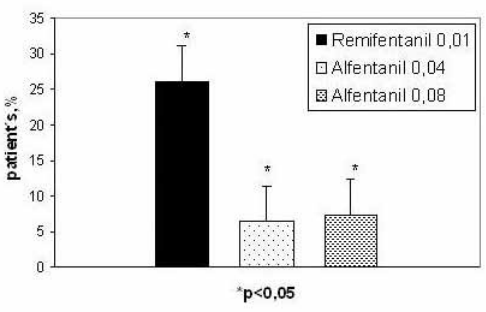

Fig.1 Patient-controlled sedation in ERCP: Desaturation frequency

Conclusion(s): Patient-controlled sedation is a safe and acceptable method for ERCP sedation. Desaturation and post-procedural nausea occurs more frequently with remifentanil than with alfentanil.

Reference:
1 Atkins,Mandel:Recent advances in patient-controlled sedation Cur.Op.in Anaesth.2008;21:759–765.

2AP2-7

Less is better: A comparison of two different doses of propofol for elective external cardioversion

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Background and Goal of Study: Elective external cardioversion is a short procedure for persistent atrial fibrillation, which requires general anesthesia. We compared effectiveness and characteristics of two different doses of propofol as sole anesthetic agent for cardioversion in order to establish a minimum effective dose.
Materials and Methods: 50 consented patients (36 men and 14 women, ASA I-III) scheduled for external cardioversion in the intensive coronary unit, were randomized into two groups of 25 patients each to receive: ♦ **Group A**: Propofol 1.2 mg/ kg ♦ **Group B**: Propofol 0.7 mg/ kg All patients received oxygen 100% through nasal prongs. Propofol was administered by slow intravenous injection (injection time > 90 sec) to a Ramsay Sedation Score of 5 (asleep patient without response to light stimulation). At this time the external cardioversion was applied. The following were recorded: 1. ***Haemodynamic and respiratory parameters*** (Blood Pressure, Heart Rate, Peripheral Oxygen Saturation, Respiratory Rate or Apnea Time >20sec). All these were recorded before (as baseline), during and after the cardioversion as well as during the recovery period 2. ***Recovery time***: time from the end of cardioversion to a Ramsay Score 2 (cooperative, tranquil, oriented patient) 3. Patient's ***recall*** of the procedure or any feeling of ***pain*** 4. Patient's and cardiologist's ***satisfaction*** Unpaired t-test and x^2 analysis was used *(p* < 0.05 considered statistically significant)
Results and Discussion: Demographic data were similar in both groups. Haemodynamic parameters decreased from baseline equally in both groups. Statistically significant difference was recorded with regard to recovery time and the number of apnoeic patients (4 patients in Group A needed artificial ventilation after propofol administration, because of apnoeic time >20sec). None of the patients complained about pain or recall of the procedure and all patients and cardiologists were fully satisfied by the procedure. The results are shown at the table 1 below:

Table 1

	Group A	Group B
Gender (male/female) (n)	19/6	17/8
Age (years)	55 ± 6	56 ± 5
Apnoeic patients (n)	4	0*
Recovery time (sec)	147 ± 18	84 ± 15 *

Data are presented as mean ± SD and number of patients (n) (*: p < 0.05)

Conclusion(s): Both doses of propofol are effective and satisfactory for anesthesia in elective external cardioversion. However, we suggest ***the lower dose*** (group B) which appears to be adequate as well as the higher dose but has significant ***faster recovery*** time ***without any incidence of apnea.***

2AP2-8

Dexmedetomidine versus propofol for sedation in patients undergoing vitreoretinal surgery under sub-Tenon's anesthesia

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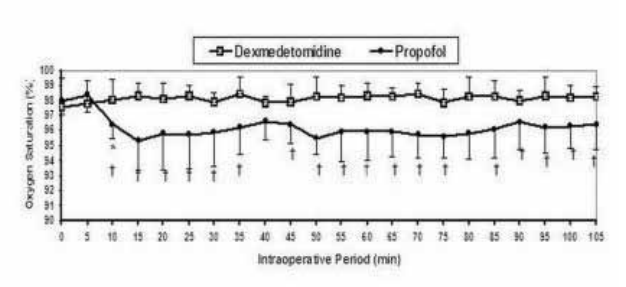
Background and Goal of Study: We evaluated the effects of dexmedetomidine sedation with those of propofol in patients undergoing vitreoretinal surgery under sub-Tenon's anesthesia.
Materials and Methods: Sixty patients were enrolled in this prospective, double-blind, randomized study. Exclusion criteria included age younger than 18 years, the usual contraindications for regional anesthesia, or history of sleep apnea. Group-D patients(30) received dexmedetomidine 1µgkg-1 i.v. over 10 min; followed by a continuous infusion of 0.1 to 0.7µgKg-1h-1, Group-P patients(30) received propofol 0.7mgKg-1 i.v. over 10 min; followed by a continuous infusion of 0.3 to 4mgkg-1 h-1. Sedation level was titrated to a Ramsay sedation scale of 3.
Results and Discussion: Both groups provided a similar significant reduction in heart rate and mean arterial pressure compared with baseline values. The respiratory rate values in the dexmedetomidine group were significantly lower than those in the propofol group. The oxygen saturation values of the dexmedetomidine group were significantly higher than those of the propofol group. The expired CO2 was similar in both groups. Postoperatively, the time to achieve an Aldrete score of 10 was similar in both groups. Dexmedetomidine patients have significantly lower VAS for pain, similar surgeon' satisfaction with patients' sedation, and higher patients' satisfaction than propofol patients.



Selected clinical data of the study groups:

	Group D (n = 30)	Group P (n = 30)	P Value
Time to achieve adequate sedation level	20.36 ± 4.66	10.96 ± 3.27 *	0.000
Time to achieve an Aldrete score of 10 (min)	40.53 ±6.51	37.60 ± 6.42	0.084
Degree of patient's satisfaction (a 7-point Likert-like verbal rating scale)	6.46 ± 0.62	5.56 ± 1.04 *	0.000
Degree of surgeon's satisfaction (a 7-point Likert-like verbal rating scale)	5.76 ± 0.97	5.25 ± 1.33	0.081

Data are displayed as means ± standard deviations. * Statistically significant compared to group D

Conclusion(s): Dexmedetomidine is a valuable adjuvant for sedation in patients undergoing vitreoretinal surgery under sub-Tenon's anesthesia

2AP2-10

Correlation of BIS value and occurrence of apnea during IV deep sedation for endobuccal surgery – A report of 100 consecutive cases performed in office-based settings

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Background and Goal of Study: Bis monitoring has often been proposed as a guide for titration of sedation (1,2). Considering the particular situation of IV sedation in spontaneously breathing patients during endobuccal procedures, we wondered if BIS monitoring could be a good predictor of apnea occurence (AO).
Materials and Methods: 100 consecutive patients scheduled for periodontic surgical procedure under deep sedation in office-based settings were investigated. Patients were not premedicated. In all cases, sedation consisted in continuous target controled infusion of combined propofol and remifentanil. Monitoring consisted in EKG, respiratory rate (RR), NIBP, SaO2 and BIS monitoring. Supplemental oxygen was systematically delivered. Data were recorded each 10 minutes. AO was defined as RR < 8/min or SaO2 < 90%. We analysed by GEE regression the correlation between AO and BIS value, age, sex, body mass index (BMI), duration of procedure at the moment of AO (T) and calculated concentrations of Propofol (C_ePr) and remifentanil (C_eRe).
Results and Discussion: Eight patients were excluded for conversion to general anaesthesia, and 4 other patients for missing data. Finally, 658 data were analysed (88 patients, 4-11 data per patient). Mean procedural duration was 78±16 min, BIS value was 85±5.4 %, age was 50.1±9.5 yrs, sex (M/F) was 35/65%, BMI was 26±4.3, T was 54±12 min, C_ePr was 1.27±0.2 µg.ml^{-1} and C_eRe was 1.54±0.14 ηg.ml^{-1}. A correlation was found between AO and BIS value ($p<0.001$) and C_eRe ($p=0.045$).
Conclusion(s): Among all analysed parameters, BIS demonstrated the best correlation with AO. Considering the particular trouble of AO during endobuccal surgery, this finding should support the use of BIS monitoring during such procedures when realized under deep sedation.
References:
1 Bispectral index as a guide for titration of propofol during procedural sedation among children. Powers KS, Nazarian EB, Tapyrik SA et al. Pediatrics 2005 Jun;115(6):1666-74.
2 The use of bispectral analysis in patients undergoing intravenous sedation for third molar extractions. Sandler NA, Sparks BS. J Oral Maxillofac Surg 2000 Apr;58(4):364-8.

2AP3-1

Outpatient videothoracoscopic palmar and axillary hyperhidrosis treatment

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Background and Goal of Study: Palmar and axillary hyperhidrosis is characterised by excessive perspiration and is the most debilitating form of hyperhidrosis. The excessive sweat is mediated by the vegetative nervous system. Our study has evaluated the immediate and long-term results of bilateral video-assisted thoracoscopic sympatectomy on an outpatient basis.
Materials and Methods: We analysed patients characteristics, analgesia, the incidence of nausea/vomiting and complications as well as the number of readmissions for up to 48 h after the procedure. Thirty-four patients underwent thoracoscopic sympatectomy under general anesthesia and were followed for a period of 12 months. Anesthetic induction was carried out with fentanil and propofol; maintenance was followed by an infusion of propofol, fentanil and cisatracurium. A double-lumen tube was used to collapse the lung on the side being treated. A percutaneous intercostal block was performed at the level of the thoracic incisions for a maximum extension of four spaces by infiltration of ropivacaine 0.75%. Two 5 mm ports were placed, respectively, in the fourth intercostal space on midaxillary line and third intercostal space anterior to midaxillary line. Surgical interruption of the sympathetic chain between T2 and T3 was performed with an ultrasonic scalpel. Antiemetic prophylaxis (ondansetron and dexamethasone) was administered for all patients. Thirty minutes before finishing the procedure, 1 g of paracetamol and 50 mg of desketoprofen was administered. Patients were given a telephone number for contact and received a prescription for analgesics.
Results and Discussion: Patients characteristics were: sex, F/M: 23/11; age, 29.1±6.3 years; ASA I/II: 28/6. Time under anesthesia was 90.2±11.5 minutes and recovery room time was 192.2±14.9 minutes. Five patients experienced nausea and one experienced vomiting in the hospital. All patients were discharged the same day, except one patient that required a chest drain because of pneumothorax. This procedure was associated with slight postoperative pain and no supplemental analgesic doses were required. Long-term resolution of palmar hyperhidrosis was complete in 97% of patients and serious compensatory sweating was present in 5% of patients. Patient´s satisfaction 48 h after surgery was excellent in 91% of patients.None patient was readmitted from home.
Conclusion(s): Videothoracoscopic sympathectomy on an outpatient basis is a feasible procedure if strict control of pain is established and vomiting/nausea and surgical complications are avoided.

2AP3-2

The institute of innovation and improvement classification of reasons for cancellation in day surgery: A way forward

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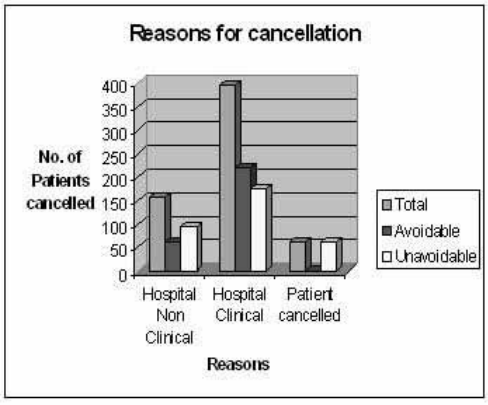
Background and Goal of Study: Cancellation of an operation on the day wastes resources and time. We looked into the various causes of cancellations and classified it according to the National Health Service (NHS) Institute of Innovation and Improvement, which is dedicated to enhance the quality of service delivery with in the National Health Service in United Kingdom.
Materials and Methods: The London hospital at which the audit was conducted has dedicated 7 day surgery theatres with separate staff as well as management system. This is one of the largest service provider in the region. We looked at the computer stored data and identified the cancellations made on the day of the operation. We divided the causes as hospital non-clinical, hospital clinical and patient reasons. The avoidable causes are sub classified and a plan of action was formulated.



Results and Discussion: Total patients booked in 2008 were 14004. 6.45% operations were cancelled on average every month. This is the data from November 2008 to October 2009 and classified the cancellations. The hospital non-clinical reasons were responsible for156 cancellations out of which 62(39.7%) was avoidable. Of the 395 cancellations made due to clinical reasons, 221(55.9%) were due to avoidable reasons. The avoidable clinical reasons were pre-existing medical conditions(13%), poor compliance with the pre-operative guidance (19%) and operation not necessary(24%). 62 patients were either self cancelled or operations were not required. The NHS Institute of Innovation and Improvement has guidelines to control cancellations. Preoperative assessment of patients, root cause analysis tools as well as various management strategies are in place. The hospital management can look into the various causes for delays and clinical staff could liaise with the management. Tackling the theatre overruns, making sure the staff availability, proper scheduling of the emergencies as well as raising the awareness about the cancellations and its implications could help in reducing the problem.
Conclusion(s): Cancellation of day surgery has significant implications. Many cancellations are potentially preventable. Along with raising the awareness, various other strategies could help minimising the problem.

2AP3-3

Comparison of two different anesthetic techniques on patient's recovery profile following laparoscopic cholecystectomy

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Background and Goal of Study: Different techniques of general anaesthesia have been recommended as suitable for laparoscopic cholecystectomy (LC). Both sevoflurane and propofol seemed to be effective to provide fast postanaesthesia discharge following procedures lasting less than 2 hours. The aim of the study was to compare two different anesthetic technique for LC on patient's recovery profile.
Materials and Methods: Sixty adults ASA I-III patients scheduled for LC were included. They were randomly alocated into two groups, depending on anesthetic technique applied. Technique of Volatile Induction and Maintenance of Anaesthesia (VIMA) with sevoflurane and remifentanil 0.1-0.3 $\mu g \cdot kg \cdot min^{-1}$ were delivered to the patient's in the first group (VIMA group, n=30) to target satisfactory BIS values (range between 40-60). Total intravenous anesthesia with target controlled infusion of propofol 2-4 $\mu g \cdot ml^{-1}$ (TIVA-TCI) and remifentanil 0.1-0.3 $\mu g \cdot kg \cdot min^{-1}$ were established in second group (TIVA-TCI group, n=30). Rocuronim were used to fascilitate neuromuscular blockade and it was routinely reversed with neostigmine and atropin at the end of procedure in both groups. The results relating to parameters of recovery after anesthesia were recorded and compared between two groups. The patient's recovery parameters were defined as the time intervals from the interruption of anesthetic delivery until the time to eye opening, to response to a command, to extubation and to orientation. Post Anesthesia Discharge (PAD) time and frequency of postoperative nausea, vomiting and agitation (PONVA) were also analysed.
Results and Discussion: The time to eye opening (4.49±1.20 vs 7.42±1.25 min.) as well as the time to respond to a command (5.93±1.12 vs 8.47±1.08 min) were significantly shorter in VIMA group compared to TIVA-TCI group ($p<0.001$). Patients anesthetised with VIMA technique were also extubated earlier (6.84±1.19 vs 9.69±1.31 min., $p<0.001$). Orientation time is was also significantly shorter in the patients anesthetised with VIMA technique (7.51±0.97 vs 11.60±1.75 min., $p<0.001$). There were no difference in PAD time duration (19.42±5.99 vs 20.80±1.59 min., $p=0.142$). Also, there were no differences in incidences of PONVA between examined groups ($p=0.342$).
Conclusion(s): This study implicates that VIMA technique with sevofluran is associated with faster and more qualitative recovery of patients undergoing LC compared to standard propofol-remifentanil TIVA-TCI technique.

2AP3-4

Transbronchial lung biopsy with cryoprobes under outpatient regime

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Background and Goal of Study: Conventional transbronchial lung biopsy (TBLB) usually has poor diagnostic utility for the small size of biopsies obtained. The use of cryoprobes can allow larger size and better quality biopses. Our objective is to expose our experience in transbronchial outpatient cryobiopsies, the anesthetic technique and the perioperative complications.
Materials and Methods: Descriptive and observational study of 10 patients suitable for cryobipsies by TBLB during the study of interstitial lung disease. The cryoprobe (Erbokryo CA®) is introduced through the bronchoscopy channel. Then, under fluoroscopic control, is placed in periferic lung areas previously selected according to CT findings. Cold (-89.5ºC) is applied during 3 seconds and cryoprobe and bronchoscope are removed with the frozen lung sample attached to. Preoperative study: echocardiogram, functional tests and thoracic CT. Anesthetic technique: Upper airway anesthesia with lidocaine 2%.

Premedication: Atropine and midazolam. Induction: Perfusion of remifentanil at 0.05-0.1 µg Kg^{-1} min^{-1} and propofol at 4-6 mg Kg^{-1} h^{-1} (TIVA). Intubation: Flexible tube Broncoflex®. During perioperative period was evaluated: hemodynamic signs, peripherical oxygen saturation, bleeding, assisted ventilation and surgery time. In the postoperative period (30 minutes and 24 hours), was evaluated: cough, pneumothorax, bleeding, fever and thoracic pain. In-hospital time and need of hospital admission not planned was also investigated.

Results and Discussion: Average age of 64±8 years. Average duration of surgery: 35 ±11.4 minutes. Intraoperative complications: arterial hypotension (less than 20% of basal values): 50%, peripherical oxygen desaturation: 100%, intraoperative assisted ventilation: 60%. Post biopsy bleeding: 60% always controlled with standard bronchoscopy measures. Cough when waking up, in an 80%. No case of pneumothorax. Average hospital stay was 156±40 minutes. No hospital admission was required. Postoperative control by phone at 24 hours without complications.

Conclusion(s): The use of cryoprobes for TBLB may become an alternative technique to increase the diagnostic yield. Its performance under general anesthesia (TIVA), without muscular relaxants and with endotracheal intubation is an efficient and safe technique. Despite its risks: hypoxia, pneumothorax, hemothorax, fever and thoracic pain, complications are minimum and enable its carrying out in outpatient regime, provided that clinical safety controls are done. A higher number of cases are needed for its complete evaluation.

2AP3-5

What are determinants of patients' satisfaction in postoperative pain treatment after ambulatory surgery?

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Background and Goal of Study: Adequate postoperative analgesia is a prerequisite for successful ambulatory surgery and continues to be a challenge for anaesthesiologists. Pain is a multifaceted and highly personal experience. The goal of the study was to analyse what are determinants of patients' overall satisfaction in postoperative pain management after ambulatory hand surgery.

Materials and Methods: Patients undergoing ambulatory hand surgery received oral fixed association Tramadol/Paracetamol 37,5/325mg every 6 hours during the first 48-h after operation. The first dose was administrated preoperatively. Analgesic efficacy was evaluated by self-assessment of pain intensity by numeric rating scale (NRS 0-10). Patients also recorded total number of daily study analgesic tablets, frequency and severity of adverse events, sleep pain interference (SPI 0-10), number of rescue doses (Ibuprofen 400mg), number of antiemetic doses (Metoclopramide 10mg) and patient global assessment (PGA) on a 4-grade scale. Success ratings on the PGA were considered "good" and "excellent". Preoperative pain intensity, analgesic use, and expectation were also recorded.

Results and Discussion: 120 subjects participated in the study. The percentage of patients who reported rating of success on the PGA was 88,3% in the first 48-h. The incidence of adverse events was 24% in the first 24-h and 15% at 48-h, with the most common being nausea, vomiting, and somnolence. The most significant determinant of failure on the PGA was the presence of moderate to severe adverse events (R=0,87). Determinants of ratings of success on PGA were mean daily pain intensity scores <4 on NRS (R=0,79) and SPI<3 at 48-h (R=0,78). Predictors of successful patient satisfaction were preexisting pain <4 on NRS (R=0,75) and lack of preoperative analgesic consumption (R=0,72). The perception regarding pain and analgesia (expected pain >6 on NRS) was shown to have a positive correlation (R=0.53) with postoperative pain relief and overall satisfaction. Weak correlation (R=0.26) was observed among mean daily pain intensity and analgesics intake.

Conclusion(s): Results indicate that the oral association Tramadol/Paracetamol 37,5/325mg is effective for the management of postoperative pain after ambulatory hand surgery. The lack of adverse events is the most important determinant of patients' satisfaction, followed by the analgesic efficacy.

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2AP3-6

VIMA (volatile induction and maintenance anesthesia) for the geriatric patients, an alternative to choose in one-day plastic surgery

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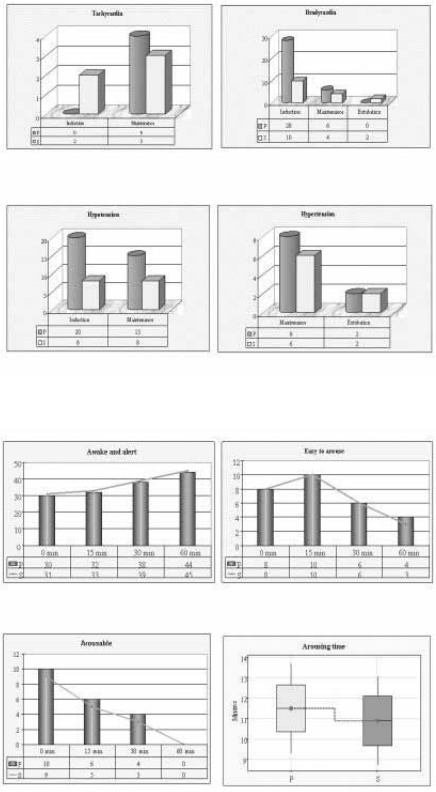
Background and Goal of Study: Using the lowest possible anesthetic dose on elder patients without sacrifying efficacy may help reduce the risk of complications The aim of this study: to compare the technique of VIMA with sevoflurane vs. TIVA (propofol/fentanyl) in geriatric patients Primary objectives: to compare induction time, incidence of intraoperative side-effects and recovery time. Secondary objectives: time to discharge from the hospital and the patient satisfaction

Materials and Methods: 96 ASA I-II patients, over 75, scheduled for minor plastic surgery were randomised in 2 groups: Group P received i.v. fentanyl 2 µg/kgc and propofol 2 mg/kgc for induction, followed by propofol 10 mg/min and fentanyl 2 µg/kgc/h after intubation Group S received vital capacity breathe technique of induction with 8% sevoflurane and were maintained with 2% sevoflurane All patients were premedicated with midazolam 0,05mg/kgc and fentanyl 1µg/kgc, 30 min before surgery Induction times, intraoperative cardio-vascular events and recovery times were recorded. We also assessed the sedation score, patient satisfaction and discharging time from hospital



Results and Discussion: Statistical analysis were carried out using the chi-square and Anova test: p<0,05 was considered significant. 1. Induction time P=98 seconds S=102 seconds p>0,05 2. Incidence of intraoperative cardiovascular events 3. Recovery time P: 11,5 min +/- 2,21 min S: 10,9 min +/- 2,15 min p< 0,05 Both groups had a statistically similar time to reach an Aldete score of 9 4. Sedation score. 5. Discharging time from the surgical unit P: 8h +/- 32 min S: 8h +/-27min p< 0,05 6. Induction experience.

Induction experience

Experience	P	S
Pleasant	40	36
Neutral	7	8
Unpleasant	1	4

Conclusion(s): In elderly population not receiving cardio-vascular drugs, VIMA technique was a practical, safe and liked alternative In terms of cardio-vascular stability, sevoflurane induction is comparable with propofol

2AP3-7

Online-survey about the medicinally premedication and analgesia in the ambulatory and day case sector

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Background and Goal of Study: Ambulatory performed surgery gain significantly. Better and optimised techniques of the operation, more comfort for the patients, economical evaluations and optimised pharmacokinetics of newly developed anaesthetics allows an increasing number of operations. A survey

between registered anaesthetists in Germany regarding strategies of premedication with these new requirements shall be analysed.
Materials and Methods: In cooperation with the German Federation of Anaesthesiologists (BDA), 1200 anaesthetists were called attention to the questionnaire (www.bda.de/praemed) by e-mail, per mail and publication (1). Current medicine and routes of administration for adults were taken into account, as well as for infants weighing more and less than 25 kg.
Results and Discussion: The representative selection contains 156 participants and 365,000 narcoses per year. Thereof 86% were ambulatory. The dominant medicin given in all collectives was midazolam: For adults in equal shares intravenious (Ø 2.2mg per dose) and in tablets (Ø 6.6mg per dose). For infants (independent of their weight) the preference was midazolam juice (Ø 0.43mg per kg weight). Alternatively clorazepate dipotassium (oral Ø 17mg per dose) and diclofenac as an analgesic was given for adults. Paracetamol was preferably given to infants. 7% of the infants with less than 25kg weight got midazolam nasally (Ø 0.4mg per kg weight). 81% were satisfied with their premedication. 48% of the participants see a necessity for improvement. The majority suggests a better timing, more pleasant atmosphere and improved communication. Two-thirds wish stronger, faster reacting and less soothing sedatives. Explicitly 34 times a better tasting midazolam juice was asked for. In contrast many questionnaires indicate that premedication is not routine (30 direct negative answers, further only sporadically). Very often it is mentioned that the patients were calm and without pain. A trustful discussion and environment was repeatedly pointed out as an alternative.
Conclusion(s): In the ambulant sector there is no premedication in all cases; midazolam as juice for infants (better taste requested) and intravenous or in tablet form for adults is still the major medicine in use.
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2AP3-9

One year of day surgery in a geriatric hospital integrated facility

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Background and Goal of Study: To assess suitability and acceptability of day surgery in elderly pts.
Materials and Methods: Between Dec. 2008-Dec. 2009, 352 pts 60-95 y (74.5+-8.3, range: 60-95) underwent surgical/diagnostic procedures as outpatient in a geriatric hospital-integrated DS unit. Patients were admitted to DS (admission + procedure on the morning, discharge 12 h after admission) but were allowed to pass to ODS (discharge early the day after) in case of need or patient preference. In all cases, after 12 h from admission, they were checked for discharge using PADSS. This paper will review age, ASA status, reasons for longer than 12 h hospital stay and complications.
Results and Discussion: Pts 60-69 were 162 (46%); pts aged 70-79 were 112 (32%); pts aged 80-89 were 74 (21%) and pts aged more than 90 were 4 (1%). ASA class was: 1: 60 (17%); 2: 199 (57%); 3: 93 (26%). Two thousand and sixty nine pts (76%) had total hospital stay of 12 h. Of the other 83 (24%), 20 pts resulted fit for discharge after 12 h, but preferred to spend the night at the hospital; 12 pts also resulted fit for discharge but were retained overnight due to distance between patient home and hospital (40-50 km, which is near to the limits of acceptability); other 9 pts who lived in social institution were retained overnight in accordance with their institution. In 15 cases, the overnight stay was due to reasons related to the procedure (need for maintaining compression on the vascular access after arteriography, 11 pts; time for bowel preparation before endoscopy, 4 pts). Clinical reasons for overnight stay occurred in 23 case (5%) and were minor cardiovascular troubles (5), urinary retention (5), hyperthermia (5), haematuria (3) and pain (1).
Conclusion(s): Our experience confirmed that the 12 h Day Surgery model is safe and applicable also for elderly patients. Limitations to geriatric 12 h day surgery may emerge from psychological/social factors, which reduce compliance and acceptability such patients. A second limitation factor is represented by the traditional DS organizative models when procedures requiring bowel preparation or external continuous vascular compression are scheduled. A 12 h DS model with entrance in the afternoon, bowel preparation, overnight and endoscopy the morning after, which offers the advantage of short hospital stay plus overnight, should be considered for feasibility. Considering mean age and the ASA class distribution, complication rate is acceptable and allows continuing our experience.

2AP3-10

The effect of increasing dexamethasone doses in combination with low dose droperidol for prevention of postoperative nausea and vomiting in ambulatory surgery – A retrospective cohort study

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Background and Goal of Study: Postoperative nausea and vomiting (PONV) associated with ambulatory surgery increases health care costs, accounts for 0.1%-0,2% of unanticipated admissions and is a major cause of patients fear and discomfort [1]. Prophylactic dexamethasone alone or in combination with other antiemetics reduces PONV. However optimal antiemetic dosing in combination therapies needs to be established [1,2]. We investigated if the routine use of an increasing dexamethasone dose associated with droperidol can decrease the incidence of PONV in ambulatory patients of our institution.
Materials and Methods: We analysed retrospectively 1132 patients, submitted by the same anaesthesiologist to general anaesthesia in our ambulatory unit, divided in two groups: A (n = 672) representing surgeries perfomed between January 2005 and May 2007, with use of prophylactic droperidol 0,625mg associated with dexamethasone 4mg; B (n = 460) referring to surgeries performed between June 2007 and December 2008 using droperidol 0,625mg and 8mg of dexamethasone. Patients in which any of the drugs was contraindicated or who had received antiemetics within 48h before surgery were excluded. PONV data was recorded by nurses every hour or by spontaneous complaint of the patients. Rescue ondansetron 4mg was given if vomiting occurred. Need for hospital admission was recorded. Statistical analysis was performed using χ^2 test and t-test as apropriate. Assuming an expected incidence of PONV of 5%[2] in the first group, power analysis before the study showed this sample size would allow seeing differences of 4% with a power of 0.95 and a α=0.05. A P value ⟨0.05 was considered statistically significant.
Results and Discussion: Both groups were similar in relation to age (p=0.952), gender (p=0.537), physical status (ASA) (p=0.096), surgery duration time (p=0.999); surgical specialty (p=0.147) and general anaesthetic technique (p=0.084). We found a low incidence of PONV in both two groups (2.2% vs 3.0%), with only 1.2% needing for a recue antiemetic drug, and there was no significant difference between the groups (p=0.396 and p=0.206, respectively). Need for hospital admission was also similar in both groups (p=0.385).
Conclusion(s): Our study suggests that there is no advantage in increasing dexamethasone 4 mg to 8 mg in association to droperidol 0.625 mg in order to reduce prophylactically PONV in ambulatory patients submitted to general anaesthesia.
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2AP3-11

Electrochemotherapy – Is it safe to do it and go home?

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Background and Goal of Study: Only recently through the development of standard equipment for electrochemotherapy it was possible to reach a therapeutic weapon that was reproducible and capable of being used in a broader clinical context. In 2006 it was published a multi-centric study that established the European Standard Procedures of the Electrochemotherapy (ESOPE) that describes 24 cases where an anesthesiologist intervened. This technique is currently indicated in palliation and as a neo-adjuvant therapy in malignant lesions of the skin. It can be performed with local anesthesia in small lesions, but in patients with multiple sites of application and in painful locations it is necessary the support of an anesthesiologist. This procedure was started in our institution in 2007 and it was routinely started in the surgical ambulatory unit in 2008. The ESOPE states that this is a procedure that should be ideally performed in the ambulatory setting. The objective of this work is to demonstrate our experience and follow-up of the patients in these conditions.
Materials and Methods: Retrospectively we analyzed patient files for collection of demographic data, place of application and duration of the technique, type of anesthesia, analgesia and pain control, complications during, immediately after and 24 hours after the procedure.
Results and Discussion: We had 35 procedures and one was left out has it was performed with a tumor excision that required a large incision of the skin. That left us with 34 procedures of which 22 were female patients, with a median age of 66 years, most with ASA physical status of 2 (31). The majority of lesions were at the limbs (22) but it was also performed in the head, thorax, breast and vulva with a maximum procedure duration of 40 minutes. Every patient was given drug prophylaxis of nausea and vomiting according to the protocol of our institution. There were 2 cases of hypertension and one of bradycardia, and 2 patients with nausea after 24 hours. Regarding pain: only in two cases it was referred moderate pain and in both the patient was followed in the chronic pain department; 5 patients claimed mild pain. In the contact after 24 hours every patient felt no pain. All of our patients stated the prescribed pain medication they took home was sufficient and 1 did not find necessary to take any.
Conclusion(s): For now this technique seems to be suitable to be performed in selected patients in the ambulatory setting. Additional research should be undertaken so that more information can be available on this subject.

Monitoring Equipment and Computers

3AP1-1

Stroke volume variations (SVV) during the Pringle and inferior vena cavour half occlusion at hepatic surgery

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Background and Goal of Study: In hepatic resection surgery the Pringle and Inferior Vena Cavour half occlusion techniques (IVCHO) are used to reduce blood loss. It is reported that when central venous pressure (CVP) is decreased below 5 mmHg by these techniques, blood loss is significantly reduced. However it is not deternined how this low CVP affects the SVV. The purpose of this study is to examine how the SVV is changed by Pringle and IVCHO and to find out if Maart SVV, rather than CVP, is an effective indicator of these techniques.

Materials and Methods: In 23 consecutive hepatic surgery patients, SVV was monitored by the FlorTrac system and the data was recorded at one-minute intervals. Two patients were operated on without using these techniques, one had arterial fibrillation and the other hand massive bleeding before hepatic resection. They were excluded from this study. SVV data from 19 patients before (5 minutes), and during (15minutes) the Pringle and IVCHO were analyzed.

Results and Discussion: In 18 patients Pringle and IVCHO were performed 68 times and in 3 patients Pringle without IVCHO was done 10 times. We found the SVV is significantly increased by Pringle and IVCHO. Since Pringle and IVCHO were performed simultaneously in our institution, we usually do not examine the SVV change by IVCHO without Pringle. 3 patients, however, were performed Pringle without IVCHO due to surgical difficulty in accessing the IVC. Considering the fact that the SVV is not altered by Pringle alone, we can speculate IVCHO to be the main factor for the SVV change. Since our data about the effect of IVCHO on the SVV is not sufficient, further study is necessary. In this study,CVP was not measured in all patients but the blood loss was well controlled during the hepatic resection and systemic circulation was maintained, even when the SVV was increased to 20%~25%. SVV, which less invasive than CVP, is a valuable monitor during the hepatic surgery.

SVV at pre and during Pringle+IVCHO and Pringle alone

	1st time (n=18)	2nd time (n=17)	3rd time (n=14)	4th time (n=10)	5th time (n=8)
Pre Pringle+ IVCHO	10.6%	14.4%	12.9%	13.1%	8.6%
Pringle +IVCHO	24.1%*	21.6%*	23.2%*	19.1%*	20.4%*
	1st Pringle (n=3)	2nd Pringle (n=2)	3rf Pringle (n=2)		
Pre Pringke alone	9.5%	12.6%	10.7%		
Pringle alone	10.9%	10.5%	11.2%		

*:significantly difference P⟨⟨0.05

Conclusion(s): In hepatic surgery SVV is significantly increased by Pringle and IVCHO but not changed by Pringle alone. In our opinion, SVV instead of CVP could be a valuable indicator for Pringle and IVCHO.

3AP1-2

Effect of different doses of remifentanil on cardiac output with FloTrac/Vigileo system during spine surgery

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Background and Goal of Study: Spine surgery is associated with a strong stimulation of the sympathetic nervous system thereby requiring significant doses of intravenous opioid analgesics. Remifentanil which is commonly used as a component of total intravenous anesthesia may cause bradycardia and hypotension and is consider to decrease also cardiac output. The aim of this study is to evaluate the hemodynamic effect of different doses of remifentanil in patients undergoing posterior spinal instrumentation surgery, using the FloTrac/Vigileo device for estimation of the cardiac output.

Materials and Methods: We examined the effect of three different dosages of remifentanil administered during total intravenous anesthesia. The doses were 0.3mcg/kg/min: (low dose), 0.5mcg/kg/min: (medium dose) and 0.8mcg/kg/min: (high dose). Cardiac output was first measured after patients were turned from supine to prone position. Data were expressed as mean ± SD and were analyzed statistically using the SPSS program package, version 16.0.

Results and Discussion: Remifentanil in doses of 0.3mcg/Kg/min and 0.5mcg/Kg/min did not result in any difference in heart rate (HR) (p>0.05), mean arterial pressure (MAP) (p>0.05) or cardiac output (p>0.05). Higher doses of remifentanil (0.8mcg/Kg/min) caused a reduction of HR and MAP (p<0.05), while CO measurements did not reveal any statistically significant difference.

Conclusion(s): Remifentanil, even in high doses, seems to be a safe component of total intravenous anesthesia for patients undergoing spine surgery, since cardiac output, monitored with FloTrac/Vigileo is not impaired, despite a decrease in even arterial pressure and heart rate.

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3AP1-3

Comparison of the central venous pressures measured from the peripherally inserted antecubital central catheters and the internal jugular vein central catheters in liver transplantation recipients

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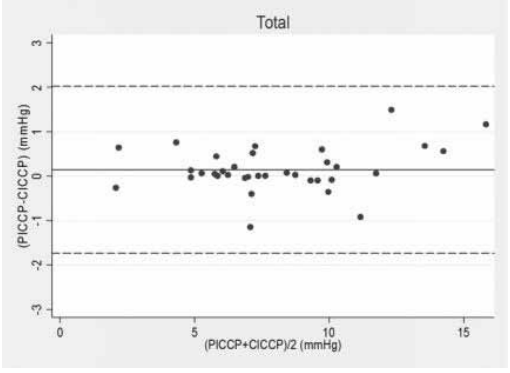
Background and Goal of Study: CVP monitoring from the peripherally inserted central venous catheter (PICC) has not often been used because of the higher inherent resistance of PICC due to its longer length and narrower lumen. The objective of this study was to assess the reliability of the CVP measured from PICCs as a predictor of the CVP measured from CICCs in the setting of rapidly fluctuating hemodynamic conditions during liver transplantation (LT).

Materials and Methods: We measured the CVPs from the CICC and the PICC simultaneously during each main surgical period of adult LT (preanhepatic, anhepatic, reperfusion, and neohepatic period). Data are presented as means ± SD. Statistical analysis was performed using simple linear regression analysis to observe whether changes in the PICCP were paralleled by simultaneous changes in the CICCP. Bland-Altman analysis was used to determine the degree of agreement between the two devices. Differences were regarded as being statistically significant when p values were less than 0.05.

Results and Discussion: A total of 1342 data pairs were collected from 35 patients. Overall, the PICCP was 8.12 ± 3.93 mmHg, and the CICCP was 7.98 ± 3.90 mmHg (p=0.1435). The differences of two CVPs among each period were not clinically significant (0.33 mmHg for preanhepatic, 0.32 mmHg for anhepatic, -0.15 mmHg for reperfusion, and -0.10 mmHg for neohepatic period). The PICCPs and the CICCPs highly correlated overall (r = 0.970, p<0.001), and at each period (r = 0.963 for preanhepatic, r = 0.959 for anhepatic, r = 0.971 for reperfusion, and r = 0.981 for neohepatic period). Bland-Altman analysis demonstrated an overall bias of 0.14 mmHg with 95% confidence interval 0.09 to 0.19 and the PICCP tended to give a higher reading by between 0.09 and 0.19. The limit of agreement was -1.74 to 2.02 overall. Bland-Altman plot calculation of bias and precision for all data pairs



Conclusion(s): These findings suggest that the PICC can be a reasonable alternative to the CICC for CVP measurement in situations of dynamic systemic compliance and preload, such as those observed during LT.

Reference:

1 Black IH et al. CVP measurements: Peripherally inserted catheters versus centrally inserted catheters. Crit Care Med 2000; 28: 3833-6.

3AP1-4

Reference level of CVP – Measurement of uppermost level of SVC and mid-chest level

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Background and Goal of Study: The importance of a central venous catheter (CVC) has been increasing, however, the reference zero level for central venous pressure (CVP) remains controversial, with a number of reference levels proposed for the uppermost blood level (UMBL) in the cardiac chambers. The tip of the CVC should generally be within a major vein such as the SVC to prevent complications. However, the UMBL in the superior vena cava (SVC) has not been well discussed. Thus, we considered that the UMBL of the SVC should be the reference level for CVP, and performed the present study to investigate the vertical distance of the SVC in a supine position and as well as its external position using the mid-chest level as a reference. We also measured the vertical distances of the cardiac chambers [right atrium (RA), left atrium (LA)] and major vein [internal jugular vein (IJV)] to determine whether there were large differences among them.
Materials and Methods: Computed tomography (CT) scanning of the neck and chest was performed in 50 consecutive adult patients (28 males, 22 females; mean age 65±16 years), with the subjects in a supine position. Using those images, the vertical distances of the UMBL of the SVC, RA, LA, and IJV from the skin on the back were measured. Those were then compared with the mid-chest level measurement, which was calculated using half of the anteroposterior diameter of the thorax. One-way ANOVA and Peason's correlation coefficient were used.
Results and Discussion: The vertical distance of the UMBL of the SVC, RA, LA, and IJV was 13.4 ± 1.3, 16.2 ± 1.3, 12.5 ± 1.0, and 13.1 ± 1.5 cm, respectively, while that of the mid-chest level was 10.5 ± 0.9 cm. There were significant differences between the UMBL values for the SVC and chambers (RA and LA; $P < 0.01$), and between those of the RA and the others (IJV and LA; $P < 0.01$). The mid-chest level was significantly correlated with the UMBL of the vessel and chambers, and also showed a strong relationship with the UMBL of the SVC (r=.816; $P < 0.01$). The vertical distance between the UMBL of the SVC and the mid-chest level was 2.9 ± 0.8 cm.There were significant differences among SVC and cardiac chamber measurements, while the mid-chest level was strongly correlated with the UMBL of the SVC.
Conclusion(s): Thus, we concluded that the mid-chest level is still a useful and reliable reference point for CVP measured in the SVC. In addition, our results showed that the uppermost SVC blood-vessel interface is about 3 cm above the mid-chest level.

3AP1-5

Non-doppler two-dimensional strain (2D stain) imaging by transesophageal echochardiography (TEE) in cardiac surgery patients: Feasibility; accuracy. A prospective study

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Background and Goal of Study: TEE has become an essential intraoperative monitor during general anesthesia for cardiac surgical procedures. Non-Doppler strain, which is derived by tracking speckles from two-dimensional (2D) images, evaluates the complex myocardial deformation. We conduct a prospective observational trial to evaluated 2D strain, its feasibility; its correlation to parameters classily used for LV function and its sensibility to detect the LV change during a slight hemodynamic change.
Materials and Methods: The exam was realized with a Vivid (General Electric, USA) in 50 consecutive patients following induction of general anesthesia and prior to incision on stabilized hemodynamic conditions with ZEEP. Was registered a transmitral inflow with a midesophageal four chamber view; pulsed wave Doppler proximal to the aortic valve, a myocardial tissue Doppler at the mitral ring and 2 consecutive views in the transgastric short axis for calculation of EF and realization of 2D strain. Then in each patient was applied 7 mmHG of PEEP. Same views than in zeep were registered. The images were just registered and not analyzed. A post-hoc quantitative evaluation was then performed by an investigator unaware of the patients' status. Hemodynamic and respiratory values were also recorded. Test used: coefficient of variation (CV); Student *t* test; Kruskal-Wallis test or Mann-Whitney *U*.
Results and Discussion: 2D strain could be fully analyzed in 19 patients (36%). Intra observer variability was moderate with CV ranging from 1,7 to 11,32 % for the 10 randomly selected patients. Inter observer variability was also moderate, as mean difference between observer was + 0,64 with 95% CI [-3,09; 4,37]. When we compared 2D strain to EF and FS the correlation is for EF (r2= 0.647) even higher with fractional shortening (FS)(r2=0.75). Between Peep and Zeep condition, hemodynamic parameters remain unchanged (MAP, CVP, HR). Echocardiography notice changes in diastolic mitral annular tissue velocity (E')(p=0.03), mitral inflow during the early diastolic phase (E) (p=0.04) and auricular contraction (A) (p=0.04). E/E'ratio remains equal (r2=0.88). The 2D strain measures are significatively higher in ZEEP than in PEEP (p=0.048) (r2=0.82).The other echographic LV systolic function parameters (EF, FS and ITV) are not modified between ZEEP and in PEEP.
Conclusion(s): By its ability accurately to evaluate LV function status 2D strain could be useful for anesthetist in managing patients in cardiac surgery.

3AP1-6

Cardiac output measured by arterial pressure waveform analysis without manual calibration (third generation software) compared with thermodilution in critical ill patients suffering from septic shock

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Background and Goal of Study: During organ failure in critical ill patients often it is unclear whether the patient is adequately fluid resuscitated. To facilitate optimal fluid resuscitation cardiac output is measured by either using an invasive pulmonary artery catheter or a less invasive device. A new minimal invasive technique, arterial pressure waveform (APCO) analysis without manual calibration, the FloTrac/Vigileo™ system Edwards Life sciences. Since its launch in 2005 there have been three software updates. The cardiac output derived from the arterial waveform analysis of the two latest versions showed good agreements when compared to pulmonary artery catheter under stable haemodynamic conditions. In septic shock the bias has been improved with the introduction of the 1.10 version of the software (in press). Only recently the newest software version has been released (3.02) targeting the patient in septic shock. The goal of the study is to determine whether cardiac output measurements obtained using APCO are comparable with those obtained using intermitted thermodilution cardiac output in septic shock patients.
Materials and Methods: This clinical observational study has been approved by the Medical Ethics Review Committee. Patients with organ failure during septic shock who received invasive hemodynamic monitoring with a pulmonary artery catheter (PAC) to optimize the hemodynamic profile, where also connected to the arterial waveform cardiac output monitoring device FloTrac 3.02, Edwards Lifesciences, Irivine, Clf, USA. Thermodilution cardiac output measurements are performed in triplicate measurements, before and after interventions. Values were averaged. FloTrac cardiac output was recorded during triplicate bolus measurement and also averaged.
Results and Discussion: Six patients are included in this study so far [45-79 years]. A total of 91 paired measurements have been obtained during the clinical treatment of these severely ill patients. The average APACHE II score is 33 [18-47], all patients suffered from multi organ failure. Bland Altman plot shows a mean bias of 0,8 $lmin^{-1}$ and precision of 1.7 $lmin^{-1}$. Consecutive cardiac output measurements reveal that CO changes in the same direction in 83% of the measurements.
Conclusion(s): These first data gathered in patients suffering from organ failure and septic shock show a reduced bias compared to the 1.07 and 1.10 software versions (Slagt et al. Eur J Anesth 2009 in press). More data is needed to answer the question if this is clinical applicable.

3AP1-7

Conventional intermittent blood pressure (BP) or finometry in detecting episodes of hypotension during induction of anaesthesia

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Background and Goal of Study: Anaesthetists use combinations of drugs and procedures that directly affect the cardiovascular system. Non-invasive BP monitors (arm cuff), normally set to measure BP every 2-3 min, may not detect the maximal changes during induction of anaesthesia. As part of service evaluation, we used Finometer (a continuous non-invasive haemodynamic monitor) to assess the ability of conventional intermittent non-invasive BP monitoring to detect maximum decreases in BP in terms of magnitude and timing.
Materials and Methods: Finometer, along with conventional monitoring, was used during induction of anaesthesia in 100 consecutive patients. The patients were 50 female; 50 male; ASA 1-4, undergoing routine or emergency surgery. The maximum decreases in BP and their timing, as recorded by Finometry and arm cuff were compared.

Results and Discussion: Intermittent measurements by arm cuff underestimated the overall maximum decreases in BP as assessed by Finometry (Table 1). It also underestimated the total number of patients who had significant hypotension (more than 30% decrease in MBP) (25/100 vs. 52/100; p=0.002*). This was mainly because the intermittent recordings often missed the maximum changes seen on continuous monitoring (Table 2). The mean time lag between lowest BP readings detected by Finometry and next available arm cuff readings was 1 m 29 s. Finometry indicated that the decreases in BP were mainly due to decreases in stroke volume (SV).

Comparison between %changes of lowest blood pressure readings from baseline (arm cuff vs. Finometer). Data presented as mean (SD)

Systolic and mean BP (mmHg)	%change of lowest reading from baseline (arm cuff)	%change of lowest reading from baseline (Finometer)	Difference	P value
SBP	24 (14)	38 (18)	-16 (15)	<0.0001*
MBP	22 (13)	32 (17)	-11 (14)	<0.0001*

Time lag between lowest blood pressure readings detected by Finometry and next available arm cuff readings

Time lag	< 1 min	1-2 min	> 2 min
number of patients	37 / 100	35 / 100	28 / 100

Conclusion(s): Significant decreases in blood pressure and stroke volume are encountered during induction of anaesthesia. Their magnitude is underestimated, and detection is delayed or missed by conventional intermittent BP monitoring. The Finometer's ability to detect haemodynamic changes as they occur, and the potential for their early detection and treatment, may add extra safety during anaesthesia. Further studies are required to explore this potential.

3AP1-8

Comparison of blood pressure (BP) measurements using arm cuff and finometry during induction of anaesthesia

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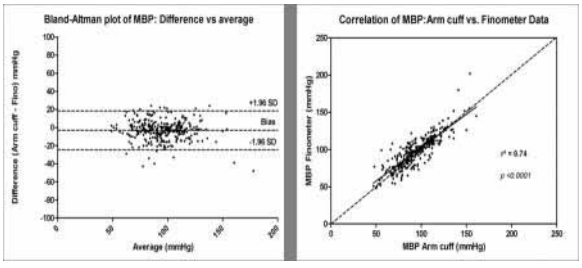
Background and Goal of Study: The Finometer is a non-invasive beat-by-beat haemodynamic monitor providing continuous blood pressure (BP) measurements through a finger cuff. Validation of Finometry showed accuracy in terms of BP monitoring,[1] and it has an established role in cardiovascular research [2] However, its use during anaesthesia and surgery is not yet established. We used Finometry for haemodynamic monitoring during anaesthetic induction as part of a service evaluation, subsequently comparing the BP measurements obtained by the non-invasive BP monitor (arm cuff) and Finometry.
Materials and Methods: We compared 311 pre, during and post induction of anaesthesia, simultaneous pairs of arm cuff and Finometer BP measurements, which were obtained from 100 patients (50 female; 50 male; mean (SD) age 53 (19) years) undergoing anaesthesia induction for various surgical procedures.
Results and Discussion: The averaged values of BP measurements from arm cuff compared to the Finometer were 130 (27) vs. 131 (30) mmHg for SBP, 72 (17) vs. 76 (17) mmHg for DBP and 94 (20) vs. 97 (21) mmHg for MBP. The measurements from arm cuff and Finometer showed a significant correlation, and the 95% limits of agreement (mean difference ± 1.96 SD) for the MBP were 18.3 to -24.6 mmHg.



Conclusion(s): The British Hypertension Society criteria for accuracy of BP machines are met when a BP machine achieves grade A/B when compared to the sphygmomanometer method. We found similar accuracy of the Finometer, but in comparison with the arm cuff monitor. The Finometer shows potential for use in anaesthesia and surgery, in particular whenever continuous BP monitoring is required.

References:
1 Schutte, A.E., et al. Journal of Human Hypertension, 2004. 18(2): p. 79-84.
2 Ryan, S., et al. Chest, 2007. 131(4): p. 1100-7.

3AP1-9

Relations between respiratory changes in R-wave amplitude and arterial pulse pressure in mechanically ventilated patients: Impact of the Brody effect

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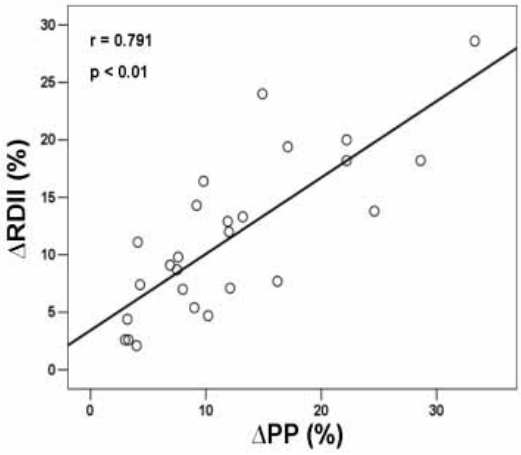
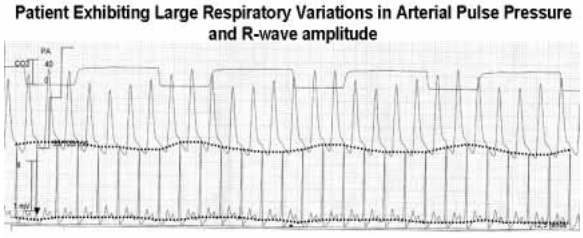
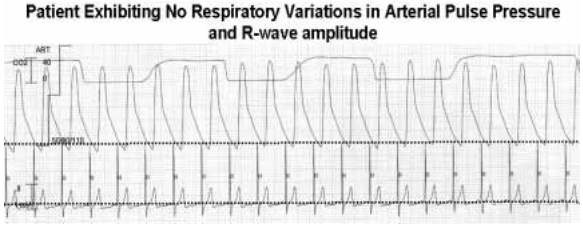
Background and Goal of Study: Electrocardiogram (ECG) monitoring is of common use in anesthesiology and in intensive care medicine. Several studies suggest that changes in ECG morphology may also reflect changes in volume status. The "Brody effect", a theoretical analysis of left ventricular chamber size influence on R-wave amplitude is the key element of this phenomenon. It is characterized by an increase in R-wave amplitude induced by an increase in ventricular preload. Since ECG changes in R-wave amplitude from the DII lead (ΔRDII) are induced by marked and rapid LV preload alterations, we hypothesized that this new index could reflect respiratory variations in arterial pulse pressure (ΔPP). In the present study, we studied the relationship between ΔRII and ΔPP in mechanically ventilated patients.
Materials and Methods: We studied 24 patients under general anesthesia and mechanical ventilation. Electrocardiogram was recorded using a standard monitor (Intellivue MP70, Philips Medical Systems, Suresnes, France). The ECG waveforms were analyzed by an observer blinded to the arterial waveforms. R wave amplitude was calculated off-line on a millimeter sheet as the height of the R wave relative to the isoelectric plateau immediately preceding the QRS complex of standard lead II (RDII). Maximal RDII (RDIImax) and minimal RDII (RDIImin) were determined over the same respiratory cycle. ΔRDII was then calculated as 100x[RDIImax-RDIImin]/([RDIImax+RDIImin]/2. ΔRDII and ΔPP were simultaneously recorded.
Results and Discussion: There was a statistically significant relationship between ΔPP and ΔRDII (r = 0.79, p < 0.01) (Figure 1). The threshold ΔRDII value of 13 % allowed discrimination between patients with a ΔPP > 13 % (n = 12) and patients with a ΔPP ≤ 13 % with a sensitivity of 89 % and a specificity of 88 %.







Conclusion(s): ΔRDII and ΔPP are related in this setting. This new index may have potential clinical applications.

3AP1-10

Pulse rate variability corresponds with heart rate variability in the evaluation of autonomic function

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Background and Goal of Study: Autonomic dysfunction is associated with perioperative complications, such as hemodynamic instability, mainly because of loss of autonomic reflexes. According to international standards, autonomic function is assessed by heart rate variability (HRV) calculated from R-R intervals obtained with an electrocardiogram (ECG). However, intraoperative movement artifacts and electrical interference due to diathermy may complicate R-wave detection. Pulse rate variability (PRV) derived from continuous blood pressure measurements may provide a feasible alternative for HRV with less sensitivity to perioperative environmental disturbances. In this study we therefore aim to investigate whether PRV derived from non-invasive blood pressure waveforms is comparable to traditional HRV obtained with ECG.
Materials and Methods: To test our hypothesis we studied healthy male subjects during 5 minutes of spontaneous breathing in the supine position. R-R intervals and non-invasive blood pressure waveforms were recorded simultaneously using an ECG monitor and a plethysmography-based blood pressure measurement device (Nexfin, BMEYE, Amsterdam, the Netherlands). HRV and PRV were analyzed offline by spectral analysis (Fast Fourier transformation), which determines variability as a function of frequency. The power was calculated in three frequency bands: very-low-frequency (VLF; 0-0.04 Hz), low-frequency (LF; 0.04-0.12 Hz) and high-frequency (HF; 0.12-0.40). Correlation and level of agreement between ECG and Nexfin were analyzed using Spearman's correlation coefficient and Bland-Altman plots. Values are represented by mean±SD.
Results and Discussion: Twenty subjects aged 24±5 years were included. Correlation coefficients between HRV and PRV were 0.998 in the VLF and LF band and 0.993 in the HF band (all P<0.01). The bias, limits of agreement (LOA) and percentage errors are shown in Table 1.

Table 1. Results of Bland-Altman analysis

	Bias±SD (ms^2)	LOA (ms^2)	Percentage error (%)
VLF	-12±34	-80 to 56	3
LF	-5±76	-154 to 145	9
HF	-348±509	-1345 to 650	29

Conclusion(s): Our data show that PRV derived from non-invasive blood pressure waveforms obtained with the Nexfin corresponds well with traditional HRV derived from ECG. These results indicate that under standard conditions blood pressure waveforms may replace HRV in the evaluation of autonomic function and that the use of PRV in the perioperative setting should be further evaluated.

3AP2-1

Automated real-time capture of anaesthetic drug administration data using barcodes, weighing scales and a robotic syringe handler: Insurmountable problems with weighing scales

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Background and Goal of Study: A system of automated real-time capture of drug administration data during anaesthesia has previously been reported[1]. Drugs are identified using barcodes printed on sticky labels placed on syringes. Doses administered are calculated from changes in weight of the syringe and knowledge of drug concentration. A simple robotic device returns each syringe to the storage tray after weighing. The information is printed as it is generated and printed again in summary form at the end of the case. It is also stored for later retrieval. In the previous study, accuracy was demonstrated in recording drug-name and administration-time, but accuracy of drug dose given was not reported. Small changes in the software and hardware of the device have been made in a continuous development process attempting to improve the accuracy of the device. This study compared the dose of drug recorded by the system with the dose reported by the anaesthetist (the author), to assess the accuracy of drug dose estimation and to investigate whether the device was becoming more accurate over time.
Materials and Methods: The device was used during 64 inductions of anaesthesia during a 12-month period. A note made of the differences between the dose on the printed summary information and the dose recorded on the hand-written anaesthetic chart. The results were analysed by dividing the study period into 5 epochs of 11 weeks, and trends in accuracy were sought. Dose records were rejected if they were zero or negative, or were inaccurate by more than one decimal order. The rest (termed "good" results) were divided into absolutely accurate, accurate within 10% of the true dose or accurate within 25% of that dose.
Results and Discussion: Results are shown in Table 1.

Epoch	No of patients	No of readings	No of good readings	No of accurate readings (percent of good readings)	No of readings accurate to within 10% (percent of good readings)	No of readings accurate to within 25% (percent of good readings)
1	9	94	75	32 (42)	45 (60)	54 (72)
2	14	138	122	60 (49)	74 (60)	84 (68)
3	14	131	122	80 (65)	91 (74)	104 (85)
4	19	185	165	92 (55)	116 (70)	138 (83)
5	8	92	88	32 (36)	46 (52)	66 (75)
Totals	64	640	572	296 (51)	372 (65)	446 (77)

Conclusion(s): There was no trend towards improved accuracy over time. I conclude that using weighing scales to measure drug dose involves insurmountable sources of inaccuracy.

Reference:

1 Read M. A system for automated real-time capture of drug administration data. *Eur J Anaesthesiol* 2004; 21: A101, p 25.

3AP2-2

Influences of methane in concentration determination of volatile anesthetics

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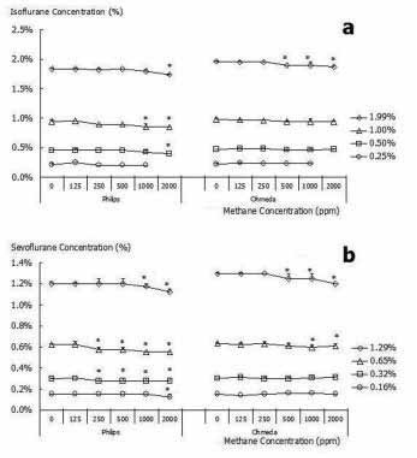
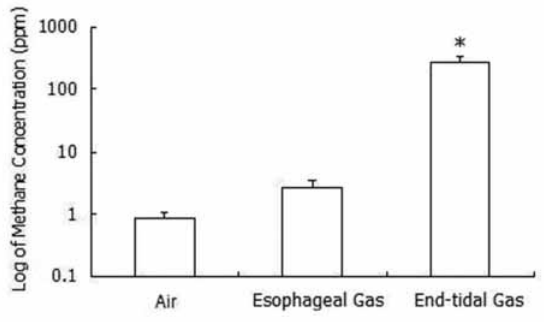
Background and Goal of Study: It is very important to real-timely and accurately measure concentrations of volatile anesthetics by using Anesthetic Gas Module (AGM) for proper anesthetic depth evaluation. However, methane, which be produced in digestive tracts of human and animals, might influence concentration determination of volatile anesthetics. It is induced by some AGMs using 3.3 μm infrared ray and methane also absorbed at 3.3 μm infrared ray. Therefore, we investigate if methane affect concentrations determination of volatile anesthetics.
Materials and Methods: In vitro study, different concentrations isoflurane and sevoflurane, were mixed with different concentrations methane. Concentrations of the mixed gases were measured by Datex-ohmeda AGM-103 (10.3-13 μm infrared ray), Philips M1026B (3.3 μm infrared ray) AGM and Aglient 4890D Gas Chromatograph, respectively. In vivo study, methane concentrations in end tidal gas of goats and human were measured by the gas chromatograph.
Results and Discussion: No differences were found in the concentrations determination of the mixed gases measured by the two AGMs and the Gas Chromatograph. The concentration measurement of volatile anesthetics would not be affected by methane when the methane concentration was less than 500 ppm in using Datex-ohmeda AGM-103, compared to 1000 ppm (isoflurane) or 250 ppm (sevoflurane) for Philips M1026B. In goats, the methane concentration of the end tidal gas was much higher than that of esophageal gas (280.8 vs. 2.70 ppm). In healthy human volunteers, there is a very low methane concentration of the end tidal gas (1.06 ppm).





Conclusion(s): When using the two AGMs, concentrations determination of isoflurane and sevoflurane were dose-dependently influenced by methane. In general, in clinic and experimental states, concentrations determinations of isoflurane and sevoflurane were not affected by methane for their low concentration range.

3AP2-4

Automated anaesthetic drug dose recording system using radio frequency drug label reader, laser syringe length measurement, microprinter and mechanism to return syringe to tray

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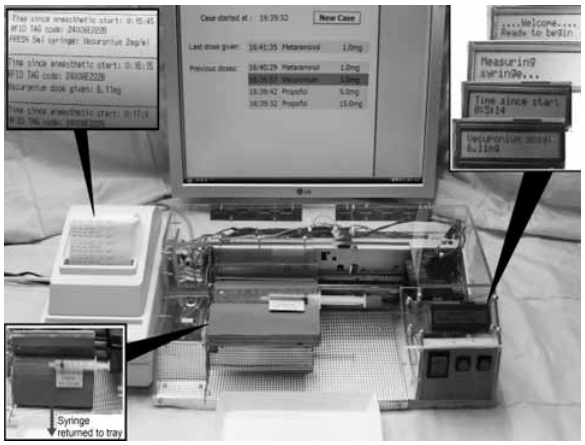
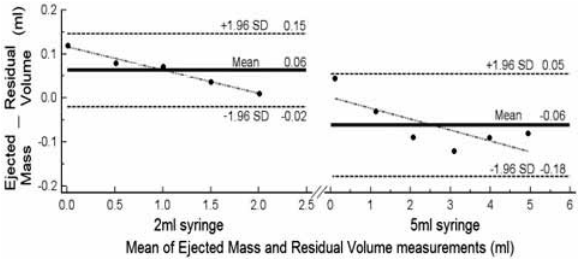
Background and Goal of Study: The "missing link" in true automated anaesthesia record keeping has always been the lack of automated drug dose recording – a technical challenge. A previous approach using bar-coded drug labels and weighing of syringes [1] was limited by the difficulty of recording small weight changes in the theatre environment. Study objectives were a new machine designed to read the syringe label via a different non-contact technique, and measure the volume of drug given using a less interference sensitive technology.

Materials and Methods: Syringe labels incorporated radio frequency "RFID" tags. Having remotely identified drug, concentration, syringe size from the unique RFID code, the length of the syringe was measured via moving laser beam. The dose given was calculated from the plunger movement versus its (remembered) previous position. The internal microprocessor had embedded "C" software – no "boot up" required. Drug doses and times were (i) were printed on a "till-roll" printer (ii) displayed on a screen (iii) sent via USB cable to a PC if desired (iv) "spoken" by machine to the user via speech synthesizer. Incremental doses of distilled water were ejected from 2 and 5ml syringes. The residual volume was measured using the device and mass of ejected water measured via high precision scales – resolution 0.01g (0.01 mL).



Results and Discussion: The device demonstrated a high level of agreement with the weighing method. The mean difference between the two methods was 0.06ml with +/-1.96SD limits of +0.15 to -0.02 for the 2ml syringe and -0.06ml with +/-1.96SD limits of +0.05 to -0.18 for the 5ml syringe.



Conclusion(s): Technically the device worked well and would be accurate enough for clinical use. We intend to evaluate it with a wider range of syringe sizes and types followed by a clinical evaluation. It may also have potential in anaesthesia simulator systems.

Reference:

1 *EJ Anaesthesiol* 2004: 21(S32); A101.

3AP2-5

Mustimeg's precision and accuracy compared to mechanomyography

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Background and Goal of Study: Mechanomyography (MMG) is the gold standard for neuromuscular transmission monitoring but is not suitable for daily practice. The goal of this study is to assess the performance (precision and accuracy) of a new device using electromyography (EMG).

Materials and Methods: Mustimeg is the combination of a standard nerve stimulator and an EMG acquisition channel, including 50 Hz noise and stimulation artefact suppression (MDB Engineering, Belgium). After Ethical Committee approval and written informed consent, 19 ASA I-II patients undergoing lower limb surgery were included in the study. The ulnar nerve was stimulated supramaximaly at the wrist (train-of-four (TOF) every 15 seconds). The temperature remained stable. The hand was firmly installed on a board to monitor the thumb force of adduction (with 250 g preload) (Myograph 2000, Biometer, Denmark). Mustimeg recorded simultaneously the adductor pollicis EMG through surface electrodes (Kendall Care, Tyco healthcare, USA) and the MMG analog signal. After induction of anaesthesia and EMG/MMG initial calibration, 0.3-0.45 mg/kg of rocuronium were injected. The neuromuscular block recovered spontaneously until a stable final baseline. 3 parameters described its evolution: the time between the injection and the T1 95% depression (Onset), until the T1 25% recovery (Dur T 25), and until TOF ratio 0.9 (Dur TOF 0.9). The agreement of both monitoring was evaluated by the concordance correlation coefficient (1): $\rho c = \rho.Cb$ where ρ is the Pearson correlation coefficient, which measures how far each observation deviates from the best-fit line (measure of precision) and Cb a bias correction factor that measures how far the best-fit line deviates from the 45° line through the origin (measure of accuracy).

Results and Discussion: Results are expressed as mean ± SD, time in minutes:seconds. The concordance between both techniques was poor for onset (longer with EMG, especially for low dose blocks), but excellent for the recovery parameters.

	Onset EMG	Onset MMG	Dur T 25 EMG	Dur T 25 MMG	Dur TOF 0.9 EMG	Dur TOF 0.9 MMG
time	02:14 ± 01:50	01:26 ± 00:37	28:10 ± 11:29	30:04 ± 12:07	62:50 ± 29:12	67:31 ± 33:25
ρ	0.525	0.991	0.983			
Cb	0.507	0.985	0.979			
ρc	0.266	0.976	0.963			

Conclusion(s): The Mustimeg EMG performance is close to the MMG during neuromuscular block recovery.

Reference:

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3AP2-6

Mustimeg's repeatability compared to mechanomyography

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Background and Goal of Study: Mechanomyography (MMG) is the established standard for neuromuscular transmission monitoring but is not suitable

for daily practice. The goal of this study is to assess the repeatability (internal consistency) of a new device using electromyography (EMG).

Materials and Methods: Mustimeg is the combination of a standard nerve stimulator and an EMG acquisition channel, including 50 Hz noise and stimulation artifact suppression (MDB Engineering, Belgium)(1). After Ethical Committee approval and written informed consent, 18 ASA I-II patients undergoing lower limb surgery were included in the study. During propofol and sufentanyl anaesthesia, the patients were ventilated through a laryngeal mask. The ulnar nerve was stimulated supramaximaly at the wrist (train-of-four (TOF) every 15 seconds). The temperature remained stable during the measurements. The hand was firmly installed on a board to monitor the thumb force of adduction (with 250 g preload)(Myograph 2000, Biometer, Denmark). Mustimeg recorded simultaneously the adductor pollicis EMG through surface electrodes (Kendall Care, Tyco healthcare, USA) and the MMG analog signal. After the stabilisation of the responses and initial calibration, 0.3-0.45 mg/kg of rocuronium was injected and the trachea intubated. The neuromuscular block recovered spontaneously until a stable final baseline. During the initial baseline, we analysed the variability of 10 successive EMG and MMG recordings. Repeatability coefficients (2) and their standard errors were estimated with within-subject standard deviation obtained from analysis of variance, and compared using z test. After obtaining a stable final baseline, we compared the initial and final mean values of T1 and TOF ratio using paired t test.

Results and Discussion: The results showed no statistically significant difference between the repeatability coefficients of EMG compared to MMG. The final baselines were statistically different from the initial ones, but that lack of recovery did not differ between EMG and MMG.

	repeat coeff	Initial baseline	Final baseline
T1 EMG	2.805 ± 0.429	99.86 ± 0.84	95.05 ± 8.37
T1 MMG	3.724 ± 0.570	99.98 ± 1.33	96.61 ± 6.44
TOFr EMG	4.031 ± 0.617	102.27 ± 1.79	99.79 ± 3.17
TOFr MMG	3.038 ± 0.465	98.25 ± 2.57	95.32 ± 3.73

Conclusion(s): The repeatability of Mustimeg's twitch height and TOF ratio measurements were of the same magnitude than MMG.

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1 Jaumain M. et al. EJA 2009;26 Sup 45:31.
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3AP2-7

A novel method to detect accidental oesophageal intubation based on ventilation pressure waveforms

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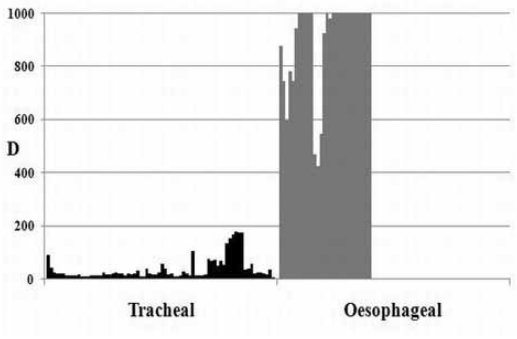
Background and Goal of Study: Emergency prehospital intubation may result in accidental oesophageal intubation in up to 17% of patients, causing significant morbidity and mortality. There is no single highly sensitive and specific method of detecting accidental oesophageal intubation in prehospital emergency conditions, especially during cardiac arrest. The aim of our study was to develop a method of differentiating oesophageal from tracheal intubation based on ventilation pressure profiles.

Materials and Methods: After obtaining institutional approval and informed consent, 25 patients undergoing elective surgery were enrolled to compare oesophageal and tracheal ventilatory pressure waveforms. Fifteen patients were tracheally intubated with an endotracheal tube; ten patients were intubated in the oesophagus using an Easytube® (Rüsh). In all patients, a thin air-filled catheter was inserted, with its tip 1cm from the distal end of the tube, and connected to a pressure transducer. At the same time, pressure was recorded at the proximal end of the tube. For every ventilation cycle, the peak temporal pressure gradient dP_{distal}/dt at insufflation, the coincidental distal pressure (P_{distal}) and the spatial pressure gradient (dP/ds) were calculated. A determinant $D = [dP_{distal}/dt] * P_{distal} / (dP/ds)$ was defined.

Results and Discussion: The figure shows D-values recorded from 15 patients in whom 81 episodes of tracheal ventilation were assessed and from 10 patients in whom 31 episodes of oesophageal ventilation were assessed. During all episodes of oesophageal ventilation D-values were >400 (range 423–2105), whereas during tracheal ventilation all D-values were < 200 (range 5-180). This new method of detecting oesophageal intubation relies on the difference in compliance of lungs/chest and the oesophagus. The technology can be easily integrated in mechanical ventilators or developed as a stand alone device. Additional advantages of this method are that it is user-independent and provides a diagnosis within seconds.



Conclusion(s): In patients undergoing elective intubation in the operating theatre, analysis of ventilation pressure profiles discriminated between tracheal and oesophageal intubation with high accuracy.

3AP2-8

Target controlled infusion – A new mathematical algorithm to control the plasma concentration

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Background and Goal of Study: Target Controlled Infusion (TCI) systems are widely used in clinical anaesthesia practice. They incorporate drugs' pharmacokinetic/pharmacodynamic (Pk/Pd) models and an algorithm to drive the infusion devices (ID). Aiming at improving TCI practice, we developed a new mathematical algorithm (NA) to control the plasma concentration (Cp) to be used in TCI. The goal of the present study was to assess the performance of this NA in simulation mode.

Materials and Methods: Several algorithms have been proposed for Cp control[1]. We took Shafer's and Poucke's[2] analytical solution, which use a matrix based control rule and developed a NA, based on continuous model (CM): dx/dt = A*x(t) + B*dose(t) y(t) = C*x(t) Where: A = [-(k10+k12+k13) k21 k31 k12 -k21 0 k13 0 -k31] B = [1 0 0] C = [1 0 0] x(t) = [Cp(t) C2(t) C3(t)] Conversion of the CM in space states (ss) to discrete being Cp as output: X(k+1) = F*X(k)+G*DOSE(k) Cp(k)=H*X(k) Equating the ss model in order to the input *dose(i)* it is possible to know the exact value of the *dose(i)* to obtain the next *Cp:* Dose(i)=0.36*inv(H*G)*(Cpt*1000*V1-H*F*X) Where: V1= PatientWeight*Vc kn and Vc: Pk/Pd parameters The NA was implemented in Anaesthesia Synchronization Software[3] (ASYS), and its performance compared with Rugloop© I, a software that uses a different mathematical algorithm for Cp control. The Pk model used was Marsh's for propofol. A 70kg male was considered in the simulations. The experimental protocol used was: an initial propofol target Cp was set at 3µg/ml and kept until steady state was reached at which point it was changed to 5µg/ml and kept until steady state was reached.

Results and Discussion: Predicted infusion volumes and rates, estimated Cp did not differ between ASYS with the NA and Rugloop© I, fig.1.

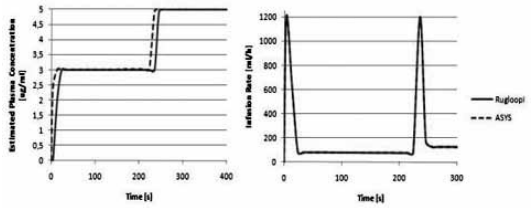

Fig.1- (a) Estimated Plasma Concentration at Rugloop I and ASYS (b) Infusion Rate administration in Simulation mode by Rugloop I and ASYS.

Conclusion(s): Our algorithm is mathematically simpler then most of the existing algorithms and the results shown that it performance accurately. The fact it is simpler may offer advantages when used in the clinical setup to control ID; tests will be needed to fully assess it.

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2 Van Poucke, G. E. ET all, IEEE Trans Biomedical Eng, Vol.51(11), 2004.
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3AP2-9

Venovenous bypass does really improve splanchnic perfusion? Tonometric evaluation

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Background and Goal of Study: Gastric tonometric parameters (pHi, pr-paCO2) appear to be sensitive markers of splanchnic hypoperfusion and good predictors of poor outcome in critically ill patients. The aim of the present study was to evaluate if the veno-venous bypass may affect tonometric parameters during anhepatic phase of orthotopic liver transplantation.

Materials and Methods: We retrospectively reviewed 35 patients undergone liver transplantation in the last year. Demographic data, MELD and Child-Pugh status were registered. Patients were grouped in venovenous bypass (BP, 20 pts) and non venovenous bypass groups(NBP, 15 pts). During preanhepatic, anhepatic and postreperfusive phase of transplantation we recorded hemodynamic and respiratory data including continuous cardiac output and tonometric pHi, Pr-PaCO2. Analysis of tonometric parameters were performed by 2-way ANOVA for repeated measures

Results and Discussion: Phi significantly decreased in the anhepatic phase both in BP group (baseline7.36 ± 0.02 vs 7.20±0.05, p<0.05) and in NBP group (baseline 7.34±0.03 vs 7.22±0.04, p<0.05) when compared to preanhepatic values. On the contrary pHi in the anhepatic phase didn't show a statistically significant difference between the 2 groups. Pr-PaCO2 showed a relevant increase in the anhepatic phase compared to preanhepatic both in BP group (18±3.7 vs 44.5±10.4, p<0.05) and in NBP (10.3±3 vs 32±6.2, p<0.05); but this anhepatic increase wasn't statistically significant comparing the 2 groups. In postreperfusive phase we observed a recovery towards baseline values of tonometric data in both groups: Phi (BP): 7.30±0.04 vs (NBP) 7.31 ±0.03; Pr-PaCO2 (BP): 15±5.2 vs (NBP) 15 ±3.5. Cardiac output during anhepatic phase wasn't affected by venovenous bypass (BP: 9.7 ± 0.75 vs NBP 8.8±1.2).

Conclusion(s): Venovenous bypass doesn't improve splanchnic perfusion as assessed by gastric tonometry.

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2 Ivatury RR, Simon RJ, Islam S, Fueg A, Rohman M, Stahl WM: A prospective randomized study of end points of resuscitation after major trauma: global oxygen transport indices versus organ-specific gastric mucosal pH. *J Am Coll Surg* 1996, 183:145-154.]

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3AP2-10

The change in preload modulates the characteristics of second derivative photoplethysmogram in healthy volunteers

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Background and Goal of Study: The second derivative of the finger photoplethysmogram (SDPTG) is obtained from double differentiation of the finger photoplethysmogram and has been reported to provide much information relating to arterial structure and function (1). On the other hand, the contour of pulse wave can be sensitive to changes in preload as a result of the changes in stroke volume (2) or respiratory fluctuation of pulse wave (3). Thus, we hypothesized that the characteristics of SDPTG can be affected by the changes in preload.

Materials and Methods: Fifteen healthy volunteers (age: 28±2 years, range 22±32, 6 males) participated in this study. This study was approved by the ethics committee of Aichi Medical University and written informed consent was obtained from all participants. After lying on a bed for 5 min, a photoplethysmogram probe was placed on the second finger of the left arm of the participants. APG Heart Rator SA-3000P (Tokyo Iken, Tokyo, Japan) was used for the recording and calculation of SDPTG. Then the participants were allowed to stand up. After being in upright position for 5min, the SDPTG was recorded again. The SDPTG consists of 4 waves in systole ('a', 'b', 'c', and 'd' waves) and 1 wave in diastole ('e' wave). The excursion of each wave from the baseline was measured and the relative height to wave 'a' was calculated and compared between supine and upright position.

Results and Discussion: The b/a and c/a ratios of the SDPTG significantly increased during upright position. However, d/a and e/a ratio were not affected by upright position.

The comparison of SDPTG before and after upright position

	supine	upright
b/a	.89 ± .09	1.17 ± .11*
c/a	.1 ± .09	0.28 ± 0.17*
d/a	.13 ± .12	.20 ± .14
e/a	.5 ± .06	.5 ± .0.07

*:p<0.05 vs supine.

Conclusion(s): The characteristics of SDPTG is modulated by the changes in preload. The b/a and c/a ratio of SDPTG may be potential index to evaluate preload.

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3AP2-11

EMG monitoring on the hand: To maximize or to minimize distance between electrodes and wrist?

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Background and Goal of Study: The peripheral nerve stimulation is used in daily practice to evaluate neuromuscular relaxation. Among factors influencing muscle response, there are the location, the polarity and the intensity of the stimulation current. Previous studies recommend to locate the cathode in distal position, and distant to the wrist to avoid direct stimulation and stimulation artifact (ArtSt) [1, 2]. We studied the influence of the Cathode-Wrist Distance (CWD) on the current threshold (I_{TH}) to obtain a stabilization of the maximal EMG response. ArtSt amplitude will also be investigated.

Materials and Methods: MUSTIMEG[3] was used to stimulate the ulnar nerve by rectangular pulses (200 µs) and to record the evoked EMG on the hypothenar muscle in 10 informed volunteers. Cathode is keeping in distal position along ulnar nerve and the CWD is progressively increased with a constant inter-electrode distance of 3cm. For each electrodes configuration, stimulation intensity is progressively increased from 0 until a stable maximal response is reached. We compared the I90 (the current to obtain 90% of the maximal response) for 3 CWD using the Wilcoxon signed rank test.

Results and Discussion: Fig1: a typical result of the CWD influence on I_{TH}. Fig2: the influence of CWD on the ArtSt amplitude with a constant stimulation current. Tab1 presents the distribution of I90 for three CWD. The 3 CWD induced statistically significantly different I90 intensity (p=0.005 for all comparisons: cwd3<cwd6<cwd9). With a CWD of 9cm, a stabilization of EMG response was no longer obtained for one patient despite a stimulation current of 80 mA.

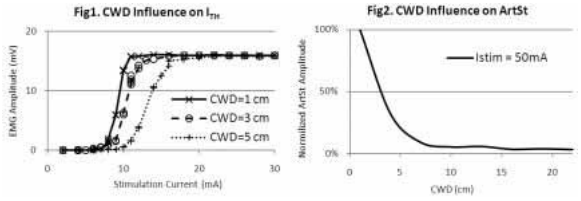

Table1. I90 Distribution

n=10	I90 (CWD=3cm)	I90 (CWD=6cm)	I90 (CWD=9cm)
Mean (mA)	22.44	32.82	42.28
StD (mA)	9.27	11.93	14.4
Min (mA)	13.11	18.5	24.48
Max (mA)	42	62	80

Conclusion(s): Increasing CWD decrease ArtSt disturbances but require a higher intensity to obtain a maximal EMG response. An optimal approach for further developments might be to lower CWD and to subtract the ArtSt from the recorded EMG.

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1 Smans J et al. J. Clin. Monit. Comput. 1996;13:9-20.

2 Fuchs-Buder T et al. Acta Anaesthesiol. Scand. 2007;51:789-808.

3 Jaumain M et al. Eur. J. Anaesthesiol. 2009;26 Sup 45:31.

3AP3-1

Impact of age using midlatency auditory evoked potentials during anesthesia with propofol and remifentanil in children

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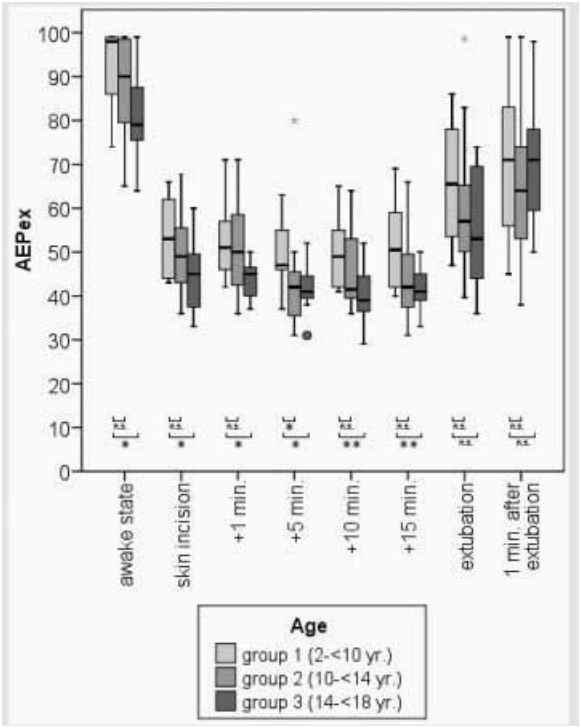
Background and Goal of Study: The Auditory evoked potential index (AEPex) has been promoted as AEP-based anaesthesia depth monitor. The EEG changes with brain maturation, but there are limited published data describing the characteristics of midlatency auditory evoked potentials (MLAEP's) in children, and some data suggest that MLAEP's are less reliable in young children.

The aim of this study was to compare the performance of the AEPex as a measure of anaesthetic effect in different age groups.

Materials and Methods: With approval of the local ethic committee 35 children (age range 2-17 years, mean 11,2 ± 4,7 years) were included in a prospective observational study. Neurological disease or hearing deficits was an exclusion criterion. Anaesthesia was maintained using propofol and remifentanil. The remifentanil infusion rate was kept constant with 0.2 mcg/kg/min., whereas propofol was adjusted according to clinical needs by an anaesthetist blinded to AEP monitoring. The AEPex was recorded at the awake (unpremedicated) state, intraoperative state (defined as measure-points during skin incision, 1, 5, 10 and 15 min. after incision, respectively) and at emergence (during and 1 min. after extubation). For analysis children were divided into three age groups: gr. 1: 2-<10 yr. (n = 12), gr. 2: 10-<14 yr. (n = 12), gr. 3: 14-<18 yr. (n = 11). A Mann-Whitney-U-test was used for inter-group comparison; significant for p=<0.05 (*) or 0.01 (**).

Results and Discussion: The AEPex decreased significantly as age increased in children (Figure 1). The AEPex values at awake and intraoperative state were significantly higher in the 2-<10 yr. age group compared to the 14-<18 yr. age group (awake p=0.05; for all measure-points at intraoperative state p=<0.04). The interquartile range tended to be larger in younger children. During emergence differences between the groups were not significant. Recommended depth of anaesthesia values (by the manufacturer: 30-45) were only reached in the 10-<14 and 14-<18 yr. age group.



Conclusion(s): This preliminary study suggests that age has a significant impact on the AEPex in the awake and intraoperative state in children. Age-related processing algorithms of the MLAEP should be implemented.

3AP3-3

Surgical Pleth Index to assess the anti-nociceptive component of general anaesthesia: Comparison with haemodynamic parameters and identification of confounding factors

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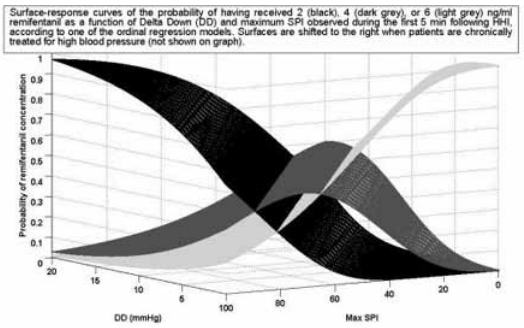
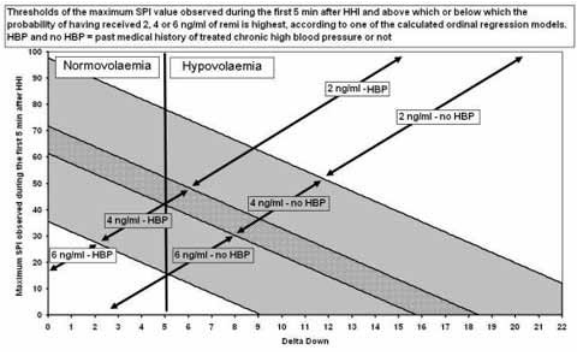
Background and Goal of Study: The Surgical Pleth Index (SPI) is proposed to assess anti-nociception during general anaesthesia(1). We compared its accuracy with that of haemodynamic parameters and identified factors that may confound its interpretation.

Materials and Methods: After IRB approval, 30 ASA I-II consenting patients scheduled for intracranial surgery received general anaesthesia based on propofol (ppf) – remifentanil (remi) TCI's. The propofol target was 3 µg/ml for all of them. They were randomly and blindly assigned to three groups, according to the target concentration of remi (2, 4, or 6 ng/ml). Both targets were achieved before head holder insertion (HHI). Volaemic status was assessed using the Delta Down(2) immediately before HHI. SPI, heart rate (HR), and mean arterial pressure (MAP) were continuously recorded. Stepwise ordinal regressions were performed to assess the effect of volaemia, and medical history of treated high blood pressure on the ability of SPI, MAP, and HR to appropriately predict the remi target.

Results and Discussion: HHI was associated to an increase in SPI, MAP and HR, more marked at low remi concentrations. The accurate prediction rate of the remi target, based on the highest (max) SPI, MAP or HR observed during the first five min after HHI was 0.5, which is better than chance in a 3 options design. It rose up to 0.6 when each model took additionally into account volemia and chronic therapy for high blood pressure. When max SPI, MAP and HR models combining those factors were concordant, the accurate prediction rate was 0.8.

Conclusion(s): The capacity of SPI to predict patient analgesic regimen during anaesthesia is equivalent to that of MAP and HR, and is improved by taking into account volaemia and chronic anti-hypertensive treatment. Combining SPI with MAP and HR offers the best accurate prediction.





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3AP3-4

Influence of electrode position on nonlinear EEG analysis: An example with approximate and cross approximate entropy

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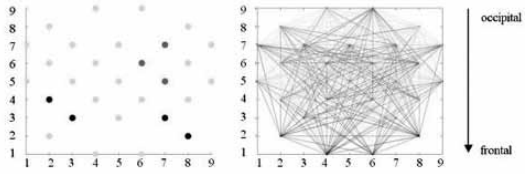
Background and Goal of Study: Aproximate Entropy ApEn evaluates signal complexity. The more chaotic a signal, the higher its ApEn. Research has shown that ApEn shows good performance distinguishing different anesthetic levels, but separation between consciousness and unconsciousness is less than ideal [1]. These results had been obtained from frontal EEG channels. We analyzed 29 EEG channels distributed over the entire scalp with the aim to detect more suitable electrode positions. In addition, we calculated Cross Approximate Entropy XApEn, a modification of ApEn [2] evaluating spatial synchrony between two EEG channels.

Materials and Methods: EEG was recorded from 13 volunteers undergoing propofol or propofol-remifentanil anesthesia on 29 channels with 1kHz and down sampled to 200Hz. 60s EEG was extracted from stable levels "awake" and "unconscious" for analysis. ApEn (m=1, r=20%SD) was calculated for every channel. XApEn (m=1, r=20%SD) was calculated over all channel combinations. PK analyis was used to evaluate the parameters performance to differentiaite levels "awake" and "unconscious".

Results and Discussion: Maximum PK for ApEn analysis was 0.83 (C4), and it was 0.93 for XApEn (CZ-CP6). PK(ApEn) for FP1/FP2 was 0.72 /0.71. PK (XApEn) was below 0.8 for channel combinations involving frontal electrodes (FP1/FP2). Figure1: PK for single channel (ApEn, left) and all channel combinations (XApEn, right). Red dots/lines indicate 0.5≤PK<0.6; yellow represents 0.6≤PK<0.8 and green indicates PK≥0.8.



Conclusion(s): Analyzing EEG with entropy parameters seems to be promising. The performance of ApEn can be improved by using other than frontal EEG positions. Electrodes are easy to place on the forehead, but distortions, e.g. eyeblinks or EMG, have more influence on this positions than on electrodes placed parietal. Evaluating spatial EEG processes with XApEn seems to be superior to ApEn, if suitable channel combinations are selected.

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1 Biomed Tech 2006; 51: 89-94.
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3AP3-5

The influence of electroencephalogram entropy monitoring in anesthetic management during bariatric surgery

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Background and Goal of Study: Monitoring of anesthetic depth arises like a necessity to adapt the administration of anesthetic drugs to avoid the injurious effects of the overdosage or an insufficient anesthesia. Entropy monitoring is based on the processing of the signal spectrum of electroencephalogram. In the morbid obese patient, pharmacokinetics and farmacodynamics of drugs can be altered and the anesthetic management can be difficult and unpredictable. It is necessary to individualize the anesthetic dose in order to obtaining an anesthetic depth. The object of this work is to value if entropy monitoring can influence in anesthetic management during open by-pass gastric surgery.

Materials and Methods: A prospective and randomized study was designed (n=20). Two groups were formed: Group A in which the anesthetic drug administration was guided through the values of the Entropy monitor (S/5 Entropy ModuleTM, Datex Ohmeda Division Instrumentarium Corp. Helsinki, Finland). And Group B in which the classic clinical criteria of control of the anesthetic depth were used. Entropy data were registered by an independent observer at the end of the procedure. Variables of the study were: sevoflurane MAC average, fentanyl standardized consumption, anesthetic recovery times, inadequate entropy values, and awareness incidence. A descriptive study for numerical variables was realised (average, standard deviation and rank). The nonparametric test of Kruxkall Wallis was used. XX2 of Pearson and the exact test of Fisher for qualitative variables were applied. It was considered statistically significant p< 0,05.

Results and Discussion: There were not significant differences in demographic data, haemodynamic parameters and entropy values. Sevoflurane MAC average, fentanyl standardized consumption and anesthetic recovery times were similar in both groups. Patients in group B showed inadequate entropy values during the maintenance of anesthesia (diference was statistically significant between groups). There was not awareness episodes.

Conclusion(s): The use of the Entropy monitor has not supposed a modification neither in the used doses of the anesthetic drugs nor in the anesthetic recovery times. Awareness episodes were not registered. The high number of inadequate values of entropy during the anesthetic maintenance in group B, indicates excessively superficial and deep anesthetic planes. This monitor of anesthetic depth would allow a more precise adjustment of the anesthetic agents within the dynamic context of the surgical procedure.

3AP3-6

The use of entropy and bispectral index in the monitoring of CNS reaction during introduction to general anaesthesia and airway management

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Background and Goal of Study: The Entropy™ Modules of anaesthesia: state entropy (SE) and response entropy (RE), also Bispectral index (BIS) are widely used for assessment of depth of anaesthesia. The **aim** of this study was to evaluate the informative significance of entropy (SE, RE) in comparison with BIS-method in similar groups of patients during introduction of anaesthesia and airway management.

Materials and Methods: After the local Ethics Committee approval 60 patients for elective gynaecological surgery, ageing 33-59 (ASA I-II) were randomised in two groups. Anaesthesia was induced with midazolam 2.5 mg, propofol 2 mg/kg, cisatracurium 0.15 mg/kg, fentanyl 0.0025 mg/kg (group A, n=30). Control group B (n=30) instead of fentanyl received normal saline. Airway management was realized with tracheal intubation (TI; n=10 A; n=10 B), intubating laryngeal mask airway (ILMA; n=10 A; n=10 B) and laryngeal tube (LT; n=10 A; n=10 B). Comparative SE, RE, BIS values as well as systolic (SBP), diastolic (DBP), mean arterial blood pressure (MAP) and heart rate (HR) were obtained at four moments: M_1 = immediately before induction; M_2 = immediately before airway management; M_3 = one minute after airway management and M_4 = three minute after airway management. The data were analysed with unpaired t-test and confidence interval analysis.

Results and Discussion: BIS, SE and RE decreased with induction of anaesthesia. There was a significant correlation between BIS and both RE and SE. BIS values were higher than SE and RE ($p<0.05$). There was no a significant difference during airway management between TI, ILMA and LT groups in group A. In A group SE (34±3) and especially RE (36±2) were significantly lower than in the B group at the tracheal intubation (TI) procedure, by 11% and 22% lower correspondingly ($p<0.05$). Haemodynamic differences were less. BIS, SE and especially RE increased at the M_3 moment to compare with M_2 in the B group only. Similar results were in the ILMA group but not in LT group. After beginning of sevoflurane inhalation the entropy, BIS value and haemodynamic parameters decreased gradually in both groups and became similar after 3 min.

Conclusion(s): Entropy, especially RE value was the most informative test for evaluation of depth of anaesthesia in comparison with BIS. All values during airway management confirmed that injection of fentanyl in dose 0.0025 mg/kg was effective to suppress the CNS responses to the noxious stimulation, induced by airway management, especially tracheal intubation.

3AP3-8

Bispectral index and effect-site concentration of propofol during propofol-remifentanil anesthesia for scoliosis surgery with intraoperative wake-up test

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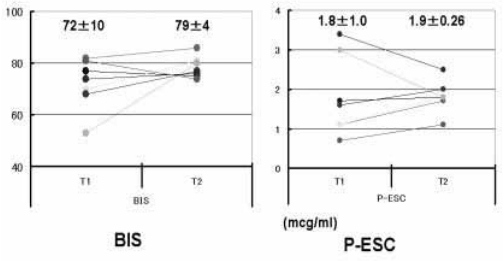
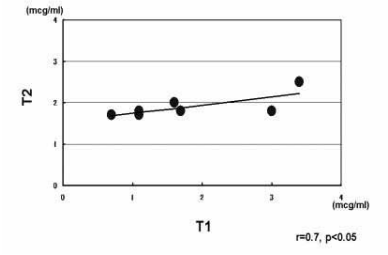
Background and Goal of Study: The intraoperative wake-up test has been used to monitor spinal cord injury during scoliosis surgery. However, rapid emergence of anesthesia may induce postoperative recall and body movement during wake-up test. So, early detection of emergence from anesthesia and then re-induction of anesthesia need to prevent those complications. We evaluated the bispectral index (BIS) and effect-site concentration of propofol (P-ESC) during propofol-remifentanil anesthesia with wake-up test.

Materials and Methods: Seven patients(aged 14±2yr) who underwent scoliosis surgery with wake-up test were analyzed retrospectively. Anesthesia was induced and maintained with propofol (TCI; Deprifuser) and remifentanil. The intraoperative monitoring included BIS, somatosensory evoked potentials (SSEP) and motor evoked potential (MEP) in addition to routine monitoring. BIS and P-ESC were compared at the induction of anesthesia (T1; loss of consciousness) and at purposeful movement to command during the wake-up test (T2). Statistical analysis used a Wilcoxon test and linear regression analysis. $P<0.05$ was considered significant.

Results and Discussion: There were no significant differences between T1 and T2 on either BIS or P-ESC (Fig.1). Linear regression analysis showed a significant correlation of T1 and T2 with P-ESC($r=0.7$, $p<0.05$, Fig.2), but no correlation with BIS($r=0.06$).





Conclusion(s): We conclude that P-ESC is useful to predict the response to verbal command during the wake-up test in scoliosis surgery.

3AP3-9

The reproducibility of non-standardized autonomic function testing in the preoperative assessment screening clinic

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Background and Goal of Study: Autonomic function testing to diagnose cardiovascular autonomic neuropathy (CAN) specifically requires standard environmental test conditions. Consequently, autonomic function testing is difficult to implement in preoperative patient assessment, although its predictive value for perioperative hemodynamic stability and complications due to CAN has been suggested. Here we aim to investigate whether the results of autonomic function testing under non-standardized conditions, which are better implementable during preoperative patient assessment, are comparable with test results obtained under standardized conditions.

Materials and Methods: Eighteen healthy male subjects (19-34 years) were studied during standard test conditions (08:00-10:30 a.m., quiet ambiance, temperature 19-22°C and overnight fasted). Autonomic function was assessed using an ECG-monitor and a continuous non-invasive blood pressure measurement device (Nexfin HD, BMEYE, Amsterdam, The Netherlands). Blood pressure and heart rate responses were measured during deep breathing (E/I-ratio (0.1 Hz)), Valsalva manoeuvre (Valsalva-ratio), sustained handgrip and after standing. Heart rate variability (HRV) analysis comprised evaluation of the very low (VLF; 0.0-0.04 Hz), low (LF; 0.04-0.12 Hz) and high frequency band (HF; 0.12-0.4 Hz) during 5 minutes at rest. All tests were repeated under non-standardized, non-fasted conditions between 12:00-04:00 p.m. Data are represented as mean ± SD and were analyzed by intra-class correlation (ICC).

Results and Discussion: ICC coefficients were calculated for all autonomic function tests under standard and non-standard conditions. The ICC for LF and HF were 0.78 (95%CI; 0.43-0.92) and 0.71 (95%CI; 0.36-0.88), respectively, whereas the ICC for VLF was 0.52 (95%CI; 0.08-0.79). The E/I-ratio revealed an ICC of 0.80 (95%CI; 0.53-0.92), the Valsalva-ratio ICC was 0.62 (95%CI; 0.20-0.84) and the handgrip test had an ICC of 0.61 (95%CI; 0.19-0.85). P<0.05 for all above mentioned ICC values. The ICC of the responses to standing was low and not significant.

Conclusion(s): We demonstrated in healthy volunteers that the reproducibility for most autonomic function tests under standardized and non-standardized conditions is clinical acceptable. In combination with the simplicity and the short duration of the function tests, these data suggest that implementation of autonomic function assessment may be feasible and of added value in preoperative patient risk assessment.

3AP3-10

Use of heart rate variability analysis to determine risk of perioperative cardiovascular events in patients undergoing general anaesthesia

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Background and Goal of Study: Patients with underlying cardiovascular disease are at high risk of perioperative cardiac events (CE) [1]. Previous pilot studies showed that heart rate variability (HRV) is useful to predict post operative CE [2]. This study investigated whether HRV in addition to Revised Cardiac Risk Index (RCRI) is suitable to predict CE.

Materials and Methods: 169 patients undergoing elective surgery were subdivided into 3 groups according to the RCRI: RCRI 1 (n=56), RCRI 2 (n=92) and RCRI 3 (n=20). Preoperatively, baseline HRV (Total Power (TP), Low Frequency (LF), High Frequency (HF), LF/HF ratio, Very Low Frequency (VLF)) was recorded. CE's were defined as: 1) ST segment depression or elevation in 24h Holter-ECG, 2) significant increase of CK/CK-MB, or 3) positive Troponin-T [3]. Blood samples were taken after surgery and 24h later. HRV and RCRI of patients without CE (n=158) were compared to patients with CE (n=11).

Results and Discussion: RCRI differed significantly in patients with CE: RCRI 1: 2 out of 56, RCRI 2: 4 out of 92, RCRI 3: 5 out of 20, p<0.05. Mean ICU stay of patients with CE was 5.6±3 days. Patients without CE were not admitted to the ICU. HRV analysis did not differ significantly: TP(no CE): 239±411*10³ vs. TP(CE): 427±427*10³; LF/HF(no CE): 3.2±3.4 vs. LF/HF(CE): 1.5±0.7; LF(no CE): 52±135*10³ vs. LF(CE): 128±135*10³; HF(no CE): 43±98*10³ vs. HF(no CE): 133±167*10³; VLF(no CE): 146±286*10³ vs. VLF(CE): 164±289*10³.

Incidence of cardiac events and mean ICU stay

	RCRI 1 (n=56)	RCRI 2 (n=92)	RCRI 3 (n=20)
CE	2	4	5
ICU (days)	0±0	1±2	5.6±3

Values are expressed as mean (± standard deviation); RCRI: revised cardiac risk index; CE: cardiac event; ICU: intensive care unit

HRV of group No CE vs. group CE

	no CE	CE
TP	239±411*10³	427±427*10³
LF/HF	3.2±3.4	1.5±0.7
LF	52±135*10³	128±135*10³
HF	43±98*10³	133±167*10³
VLF	146±286*10³	164±289*10³

Values are expressed as mean (± standard deviation), TP:Total Power; LF/HF: Low/High Frequency; LF: Low Frequency; HF: High Frequency; VLF: Very Low Frequency

Conclusion(s): Patients with RCRI 3 suffered from CE more often and demonstrated a significantly longer stay on the ICU. In contrast, pre-operative HRV did not show significant differences. Thus, only RCRI is a reliable marker for high cardiac risk in the course of anaesthesia and surgery.

References:

1 Lee TH et al. (1999) Circulation 100: 1043-9.
2 Hanss R et al. (2008) Anaesthesia 63: 1167-73.
3 Landesberg G et al. (2005) Anaesthesiol 19: 77-95.

3AP4-1

The value of the bispectral index as an early sign of perioperative stroke

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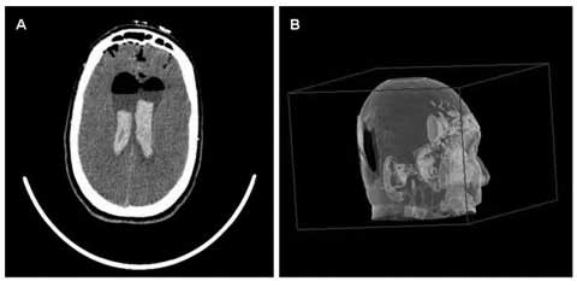
Background and Goal of Study: The use of the Bispectral Index (BIS) was originally developed as a monitor of anesthetic depth. However, recent studies have demonstrated that it may help provide an earlier indication of unfavourable neurological outcomes. Here we describe the case of a patient in which the BIS™ value helped to recognise an unfavourable neurological event and permitted a timely diagnosis.

Materials and Methods: The patient was a 46-yr-old male scheduled for an elective Transsphenoidal Hypophysectomy. After 3 hours of surgery, the surgeon requested the anesthesiologist to raise the mean arterial pressure (MAP) in order to check for possible hemorrhages. After 5 mg ephedrine IV, MAP rose from 70 mmHg to 160 mmHg and the BIS™ value dropped from 40 to zero. All anesthetic agents were discontinued, but after 30 minutes the patient did not awaken. A computed angiotomography scan showed an acute hemorrhagic stroke and failure of the contrast dye to fill the cerebral arteries.



Results and Discussion: The value of this index, which measures the activity of the cerebral cortex, falls due to many reasons. At prompt, one cannot ascertain with certainty what is the causative agent; however, it may suggest

hypotheses. In this case, the most probable cause for the observed fall in the BIS™ index in the operating room was a hypoxia/anoxia insult, since it changed linearly with the values of MAP. In other case reports, early and unfavourable results were also suspected based on the BIS™ monitor but the results could not have been circumvented. However, other workers have shown that drops in the BIS values occurred linearly with mormal MAPs in a patient with altered auto regulation due to chronic hypertension. Therefore they managed to maintain the MAP at higher levels, and after surgery, the patient had no neurological deficit. This shows that normal MAP is not a guarantee of regular cerebral blood flow.
Conclusion(s): The BIS can help separate patients who could benefit from active resuscitation from those who could not. Until more information from larger clinical trials becomes available or new models of BIS™ are developed, this device should be considered as a monitor of anesthetic depth, rather than as a diagnostic tool.

3AP4-2

Delta entropy of heart rate variability along deepening anesthesia

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Background and Goal of Study: Conventional time and frequency domain measures of heart rate variability are very sensitive to anesthetic drugs, and are not able to detect subtle changes in overall cardiac autonomic regulation even during light anesthesia. Approximate entropy of R-R intervals (RRIs) is a HRV measure which has a tendency to decrease during anesthesia, but it is sensitive to baseline fluctuations of the signal. However, the effect of these fluctuations can be eliminated by differentiating the RRI tachogram before analysis. This study was designed to investigate characteristics of a novel HRV measure, named delta entropy (dEn), during deepening anesthesia.
Materials and Methods: Eight healthy subjects were anesthetized with sevoflurane and eight with propofol in a stepwise manner using three escalating concentrations (2, 3 and 4 % end-tidal concentration and 7.4 ± 1.7, 12.3 ± 2.6 and 18.3 ± 5.0 µg/mL plasma concentration, respectively) at 30 min intervals. To further characterize dEn, a third group of eight subjects received a supramaximal intravenous dose of glycopyrrolate without anesthesia. dEn of RRIs was computed at baseline, during each step of anesthesia and during the anticholinergic blockade.
Results and Discussion: dEn decreased along with deepening levels of sevoflurane and propofol anesthesia up to 33% (95% confidence interval 21-44%) and 38% (95% confidence interval 28-48%), respectively. At each anesthesia level, dEn differed significantly ($p<0.05$) from that measured at the preceding level, similarly in both the sevoflurane and propofol groups. Parasympathetic blockade by glycopyrrolate was found to decrease dEn by 17% (95% CI 6–28%).
Conclusion(s): dEn of RRIs is a novel HRV measure able to detect alterations of cardiac autonomic regulation even during exceedingly deep anesthesia in healthy subjects. dEn seems to be more dependent on the anesthetic depth than on cardiac vagal efferent activity.

3AP4-3

Advanced hemodynemic-oxygen delivery diagnostic chart

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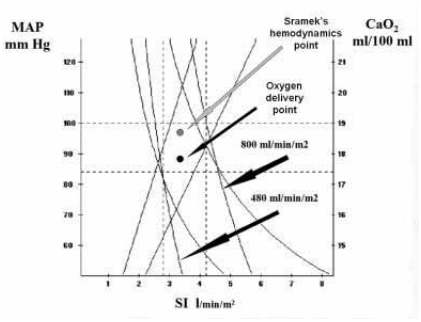
Background and Goal of Study: Haemodynamics' diagnostic chart introduced by B.Shramek in 1989 is well known and widely used in cardiac output monitoring for diagnostic and therapy management purposes. It's useful for decision-making and time-saving but in absence of oxygen delivery analyses it doesn't clearly answer the question whether the patient's haemodynamic changes are physiological or pathological ones. It's better to hanalyze aemodynamics along with oxygen delivery parameters. So our **objectives were to combine B.Shramek's Haemodynamics diagnostic chart with system oxygen transport parameters.**
Materials and Methods: Oxygen delivery index (DO_2I) is commonly used for evaluation of system oxygen transport and calculated as: $\mathbf{DO_2I = CaO_2 \cdot SI}$
While B.Shramek's Haemodynamics diagnostic chart already has horizontal axis which represents current SI values it is very easy to add the second vertical axis to the right side of the chart for representing current CaO_2 values. In order to reduce lines on the chart we scaled the CaO_2 axis in such a way that graphical borders of its normal values match the lines of Mean blood pressure normal valuesical. Now, each time a point on the chart with coordinates corresponding to SI and CaO_2 current values shows the oxygen delivery state. So this advanced Hemodynamics-Oxygen delivery chart carries two points: first one – the original Shramek's haemodynamics point and the second – newly introduced Oxygen delivery point.



Results and Discussion: Normal value range of DO_2I lies within 480-800 ml/min/m^2. So we have to draw two parabolas corresponding to these values on the chart. These lines divide the chart into three zones: left – hypoxia, central – normal oxygen delivery and right – hyperoxia. Each time the location of the new point on the chart will demonstrate the system oxygen delivery state.
Conclusion(s): While all the values for CaO_2 calculating may be obtained in a real time monitoring on our opinion this combined chart may be successfully used in a real time monitoring mode for diagnostic and therapeutic management of haemodynamics and system oxygen delivery disturbances.
References:

1 Sramek B.B. //*Ann. Acad. Med. Singapore.* – 1994. – Vol.23, – Sup. 6, – P.26-32.

3AP4-4

Evaluation of the CNAP™ monitor versus invasive radial artery pressure monitoring in surgical patients

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Background and Goal of Study: Arterial blood pressure (BP) is one of the most important variables in routine anaesthesia monitoring. Particularly in patients at risk, BP needs to be obtained frequently or even continuously. This is done either intermittently using a BP cuff (NBP) or continuously by an invasive arterial line (IBP). Recently, a new device for continuous non-invasive arterial pressure measurement (CNAP) has been introduced. This study was performed to investigate the accuracy of CNAP compared to the gold standard IBP.
Materials and Methods: After IRB approval 55 patients scheduled for major surgery with clinical indication for continuous BP monitoring were enrolled. BP was recorded invasively via an arterial catheter using standard monitoring. The CNAP device is based on continuous finger cuff BP recordings calibrated by oscillometric upper limb BP measurement. A total of 200 heart beats were collected for each patient randomly chosen by computer from recordings of at least one hour. 100 beats were collected between induction of anaesthesia and skin incision, 100 beats were collected during surgery. IBP and CNAP were compared with the Bland-Altman method (1). Percentage error (PE) was calculated for assessment of interchangeability (2).
Results and Discussion: For mean, systolic and diastolic BP, bias and percentage error of CNAP compared to IBP were: mean BP (bias -3,5mmHg, PE = 28,9%, fig. 1a) systolic BP (bias 4,0mmHg, PE = 30,8%) and diastolic BP (bias -5,0mmHg, PE = 33,0%). Lowest bias (-2,2mmHg) and highest PE (40%) were observed comparing NBP with IBP (fig. 1b).

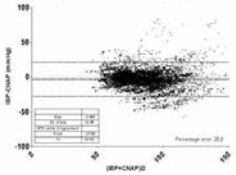

fig.1a: Bland-Altman of mean BP (CNAP)

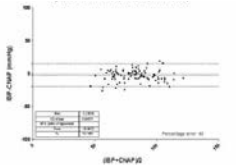

fig.1b: Bland-Altman of mean BP (oscliometeric

Conclusion(s): The newly developed CNAP monitor provides beat-to-beat BP readings and is non-invasive. The present study could demonstrate moderate agreement of the monitor compared with the gold standard of IBP during maintenance and induction of anaesthesia. Reliability of CNAP measurements is hampered by calibration with an oscillometric BP cuff. In our study the accuracy of the calibration measurements obtained by an oscillometric cuff compared to IBP was weak.

References:
1 Bland JM and DG Altman: Lancet1986; 1 (307-10)
2 Critchley LA et al.; J Clin Monit Comput 1999; 15 (85-92).

3AP4-5

Bispectral index and spectral entropy fail to indicate loss of consciousness during increasing concentrations of dexmedetomidine, propofol and sevoflurane

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Background and Goal of Study: Anaesthetic-induced loss of consciousness (LOC) has traditionally been assessed as loss of response to a verbal command. The EEG-derived depth of anaesthesia monitors Bispectral Index (BIS) and Spectral Entropy (producing two indices: State Entropy, SE and Response Entropy, RE) have been developed to measure the effects of anaesthetics on cerebral cortex. We aimed to study, whether BIS and Entropy can differentiate consciousness from unconsciousness during increasing concentrations of three different anaesthetic agents.

Materials and Methods: Thirty healthy male volunteers aged 19-30 years were recruited and divided into three ten-volunteer groups to receive either dexmedetomidine, propofol or sevoflurane in escalating concentrations at 10 min intervals until LOC was reached. Consciousness was tested during drug administration at 5 min intervals and after study drug discontinuation at 1 min intervals by requesting the subjects to open their eyes. LOC was defined as unresponsiveness to the request and pre-LOC as the last meaningful response. The first meaningful response to the request was defined as regaining of consciousness (ROC). For the statistical analysis pre-LOC and ROC values were pooled together to represent the responsive state while LOC values represented the unresponsive state. Prediction probability (P_K) was estimated with the jack-knife method.

Results and Discussion: The lowest mean values for BIS, SE and RE were recorded at LOC with all three anaesthetic agents but the inter-individual variation was extensive. BIS and Entropy performed poorly in detecting the transition from consciousness to unconsciousness.

	BIS	SE	RE
Dexmedetomidine	0.56 (0.05)	0.53 (0.05)	0.54 (0.05)
Propofol	0.61 (0.05)	0.60 (0.05)	0.60 (0.05)
Sevoflurane	0.59 (0.05)	0.51 (0.05)	0.55 (0.05)

Conclusion(s): BIS and Entropy were not able to differentiate consciousness from unconsciousness during stepwise increasing concentrations of dexmedetomidine, propofol and sevoflurane anaesthesia.

PK values (standard error) of BIS, SE and RE

3AP4-6

QRS complex detection methods used in heart rate variability research – A citation analysis

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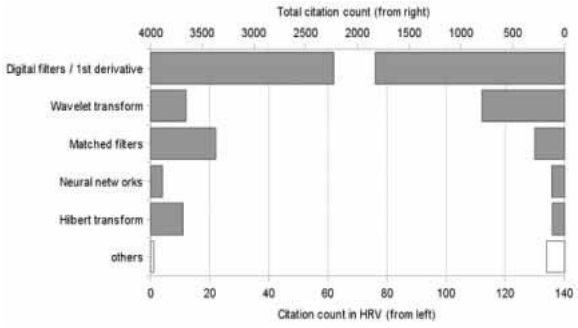
Background and Goal of Study: This study uses citation analysis to give a general review of the QRS detection techniques that have been used for measurement of heart rate variability (HRV).

Materials and Methods: QRS detection methods were searched using PubMed and citations were retrieved from ISI Web of Knowledge and Google Scholar.

Results and Discussion: Out of 599 hits for the initial search 78 publications describing a QRS detector could be identified. 718 articles were found to cite one or more of the method papers totalling 3221 citations. 98 of these articles reported on actual results from HRV measurement. Citation analysis showed a clear dominance of the classical algorithm by Pan and Tompkins in both general and HRV research. Besides that deployment of methods and algorithmic approaches differed characteristically between HRV and general research. Matched filters and Hilbert transform have achieved considerable popularity for HRV analysis though they were adopted not until several years after their first description in the literature. Wavelet-based methods are clearly underrepresented in HRV context. *Counts of citations for QRS algorithm papers by HRV research publications (from left, bottom x-axis) and by all publications (from right, top x-axis), grouped by algorithmic approach*



Conclusion(s): HRV analysis imposes unique demands on QRS detection and requires specifically tailored algorithms. Theoretical considerations show that matched filter approaches may be well-suited to satisfy these requirements thus explaining their popularity for this task. Low algorithmic complexity, convention and the absence of a generally optimal alternative seem to explain the continuing predominance of classical algorithms.

3AP4-7

Quasiperiodic oscillations of electroencephalgram during induction of general anesthesia with thiopental

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Background and Goal of Study: Quasiperiodic oscillations were observed in coupled neuronal oscillators (1). Nonlinear dynamics of electroencephalogram (EEG), with wide variety of changes, was observed during emergence from sevoflurane anesthesia (2). The aim of our work was to detect quasiperiodic EEG during induction of general anesthesia with thiopental.

Materials and Methods: A group of 46 patients (20 males, age range 42 – 54 years, ASA I), scheduled for lumbar diskectomy, recieved 5 mg / kg of thiopental intravenously, for induction of general anaesthesia. All the patients were premedicated with midazolam. EEG was recorded with four channels MEDELEC 81996 apparatus. Silver disc electrodes were palced in according with 10-20 International system on C3,C4,T5,T6. Cz ref., Fz ground. Sampling rate was 200 Hz. Recording of EEG lasted from awake state to loss of eyelid reflex. Analysis of electroencephalogram was performed off – line with in home made software. Criteria for quasiperiodicity in EEG were adopted from (3).

Results and Discussion: Quasiperiodic oscillation in EEG were detected in 12 of 46 (26 %) patients. Our results are pointing toward nonlinear dynamics of EEG during induction of general anestesia. Biological meaning of these results is not clear.

Conclusion(s): Quasiperiodic oscillations of EEG are present during induction of general anestesia with thiopental.

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1 Del Negro CA et al. Biophysical Journal 2002.
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3 Steyn-Ross ML et al. Phys Rev E Stat Nonlin Soft Matter Phys. 2003;68(2 Pt 1):021902.

3AP4-8

Symbolic dynamic EEG for the assessment of the level of consciousness during general anaesthesia

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Background and Goal of Study: Symbolic dynamics is a nonlinear technique which consists in turning time series into symbol sequences to provide information about their complexity. The goal of this study is to show that it can be applied to the EEG signal recorded during anaesthesia to reflect the reduction of the EEG complexity associated with the deepening of anaesthesia.

Materials and Methods: After receiving the ethical committee approval, data were collected from 10 patients scheduled for cardiac surgery. The standard departmental procedure for inhaled induction was applied: 8% Sevoflurane until loss o consciousness defined as loss of response to mild shaking and prodding (OAASS1), hereafter set to 1%. Five minutes after the patient had reached

OAASS1, Atracurium 0.6 mg.kg-1 and continuous Remifentanil infusion 0.3µg. kg-1.min-1 (after a bolus of 1 µg. kg-1 in 1 min) was administered and the trachea was intubated. The study was ended 1 hour later. Raw EEG was provided by the loC-View monitor (Aircraft Medical, Barcelona, Spain). Five minute EEG frames corresponding to awake and anesthetized states were extracted, converted to a sequence of 4 symbols reflecting the distance to the mean value and subsequently grouped into words of 3 symbols. The words were used to discriminate between the awake and anaesthetized states.

Results and Discussion: The majority of the words defined by the symbolic dynamics showed significant differences ($p<0.05$) between the awake and anesthetized states according to the Mann-Whitney-U-Test.

Conclusion(s): Symbolic dynamics is able to demonstrate a higher complexity of the EEG in an awake versus an anaesthetized patient. The words which are formed out of the symbol series are able to distinguish between the awake and the anaesthetized states.

3AP5-1

Haemodynamic changes during induction of anaesthesia in routine clinical practice; a service evaluation

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Background and Goal of Study: The haemodynamic responses to individual anaesthetic drugs and techniques are well known. However, the effects of induction of anaesthesia in routine clinical practice, which involves a number of drugs given and techniques employed simultaneously in a short period of time, are less clear. As part of a service evaluation within our institution, we used Finometry to measure haemodynamic changes during induction of anaesthesia in routine clinical practice.

Materials and Methods: We recorded haemodynamic variables from 100 patients (50 female; 50 male; mean (SD) age 53 (19) years; ASA 1-4) using the Finometer before, during and after induction of anaesthesia. The Finometer uses a finger cuff to measure blood pressure (BP), and derives stroke volume (SV) and total peripheral resistance (TPR) from the pulse pressure waveform, on a beat-to-beat basis.

Results and Discussion: The most commonly used anaesthetic agents during induction of anaesthesia were Propofol, an opioid, and isoflurane or sevoflurane. Blood pressure decreased significantly as early as 30 seconds after induction of anaesthesia. There were corresponding significant decreases in the SV. Changes in heart rate (HR) and TPR were not significant. Clinically significant changes (i.e. more than 20% decrease in mean blood pressure (MBP) and SV from baseline) were encountered in more than 75% of patients at some stage during induction and 40% of those sustained it for more than 2.5 min.

Mean (SD) MBP and SV during induction of anaesthesia

Interval (min)	Baseline (n=100)	0.5 min (n=99)	1.5 min (n=98)	2.5 min (n=81)	3.5 min (n=32)
MBP (mmHg)	103 (16)	92 (24)	91 (28)	89 (32)	96 (33)
SV (ml)	77 (32)	67 (28)	59 (25)	59 (25)	61 (22)

Conclusion(s): Significant and often prolonged decreases in blood pressure and stroke volume are encountered during routine induction of anaesthesia. Heart rate and total peripheral resistance remain stable. Further studies are required to evaluate whether extra information about haemodynamic changes, as assessed by Finometry, have an impact on clinical management of haemodynamics during anaesthesia.

3AP5-2

Assessment of tissue blood flow using peripheral perfusion index

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Background and Goal of Study: Traditionally, prolonged refilling time and mottled skin were the only non-invasive signs of impaired tissue perfusion. Nowadays, it is possible to assess tissue circulation using peripheral perfusion index (PPI). This index is derived from pulse oximetry and represents the ratio of pulsatile to non-pulsatile blood flow, thus reflecting peripheral perfusion. However, the interaction between PPI and conventional parameters of impaired microcirculation is still unsettled. The aim of this study was to assess the relationship between PPI and other markers of tissue perfusion.

Materials and Methods: Eighteen critically ill adult patients requiring mechanical ventilation were enrolled into an observational study. Peripheral perfusion was evaluated non-invasively using PPI (Masimo SET, Capnostream TM20, Oridion, Israel). Simultaneously, blood gases and lactate (ABL800Flex, Radiometer, Denmark) were used for invasive assessment of tissue perfusion. Pulmonary perfusion and global blood flow were assessed using venous to end-tidal CO2 (Pv–etCO2) and venous to arterial CO2 difference, respectively. For evaluation of correlations between the variables, we used Spearman's coefficient. The intergroup difference was assessed using Mann-Whitney's test. Data are presented as median [25th–75th percentile].

Results and Discussion: Ten patients had "normal" peripheral perfusion (PPI≥1) in contrast to 8 patients who had "decreased" perfusion (PPI<1). There was a negative correlation between PPI and Pv–etCO2 difference ($r= –0.51$, $p<0.05$) and a tendency to inverse correlation between PPI and lactate ($r= –0.4$, $p=0.09$). Patients with "normal" perfusion had lower blood lactate (1.1 [0.8–1.7] vs. 2.9 [1.3–9.6] in the "decreased" perfusion group, $p<0.05$) and Pv–etCO2 (8.1 [6.9–9.6] vs. 11.9 [10.4–14.5], respectively, $p<0.05$). In addition, Pv–etCO2 correlated positively with blood lactate ($r=0.57$, $p<0.05$). There was a trend towards higher central venous oxygen saturation in patients with "normal" perfusion ($p=0.07$).

Conclusion(s): The association between PPI and Pv–etCO2 can reflect the development of systemic and pulmonary hypoperfusion in critically ill patients. PPI<1 is accompanied by other signs of hypoperfusion, as confirmed by increased lactate and Pv–etCO2. Therefore, PPI may be used for non-invasive assessment of peripheral blood flow in critical conditions.

3AP5-3

Evaluation of semi-invasive arterial pressure-based cardiac output measurement during resection of pheochromocytoma

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Background and Goal of Study: Cardiac output is measured semi-invasively by FloTrac™ system (Edwards Lifesciences, Co.Ltd) using arterial pressure contour analysis. The accuracy of APCO is expected to be maintained even under hemodynamically unstable conditions,such as the resection of pheochromocytoma.

Materials and Methods: Cardiac output were monitored by FloTrac™ system (Ver.1.10 or second generation) and pulmonary arterial catheter in 5 patients who were undergoing the resection of pheochromocytoma from July 2007 to October 2008. By the pattern of elevated serum catecholamine level, 2 patients who showed elevated levels in both of adrenaline and noradrenaline were classified in adrenaline-dominant group (A group), and 3 patients with elevated only noradrenaline were in noradrenaline-dominant group (NA group). The values of APCO expressed as cardiac index(APCI) were compared with cardiac index measured by thermodilution method intermittently(ICI) or continuously (CCI) at the same period.

Results and Discussion: As a whole measurement in all 5 patients, the percentage error (%error) of APCI vs. ICI was 39.7%, with bias±precision (SD):–0.21±0.65 l/min/m^2. On the other hand, the %error of CCI vs. ICI was 52.9%, with bias±SD:–0.04±0.85 l/min/m^2. The %error of APCI vs. ICI was larger in A group than in NA group (43.5% vs. 29.7%). During operative procedure, the %error before resection of pheochromocytoma was larger than that after resection (44.4% vs. 25.0%). The %errors of APCI vs. ICI in A group or before resection of pheochromocytoma are, however, smaller than those of CCI vs. ICI (64.1% in A group and 67.5% before resection). When the values were divided in two groups by the level of cardiac output as low ICI(<3.5 l/min/m^2) and high ICI(≥3.5l/min/m^2), the %errors of APCI vs. ICI were less than 30% both in low and high ICI group, though the %error of CCI vs. ICI in high ICI group was 51.2%. The bias of APCI vs. ICI in high ICI group was lower than that in low ICI group. **Discussion:** During the prodecure for the resection of pheochromocytoma, the measured values of cardiac output were affected by the level of catecholamine, the timing before or after resection of tumor, and the level of cardiac output. Even in this way, the effect was smaller in APCI than in CCI. It should be, however, carefully evaluated that the underestimation was observed in APCI of higher cardiac output.

Conclusion(s): APCI during the resection of pheochromocytoma is more reliable than CCI compared with ICI that is the standard of measurement of cardiac output.

3AP5-4

Evaluation of cerebral oximetry in pediatric moyamoya patients during bilateral EDAS surgeries

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Background and Goal of Study: Moyamoya disease is a rare progressive and occlusive cerebrovascular disease of uncertain etiology in anterior or middle cerebral arterial territory, especially common in children. We intended to evaluate bi-hemisperic cerebral oximetry during sequential bilateral encephalo-duro-arterio-synangiosis (EDAS) surgeries.
Materials and Methods: Subjects: Twenty-two, 3-10 years (6.6±1.8 yo), moyamoya patients undergoing sequntial bilateral EDAS surgeries (interval, 1.3±0.5 month) after approval from IRB and acceptance of informed consent from parents. Anesthetic induction with thiopental sodium, 5 mg/kg + sevoflurane (ET 1 MAC)+ rocuronium 1 mg/kg, then tracheal intubation Anesthetic maintenance: Sevoflurane (ET 1 MAC) in 50% Oxygen + remifentanil infusion (0.1- 0.2 µg/kg/min); ETCO2 within 37-42 mmHg, Temperature: 35.8-36.8°C. PCA (fentanyl 0.7 µg/kg/hr for 48 hrs) begins at the dural closure. Monitoring : contimuous monitoring of INVOS cerebral oximeter (rSO2) on bi-lateral forehead as well as non-invasive BP, HR, ECG, ET CO2 and Temperature. Measurements and statistics: Intraoperative vital signs and rSO2 in non-operation and operation sites measured at 4 intraoperative events (after induction, 15 min after operation, 15 min before operation, and immediate post-extubation) during first and second EDAS surgery. Statistics: paired t-test at P value of 0.05.
Results and Discussion: Patients characteristics were shown. We found that mean rSO2 at non-operation and operation site were similar during first and second EDAS surgery and that rSO2 measured between at operated site during first surgery and at non-operating site during second EDAS surgery did not differ.

Patient characteristics

Age (yr)	6.6±1.8
Sex (M/F)	11/11
Wt (kg)	25.6±12.9
Op. interval (m)	1.3±0.5
Preop. condition	TIA(14), Infarct(7), IVH(1)
Postop. Cx	new infarct after first EDAS (1)

rSO2 measurement during first and second EDAS surgery

Sites	After induction	15 min after surgery	15 min before end of surgery	Post-surgery
N1	91.3±5.4	89.6±5.4	88.3±6.4	90.0±6.4
O1	88.3±17.4	88.4±14.0	90.0±7.7	90.3±6.4
O2	91.3±5.2	90.3±6.1	90.9±5.0	93.3±3.2
N2	93.0±3.6	91.7±5.4	90.9±3.9	90.8±7.0

N1: non-operation site during first EDAS, O1:operation site during first EDAS, O2: operation site during second EDAS, N2: non-operation site during second EDAS

Conclusion(s): Bi-hemisperic measurements of rSO2 were similar in moyamoya pediatric patients during first and second EDAS surgeries.

3AP5-6

The feasibility of a novel method to estimate cardiac output using pulse wave transit time before and after cardio-pulmonary bypass

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Background and Goal of Study: The esCCO (estimated continuous cardiac output, Nihon-Kohden, Japan), which uses pulse wave transit time (PWTT) obtained as the interval between R wave of electrocardiogram and the arrival of pulse wave of pulseoximetery at the finger tip, is a novel method to estimate cardiac output (CO). We compared esCCO with conventional cardiac output (ICO) and continuous cardiac output (CCO) measured by thermodilution technique before and after cardio-pulmonary bypass (CPB).
Materials and Methods: After approval of IRB and written informed consent, nine adult cardiac patients with a pulmonary artery catheter were included in this study. The signal of electrocardiogram and finger plethysmogram was continuously recorded to obtain PWTT. Stroke volume (SV) was estimated by using PWTT, and esCCO was calculated as the product of SV and heart rate. Prior to the data collection, esCCO was calibrated by ICO. Linear correlation was evaluated between ICO and esCCO, and the bias and precision was obtained by Bland Altman analysis. CCO were also compared with ICO. ICO and CCO were measured by Vigilance II monitor (Edwards Lifesciences; Irvine, CA).
Results and Discussion: 20 pairs of data were obtained from 9 patients. 8 pairs of data were obtained before CPB, and 12 pairs of data were obtained after CPB. The correlation between ICO and esCCO, or CCO before CPB was R=0.93, and 0.71, respectively. After CPB, there was no correlation between esCCO and ICO (R=0.06). On the other hand, there was high correlation between ICO and CCO after CPB (R=0.80). PWTT represents energy propagation of cardiac contraction and depends on the physical property of the peripheral vascular walls. It is suggested that no correlation of esCCO after CPB was due to the significant change in the physical property of the peripheral vascular walls after weaning from CPB. We must be careful with the discrepancy of esCCO, when vascular tone may change.

Statistical analysis of esCCO, CCO vs ICO

Before CPB	R	slope	intercept	Bias	precision
esCCO vs ICO	0.93	0.55	1.62	-0.43	0.74
CCO vs ICO	0.71	0.5	1.79	-0.52	1.04
After CPB	R	slope	intercept	Bias	precision
esCCO vs ICO	0.06	0.04	4.76	1.31	1.23
CCO vs ICO	0.80	0.68	0.87	-0.29	0.62

Conclusion(s): The present study shows that esCCO is a good alternative of pulmonary artery catheter to estimate CO. However, recalibration of esCCO will be mandatory while the peripheral vascular tone could be affected, such as after CPB.

3AP5-7

Performance of continuous non-invasive blood pressure monitoring

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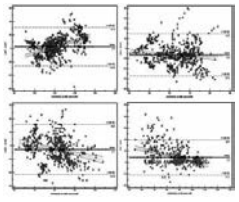
Background and Goal of Study: Continuous blood pressure monitoring is a need in some patients, but requires invasive arterial cannulation. Bias should be less than 5mmHg (SD= 8 mmHg) between devices(1). Our aim is to evaluate the performance of a continuous non-invasive blood pressure measurement device.
Materials and Methods: After local ethics committee approval, written informed consent was obtained from 20 post-surgical critical care patients and an arterial catheter placed. Patients with antecedents of cardiac or arm vascular surgery were excluded. After checking a less than 10 mmHg mean blood pressure difference between both arms with a standard cuff, the continuous non invasive blood pressure monitor (CNAP 500, CNSystems, Austria, rev. 2.9) was placed in the contralateral arm from where the arterial catheter was placed and calibrated according to the manufacturer's recommendations. The arterial catheter (Arteriofix, Braun) consisted in a 22G arterial canula and a non compliant 100 mm tube. Absence of bubbles was thoroughly checked. 30 paired measurements were recorded from each patient. Bland-Altman test was used to evaluate agreement.
Results and Discussion: 614 pairs of measurements were recorded from 20 patients (in one patient 44 pairs were recorded). Bias (mean ± SD of the difference) and precision (mean ± SD of absolute difference) are shown in table 1. Bland-Altman plots are shown in figure 1. The CNAP monitor trends to underestimate systolic blood pressure in the lower blood pressure range and to overestimate it in its high range. The tendency is the contrary regarding heart rate, mean and diastolic blood pressure.

Table 1

	Direct	Non invasive	Bias	Precision
SAP	138(±31,1)	136(±19,8)	-2,8(±14,6)	11,8(±9,2)
MAP	75,5(±3,5)	85(±2,8)	2,7(±9,6)	7,1(±6,3)
DAP	56(±18,4)	66,5(±13,4)	6,4(±10,7)	10,2(±7,1)
HR	102(±15,6)	101,5(±16,3)	-4,3(±7,8)	5,1(±7,3)



Conclusion(s): We do not recommend the use of the CNAP monitor for continuous blood pressure monitoring, although in the future is likely to be a "must have" in the critical care unit or the operating room.
Reference:
1 American national standard for electronic or automated sphygmomanometers. Association for the Advancement of Medical Instrumentation SP10:1-25, 1987.

3AP5-8

Pulse pressure respiratory variations of as preload dependency index during one lung ventilation in thoracic surgery

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Background and Goal of Study: A perioperative hemodynamic strategy is necessary to improve patients' outcome. In this context, preload dependency indices such as pulse pressure variations (PPV) are really useful. But physiological conditions during one lung ventilation in open chest surgery are changed and VPP may not be valid as a preload dependency index. The aim of this study was to assess a manual (PPV) and automated measurement (PPVauto) of pulse pressure variations as preload dependency indices during one ventilation in thoracic surgery.
Materials and Methods: Sixteen patients undergoing thoracic surgery by thoracotomy (lobectomy, pneumonectomy) were included. All patients were monitored with an artery catheter. Pressure transducers were connected to the Philips' monitor VP 50 and artery curves were recorded with Trendface® software. PPV were calculated from these curves during 3 consecutive respiratory cycles before and after fluid challenge (colloid solution: 250 ml in 15 minutes). PPVauto were directly calculated by the Philips' monitor algorithm. Cardiac output was measured with an esophageal Doppler (Hemosonic 100, Arrow). Fluid challenge responders were defined by a 10% increase in stroke volume (SV). To test the influence of tidal volume all measurements were realized with 3 different tidal volumes: 6 ml.kg-1; 8 ml.kg-1; 10 ml.kg-1. Diffences between variables were analyzed with a Mann-Whitney or a Wilcoxon test when appropriate. Correlations between variables were analyzed with a rho Spearman test. Receiver Operating Characteristic curves were realized to establishe the reliability of PPV as a preload dependency index.
Results and Discussion: There was no correlation between PPV before fluid challenge and SV variations after fluid challenge (rho = 0.239) whatever the tidal volume was. PPV, PPVauto and SV were not significantly different between responders and non responders whatever the tidal volume was (p between 0.21 and 0.92). Area under Receiver Operating Characteristic curves for the different tidal volumes were between 0.55 and 0.63, 0.47 and 0.59 for PPV and PPVauto respectively.
Conclusion(s): Physiological modifications existing during one lung ventilation in open chest surgery do not permit to use manuel or automated PPVas reliable preload dependency indices.

3AP5-9

Verification of a non-invasive continuous cardiac output measurement method based on the pulse-contour analysis combined with pulse wave transit time

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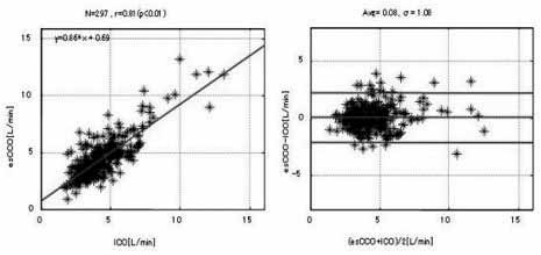
Background and Goal of Study: To measure cardiac output (CO) less invasively, various devices have been developed. The esCCO (estimated (ECG-SpO2) continuous CO) measurement system (Nihon Koden, Tokyo, Japan) is a truly non-invasive system. It estimates CO with an electrocardiogram and a percutaneous oxygen saturation waveform. Thirty-six and 15 cases of clinical use in its development process suggest it has a good measurement precision equal to pulmonary artery catheter (PAC)[1]. The purpose of our study was to inspect whether the esCCO had a sufficient precision for practical use in a large number of patients in multicenter settings.
Materials and Methods: With IRB approval, 109 elective surgery patients who need PAC insertion were enrolled. Patients who received circulation support with artificial pacemaker or intra-aortic balloon pump were excluded. After the esCCO system and PAC installation, CO was determined by bolus thermodilution (ICO) and esCCO measurements were started. ICO measurements were performed periodically, once an hour in operation room and once a day in ICU. Data recording were continued until the PAC removal. Statistically, Bland-Altman analysis and regression analysis was performed.
Results and Discussion: A total of 310 measurement pairs were obtained from 109 patients (35 in OR and 74 in ICU). The demographic characteristics of patients are following; age, height, weight, and body surface area were 66.2±11.3 y.o., 160.2±9.8cm, 59.5±13.0kg, and 1.61±0.21m^2, respectively. Thirteen pairs were excluded because of failure to correctly detect the waveform. The results of Bland-Altman analysis and regression analysis were summarized in figure.



Conclusion(s): esCCO had a small bias and close correlation with ICO. The esCCO system provide a precise CO value measurement for patients in various clinical backgrounds and settings.
References:
1 Ishihara H, Okawa H, Tanabe K, et al. J Clin Monit Comput. 2004;18:313-20.
Acknowledgements: Special thanks to esCCO Research Team (Japan) member: Masato Tsutsui, MD (National Defense Medical College); Tetsufumi Sato, MD (Okayama University); Toshimasa Akazawa, MD (Juntendo university); Nobukazu Sato, MD (Toho University); Koichi Yamashita, MD (Kochi Medical School); Hironori Ishihara, MD (Hirosaki University).

3AP5-10

Recording EEG burst suppression in sevoflurane anaesthesia with depth electrodes

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Background and Goal of Study: In order to understand better the effect of anaesthetics on EEG and indexes derived from it we need to understand better the physiology and biophysics behind the recorded signal.
Materials and Methods: To study the generators of EEG we recorded burst suppression induced with sevoflurane from depth electrodes in the subthalamic nucleus and on scalp. The patients were operated to implant electrodes in subthalamic nucleus to treat parkinsonism. We present the EEG of two patients anaesthetized to burst suppression level. EEG was recorded with Neuroscan digital EEG equipment. The study was approved by the ethics committee of Oulu University Hospital.
Results and Discussion: Slow oscillations were synchronous in all cortical areas, which is seen with scalp-depth electrode derivations while some transient waves were more localized. Recording EEG with closely spaced electrodes, including those used in calculation of anesthesia EEG indexes, underestimates the amplitude of the slow waves. Electrical fields produced by cortex could also be recorded between two electrode contacts in subthalamic nucleus.
Conclusion(s): Recordings with depth electrodes show that some of the EEG is so widespread that to accurately measure its amplitude we must use scalp and subcortical electrodes. This is particularly true about the cortical slow oscillations, seen also as DC shifts in sevoflurane burst suppression. The EEG between two contacts in depth electrode records widely synchronous cortical activity such as burst suppression. Improved 3D models of intracerebral electrical fields are needed to understand how anesthesia-induced cortical EEG is recorded by subcortical electrodes at different locations.

3AP5-11

Indexed stroke volume measured by LiDCO correlates with echocardiographic assessment of left ventricular function

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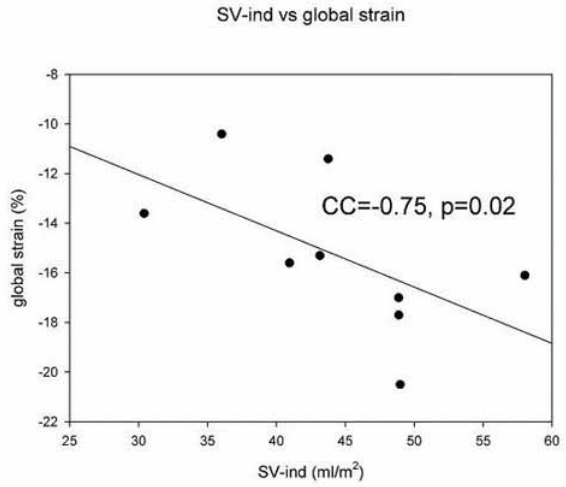
Background and Goal of Study: LiDCO plus (LiDCO™) is a validated hemodynamic monitor[2]. Protocols for preload optimization are well described[1]. Global left ventricular strain (GS) is a validated, relativley new, echocardiographic parameter for assessment of left ventricular function (LVF)[3]. GS gives an average of longitudal shortening of left ventricle during systole and is more sensitive for measuring LVF than ejection fraction (EF). Minimally invasive methods for hemodynamic monitoring have not previously been investigated regarding correlation with echocardiography in assessment of LVF. We investigated whether stroke volume measured by LiDCO and indexed for body surface area (SV-ind) after preload optimization correlates with GS and EF.
Materials and Methods: This descriptive, prospective, and non-randomized study was performed on 9 subjects admitted for esophagectomy. Echocardiography was done within 2 weeks before surgery and hemodynamic measurements were done in the morning before surgery with the subject at rest. After calibration of LiDCO plus fluid optimisation was done with bolus doses of 3ml/kg colloid, (Voluven 60mg/ml) repeated as long as SV increased >10%. Statistical analysis was performed with Spearman Rank Order Correlation test.
Results and Discussion: 8 of 9 subjects were male, mean age 62 (51-75) years. SV-ind correlated significantly to GS and EF CC= -0.75, P 0.02 and CC= 0.66, P=0.04 respectively. GS showed correlation to EF, CC= 0.90 P<0.0001. [figure1]LiDCO is a minimally invasive hemodynamic monitor. It has so far not been used to access LVF. Echocardiography is the most commonly used method for assessing LVF but it is user dependent and non continuous. Our study shows that LVF assessment by LiDCO correlates well with echocardiography. The strong correlation between GS and EF is well known and shows that echocardiographic measurements were adequate.



Conclusion(s): Indexed LiDCO measurements of SV correlates well with echocardiography for LVF assessment. We suggest that ind-SV after fluid optimization could be used for assessment of LVF in the perioperative period.

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3AP6-1

The usefulness of motor evoked potential monitoring during spinal surgery

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Background and Goal of Study: To decrease the risk of iatrogenic spinal cord injury, motor evoked potentials monitoring has been more frequently used but the efficacy of motor evoked potentials monitoring in the spine surgery have not been reported in south Korea. The purpose of this study is to investigate the reliability of intraoperative MEP monitoring in spinal surgery.

Materials and Methods: Thirty five patient scheduled elective surgery for spine correction were enrolled, after induction of general anesthesia with propofol and remifentanyl, intraoperative motor evoked potentials from upper or lower limb muscles monitoring was performed. No additional muscle relaxants were given except for tracheal intubation. Intraoperative abnormal motor evoked potentials were recorded and checked development of postoperative neurologic deficit. From this result specificity, sensitivity, positive predictive value, and negative predictive value of motor evoked potentials monitoring were calculated.

Results and Discussion: Significant amplitude decrease was detected in 6 patient. Five of 6 patients for whom no amplitude recovery was obtained by additional surgical intervention, had postoperative neurologic deficits had resulted and 1 false positive case and 1 false negative case occurred. In this study, results yielded sensitivity of 0.83, a specificity of 0.96, a negative predictive value of 0.96, a positive predictive value of 0.61.

Conclusion(s): This study shows motor evoked potentials monitoring is a reliable and sensitive method to detect injury to the spinal cord during spinal surgery and can be a way to reduce postoperative deficits.

3AP6-2

Improvement of the calculating method for EEG bicoherence to investigate pure phase relation

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Background and Goal of Study: Bispectral analysis quantifies the degree of phase coupling among the frequency components of a signal. Bispectrum is the sum of triple-products (TP; multiplies of three frequency components). Bicoherence (BIC), the normalized value of bispectrum, only depends on phase relations, therefore it is most important in this analysis. Previously, we confirmed the calculating method of EEG bicoherence (ref 1) and found that two significant peaks of EEG bicoherence were emerged around the diagonal line of bi-frequency space during anesthesia. We named these two peaks as BIC-low (around 4 Hz) and BIC-high (around 10 Hz). Primarily, bispectral analysis is a statistical analysis and is theoretically robust to contamination of a few artifacts. However, we found that EEG bicoherence calculated by our method occasionally affected by a few artifacts. Then we suspected that our calculating method could not completely eliminate the influence of the magnitudes of frequency components, and we developed a new calculating method. Modified bispectrum is defined as the sum of normalized TPs. Modified bispectrum divided by the number of TPs becomes modified bicoherence (mBIC). Here, we compared the BIC and mBIC during isoflurane anesthesia combined with epidural anesthesia.

Materials and Methods: We used the raw EEG data recorded for our previous study (ref.2). The study protocol was approved by the local ethical committee and informed consents were obtained. We calculated BIC and mBIC from the artifact-free 3 minutes of EEG at expired concentration of isoflurane 0.9% in 23 patients. We compared two peak heights of EEG bicoherence calculated by two methods. Paired t-test was applied and p values of less than 0.05 were considered significant.

Results and Discussion: BIC-low (46.9±7.1) and BIC-high (35.1±7.8) were significantly higher than mBIC-low (24.5±6.5) and mBIC-high (18.8±5.9), respectively. As the square of bispectrum is ruled by $\chi 2$ distribution, mBIC of more than 7.2 considered significant in the current settings. Our results showed that significant phase coupling existed in the EEG during anesthesia. Mathematically, our new method can completely eliminate the influences of the magnitude of frequency components. Our current result suggested that previous method could not completely eliminate such influences.

Conclusion(s): Our new calculating method for bicoherence is best to investigate the pure phase relations among the frequency components of a signal.

References:

1 Anesth Analg 2001; 93:996-70 2) Anesthesiology 2002; 97:1409-15.

3AP6-4

Comparing two measures of EEG entropy in assessment of anesthetic effect

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Background and Goal of Study: Various entropy measures have been proposed for quantifying the changes in the EEG signal due to increasing doses of GABAergic anesthetic drugs. We studied the performance of spectral entropy and approximate entropy to see how they reflect the features of EEG in deepening anesthesia and how does their value correspond to the signal waveform as interpreted by an expert.

Materials and Methods: Digitized versions of periodic test signals as well as spectral entropy surrogates of EEG waveforms were generated to study the relationships between signal waveform and the values of the two entropy measures. EEG pattern of deep anesthesia was modeled using the ARMA modeling technique. Changing the model parameters corresponding to predefined EEG rhythms, various signal waveforms were generated and their spectral entropy and approximate entropy were calculated.

Results and Discussion: Due to digitization effects spectral entropy measure of a perfectly periodic waveform can be as high as 0.42. By applying surrogate generation techniques it was possible to obtain signals of identical spectral entropy but different-looking waveform (from regular to random). Approximate entropy correlated well with the visual appearance of the signal. Using the ARMA modeling technique we showed that the effect of the delta rhythm on the spectral entropy measure depends on the presence of very low frequencies in the signal. If very low frequencies are preserved the delta rhythm of increasing amplitude actually makes the power spectrum more flat, increasing the spectral entropy value against what could be expected.

Conclusion(s): Values of spectral entropy do not per se tell anything about the regularity or predictability of the signal, unless the signal comes from a defined system, for instance, represents EEG of deepening anesthesia with GABAergic drugs. In the studied cases the approximate entropy values corresponded better to signal regularity. Spectral entropy can be used to evaluate anesthetic effect because it measures effectively the increase of slow activity and decrease of fast activity. Understanding the principles of calculation of EEG based indexes is necessary for understanding why they are useful in the assessment of anesthetic effect and why they fail in the presence of artefacts like EMG. It is also necessary for understanding why physiological events such as arousals and pathological events like seizures result in misleading values of indexes.

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3AP6-5

Permutation entropy for EEG-analysis during anaesthesia depends on frequency ranges

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Background and Goal of Study: Permutation Entropy PeEn seems to distinguish "awake" EEG from EEG at unconsciousness using EEG frequency range 0-30Hz reliably [1]. Analyzing frequencies above 30Hz bears the risk to include EMG activity that can overlap with EEG. This abstract raises the question if it may be beneficial to use PeEn and analyze more specific frequency ranges such as the β-band. β-activity is suggested to reflect intracortical signal transmission [2] that may be an indicator of consciousness. Loss of consciousness is reflected by a decrease of α and β activity while lower frequencies in the δ and θ range increase. When focussing on β activity, its decrease during loss of consciousness can be evaluated and the analysis becomes independent from low frequency artefacts, e.g. eyeblinks (1-5Hz) or sweat and motion artefacts (<4Hz).
Materials and Methods: EEG was recorded during 2 studies with (i) 15 volunteers undergoing propofol (study 1) and (ii) 15 volunteers undergoing propofol and propofol-remifentanil (study 2) anaesthesia at stable levels "awake" and "general anaesthesia". PeEn was calculated all sequences for frequency ranges 0.5-7.5Hz (δ, θ); 12-30Hz (β) and 0-30Hz. Pk values were calculated for separating consciousness from unconsciousness.
Results and Discussion: Table 1 shows the Pk values.

Table 1

PeEn d=4	Study I (Propofol)	Study II (Propofol)	Study II (Propofol/Remifentanil)	Study II (overall)
Pk: beta-band	1	0.998	0.938	0.97
Pk: 0-30Hz	0.95	0.952	0.869	0.92

Pk of distinguishing consciousness from unconsciousness for PeEn (beta-band) and PeEn (0-30Hz)

Conclusion(s): Analyzing only β activity seems to be beneficial for some data sets. If δ and θ bands are included in analysis, their activation with increasing anaesthetic level may disturb the result. PeEn tends to remain stable or increase slightly if it is used on these low frequency bands while it decreases in the β range and on the 0-30Hz band. The next step is to test, if a combination of overall PeEn (0-30Hz) and PeEn calculated over selected frequency ranges will result in a better performance for distinguishing consciousness from unconsciousness than only PeEn calculated over a wider frequency range.
References:
1 Biomed Tech 2006; 51: 89-94.
2 Anesthesiology 2005; 102: 447-471.

3AP6-6

Effect of electromyographic and electroencephalographic arousal on entropy monitoring during sevoflurane anaesthesia with and without neuromuscular blocking agents

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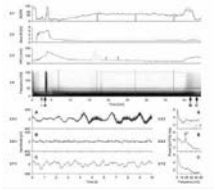
Background and Goal of Study: Entropy™ is an anaesthetic electroencephalogram (EEG) monitoring method, yielding two parameters: State Entropy (SE) and Response Entropy (RE). SE reflects the hypnotic level of the patient. RE covers also the electromyogram(EMG)-dominant part of the frequency spectrum, reflecting the upper facial EMG response to nociceptive stimulation. Skin incision is often associated with an increase in Entropy values. We studied the EEG, EMG, and Entropy values before and after skin incision, and the effect of rocuronium on Entropy and EMG at skin incision during sevoflurane anaesthesia.
Materials and Methods: 38 patients were anaesthetized with sevoflurane-nitrous oxide or sevoflurane-nitrous oxide-rocuronium. The biosignal was stored and analyzed off-line to detect EEG patterns, EMG and artifacts. The signal, its power spectrum, SE, RE, and RE-SE values were analyzed 1 minute before and 1 minute after skin incision. EEG arousal was classified as beta (spectral peak at 20 Hz, a decrease in delta activity (< 4 Hz)) or delta (increase in delta, decrease in beta activity).
Results and Discussion: EEG arousal appeared in 17/19 and 15/19 patients (n.s.), and EMG arousal in 0/19 and 13/19 patients (P<0.01) with and without rocuronium, respectively. Both beta (n = 30) and EMG arousals increased SE, but delta arousal (n = 2) decreased SE. A significant rise in RE-SE was only seen in patients without rocuronium. Figure 1. RE/SE, sevoflurane concentration, heart rate and spectrogram from the whole study period, and samples of the original biosignal/ its respective power spectra during intubation and skin incision. The characteristic patterns of the biosignal and its power spectrum allowed us to classify beta, delta and EMG arousals. However, they often occur simultaneously and to more accurately detect them, more than one channel should be recorded.



Conclusion(s): During sevoflurane anaesthesia, both EEG and EMG arousals are frequently seen. Beta and delta arousal have opposite effects on the Entropy values. EMG arousal is abolished by rocuronium at TOF level 0/4. All anesthesiologists using these monitors should be familiar with the effects of EMG and EEG arousal patterns and understand why they may cause misleading values.

3AP6-7

Bispectral index for monitoring hypnosis during balanced xenon anaesthesia

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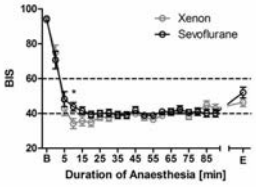
Background and Goal of Study: The noble gas xenon is an anaesthetic with a favourable haemodynamic profile [1]. The role of Bispectral Index (BIS) monitoring for the survey of hypnosis during xenon anaesthesia is discussed controversially [2, 3], but till now has only been investigated for single agent xenon anaesthesia. We analyzed the performance of the BIS during balanced xenon anaesthesia.
Materials and Methods: After written informed consent, 60 Patients undergoing abdominal surgery participated in this double-blinded randomized controlled clinical trial and were randomly assigned to receive either balanced xenon or sevoflurane anaesthesia with remifentanil titrated to clinical needs. BIS monitoring was blinded to the performing anaesthetist and values were continuously assessed by accessory study personnel.
Results and Discussion: 30 patients were enrolled in each group, comparable in respect to age, gender, height, ASA status, baseline systolic blood pressure and baseline heart rate. BIS values during induction and maintenance of xenon anaesthesia correlated well with the value range recommended for deep hypnosis and with values obtained during sevoflurane anaesthesia.Bispectral Index monitoring thoroughly indicated an adequate level of hypnosis during balanced xenon anaesthesia guided according to clinical parameters. Controversial results obtained from former studies [2] indicating unpredictable influences of xenon on the BIS were not confirmed.



Conclusion(s): We conclude that hypnosis during xenon anaesthesia can sufficiently be monitored using the BIS.
References:
1 Rossaint R, Reyle-Hahn M, Schulte Am Esch J, et al. Anesthesiology 2003; 98: 6-13.
2 Goto T, Nakata Y, Saito H, et al. Br J Anaesth 2000; 85: 359-63.
3 Laitio RM, Kaskinoro K, Särkelä MO, et al. Anesthesiology 2008; 108:63-70.
Acknowledgements: This work was co-sponsored by the University Hospital Aachen and Air Liquide Santé International.

3AP6-8

Joint monitoring of regional cerebral oxygenation and bispectral index during cerebral desaturation in cardiac anaesthesia

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Background and Goal of Study: Multimodal monitoring is essential to a thorough evaluation of neurological status. Near-infrared spectroscopy assesses the balance between oxygen delivery and consumption as regional cerebral oximetry (rSO_2) and detects cerebral hypoxia. Bispectral index (BIS) evaluates electric brain activity. Several case reports support its effectiveness as an indirect measure of injury, and it predicts neurological outcome in critical patients (1). Nevertheless, BIS and rSO_2 have not yet been evaluated jointly. Our aim was to correlate BIS and rSO_2 during cardiac surgery.
Materials and Methods: rSO_2 was monitored in elective cardiac surgery whenever patients were older than 70 or had either carotid artery stenosis >50% on pre-operative Doppler ultrasound, or previous stroke history on pre-operative

medical records or radiological exams. Clinical data and continued intra-operative monitoring were retrospectively retrieved for patients that desaturated (absolute rSO_2 <50% or drop from baseline >20%). BIS and rSO_2 were correlated with Pearson product moment correlation coefficient. Quantitative variables are mean±SD; $P < 0.05$ was considered significant.

Results and Discussion: Twenty four patients (73±4 years, 63% female, 19/5 ASA IV/III, 15±8% euroSCORE) that underwent valvular replacement (38%), CABG (38%), or both (24%) – 4 of them with synchronous carotid artery endarterectomy – met desaturation criteria. When intraoperative records spanning periods of desaturation from all patients were analysed, BIS and rSO_2 were significantly correlated (R=0.28, P=0.027). The correlation improved however if, for each patient, only the higher rSO_2 drop and simultaneously obtained BIS value were correlated (R=0.63, P=0.001). Significant correlations were obtained during both off-pump and cardiopulmonary bypass periods.

Conclusion(s): Although anaesthetic doses were not accounted for, we observed a significant direct correlation between BIS and rSO_2 value drops during cerebral desaturation, supporting the hypothesis that BIS can be an indirect intra-operative measure of brain insult. Conjugating monitoring strategies can improve interpretation of data and facilitate patient management during anaesthesia.

Reference:

1 Myles PS, Daly D, Silvers A, *et al*. Anesthesiology 2009;110:1106–15.

3AP6-9

The relationship with regional cerebral oxygen saturation and blood variety index by central venous oxygen saturation under the cardiopulmonary bypass in children

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Background and Goal of Study: Cardiac surgery with cardiopulmonary bypass (CPB) induces the change in supply of cerebral oxygen by some factors. It is difficult to infer whether cerebral oxygen balance in adequate. Regional cerebral oxygen saturation (SrO_2) is monitored widely. The efficiency of monitoring blood variety index (BVI) with SrO_2 has been reported. The goal of this study is to investigate BVI monitoring during CBP.

Materials and Methods: This prospective study carried out in 10 patients, less than 2-year-old, who underwent ASD closure or VSD closure at our hospital. Infrared spectroscopic soma sensor (INVOS) were placed on the patient's left and right frontal head to continuously monitor SrO_2 and regional BVI that were calculation by Spatial Resolved Spectroscopy Methods and Modified Beer-Lambert Methods. The internal jugular vein was cannulated for measurement of central venous oxygen saturation (SvO_2). The value of SrO_2, BVI, SvO_2 and mean arterial pressure (MAP) were recorded before CBP and every 15 minutes after CBP induction. The data obtained were statistically analyzed and presented by Pearson's correlation coefficient and Simple regression and one-factor ANOVA.

Results and Discussion: There were no relationship between the change of SrO_2, SvO_2 and time of CBP. Low MAP did not induce SrO_2 decrease. There were no cases that the fatal decrease of SrO_2 were presented. The decline of MAP leaded to significant decrease of BVI without remarkable decrease of SrO_2. Low BVI induced low SvO_2 without SrO_2 decrease.

Conclusion(s): We investigated that whether the monitoring of SrO_2 and BVI reflected cerebral desaturation in patients who had been received cardiac surgery with CPB. It has been found that the monitoring of SrO_2 with BVI was required to infer whether cerebral oxygen supply in adequate.

3AP6-10

Non-invasive absolute cerebral oximetry (Fore-Sight technology) during carotid endarterectomy

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Background and Goal of Study: During carotid endarterectomy (CEA), incidence of intra-operative stroke due to clamping-induced cerebral ischemia or embolization remains high (3-5%). The Fore-Sight cerebral oximeter, a recently introduced NIRS device, uses 4 precise wavelengths to determine absolute cerebral tissue oxygen saturation (SctO2). The SctO2 threshold for ongoing cerebral ischemia is estimated at 55%. In this study, we monitored SctO2 during carotid clamping for CEA comparing pts requiring shunt insertion (S) to pts undergoing CEA without need for shunt insertion (NS).

Materials and Methods: Over a 18 months period, 172 pts scheduled for CEA were included with IRB approval. In all pts, CEA was performed under general anesthesia. Bilateral SctO2 monitoring was applied, but blinded for intra-operative interpretation. Shunt insertion was solely guided by aEEG monitoring and/or by absence of any carotid backflow.

Results and Discussion: In 40 of 172 pts, EEG changes indicative of ongoing cerebral ischemia (21pts) and/or absence of any carotid backflow (28pts) guided shunt insertion. Mean ipsilateral SctO2 before clamping was not different for NS (71.2%; 62-80%) compared to S (69.3%; 64-77%). In both groups, SctO2 decreased significantly after carotid clamping (NS: minus 6.56%; 2-20%; p0.0042 vs S: minus 9.1%; 4-29%; p: 0.0031). Significantly more S pts (10/40) revealed SctO2 below 55% (mean duration 2.1min) after carotid clamping (compared to 5/128 NS pts). Ipsilateral mSctO2 before shunt opening was 60.4% (50-77%) and increased significantly (p: 0.0039) to m68.3% (52-78%) after opening. In one pt, SctO2 remained below 50% during whole shunting period (31min). This pt revealed a new neurological deficit at emergence from anesthesia. All other 171 pts experienced an uneventful neurological recovery.

Conclusion(s): Non-invasive absolute cerebral oximetry revealed significant ipsilateral decreases in cerebral saturation after carotid clamping. Significantly more pts requiring shunt insertion were found with SctO2 values below the threshold of 55% after carotid clamping.

3AP6-11

New technology of non-invasive cerebral oximetry (Fore-Sight technology) to monitor cerebral perfusion during resuscitation from cardiac arrest (CPR)

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Background and Goal of Study: Favourable neurological outcome after CPR may be influenced by the adequacy of cerebral perfusion during resuscitation. Near-infrared spectroscopy (NIRS) provides a non-invasive real-time index of cerebral perfusion. Until yet, few data (1) reported on NIRS during CPR and could not monitor any effect of resuscitation on cerebral oxygenation. Newest NIRS technology uses four precise wavelengths to determine absolute cerebral tissue oxygen saturation (SctO2) (Fore-Sight technology). In this paper, we report on the first ever experience with this new NIRS technology during CPR.

Materials and Methods: With IRB approval, a protocol is implemented with non-invasive cerebral oximetry applied immediately, at arrival of the scene, by the emergency physician.

Results and Discussion: As far as today, we monitored 6 pts. In all 6 pts, CPR was already started (at least 5 minutes) before arrival of the medical rescue team. First $SctO_2$ values were between 30-40%, in all 6 pts. As soon as spontaneous circulation was restored, $SctO_2$ increased to 50-60%. These values were maintained during further CPR in 4 pts. In 2 pts, it was impossible to restore any circulation, SctO2 did not increase above 40%. In 2 pts, spontaneous circulation was maintained (successful CPR) and SctO2 increase (and remained) above 70%.

Conclusion(s): First preliminary data on the use of newest NIRS technology during CPR are most promising. Immediately after return of spontaneous circulation, cerebral oxygenation and adequacy of cerebral perfusion can be monitored.

Reference:

1 Newman H et al. Cerebral oximetry in out-of-hospital cardiac arrest: standard CPR rarely provides detectable hemoglobin-oxygan saturation to the frontal cortex. Resuscitation 2004; 63: 189-194.

3AP7-1

Comparaison between a new non-invasive continuous technology of spectrophotometry-based and R.B.C count for haemoglobin monitoring during surgery with hemorrhagic risk

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Background and Goal of Study: Per operative bleeding is a frequent complication during an anaesthesia. The haemoglobin monitoring is needed in order to manage a RBC transfusion decision. Actually the measures of haemoglobin is realized either in the laboratory, or relocated laboratory or at bedside of the patient by azidemethaemoglobin reaction (point-of-care). Recently a new non-invasive continuous technology of spectrophotometry-based haemoglobin monitoring appeared. This work aims to estimate the reliability of a prototype of this technology.

Materials and Methods: During surgery with an hemorrhagic risk, a RBC count and a spectrophotometric haemoglobin measurement are realized simultaneously (Radical 7 Rainbow, 7.3.0.2 Version, Masimo Inc©©, Irvine, CA, USA). The measures are performed at the beginning and at the end of intervention, before and after a RBC transfusion and every time it is considered necessary by the anaesthesiologist in charge of the patient. A correlation between laboratory and the spectrophotometric measured values and a Bland and Altman test were performed.

Results and Discussion: 20 patients subjected to an urologic surgery procedure with hemorrhagic risk are included. 54 couples of measures are realized. The correlation between laboratory and the spectrophotometry values is 0.88. The bias is 0,26 with a standard deviation of 1,11 on Bland and Altman test.

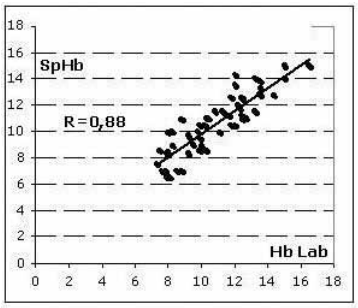

Figure 1. Correlation between RBC laboratory (Hb Lab) and the spectrophotometry haemoglobin measurement (SpHb)

Conclusion(s): This study realized in clinical conditions confirms the first tests realized by the manufacturer. The correlation is good, suggesting the possibility of a daily use of this technology. This correlation and the amplitude of the standard deviation should improve with the appearance of sensor's new generation. Further studies to define the indications and the limits (vasoconstriction, hypothermia) of this technology are necessary.

3AP7-2

Increases in the composite variability index (CVI) were associated with increases in heart rate

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Background and Goal of Study: Increases in the Composite Variability Index (CVI) have been associated with intraoperative somatic responses. This study investigated the association between CVI increases and heart rate increases, a commonly used indicator of patient response to surgical stimulation.
Materials and Methods: Records from 105 patients undergoing elective, non-cardiac surgery were collected from 4 sites. Heart rate (HR), raw EEG, and processed EEG variables were recorded continuously to laptop. CVI (v2.1) was computed offline for analysis. Balanced anesthesia was maintained with remifentanil and either sevoflurane or propofol. Propofol or sevoflurane concentrations were adjusted to maintain BIS in the 45-60 range. Neuromuscular blockade use was limited to maintaining at least one or two twitches. All other anesthetic management was left to the discretion of the anesthesia provider who was blinded to CVI. Thirteen cases were excluded due to excessive artifact, incomplete data or intraoperative beta blocker use. Data were analyzed from the time of skin incision to ten minutes prior to cessation of the primary anesthetic agent. CVI events were defined as the times when CVI increased and remained above a target threshold of 3.0 for more than 30 seconds. HR events were defined as the times when the % change in HR, relative to HR 5 minutes earlier, increased and remained over 20% for more than 10 seconds. Once an event was identified, any events of the same type in the next 3 minutes were ignored. We identified all instances when CVI and HR events occurred within 5 minutes of each other and compared the incidence with the expected incidence if CVI and HR events were independent, poisson processes.
Results and Discussion: We identified 185 CVI events and 88 HR events from 7342 minutes of intraoperative data. 36 (41%) HR events coincided with a CVI event (Table 1). The expected probability of at least one CVI event occurring within five minutes of a HR event is 0.22. Using a binomial test, we ruled out the probability that 36 coincident HR and CVI events were observed by random chance (p = 0.0003).

	No HR Event	HR Event
No CVI Event		52
CVI Event	149	36

Conclusion(s): This study shows that CVI and HR events occur together at about twice the rate expected by random chance. However, only 40% of HR events or 20% of CVI events are coincident with each other. This suggests that even though increased CVI and HR are correlated, there are many times when we would expect cortical or autonomic responses to occur without the other.

3AP7-3

Pulse-independent, non-invasive, hemoglobin and oxygen saturation monitor

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Background and Goal of Study: Monitoring of blood Hemoglobin and Oxygen saturation is essential in intensive care units, operating and recovery rooms. However, significant challenges still remain. Standard pulse oximeters cannot be relied upon to provide accurate measurement results in cases of weak pulse and low perfusion, e. g. in states of hypovolemia or hypothermia. Disadvantages of current methods for the determination of Hb are that they are invasive and do not lend themselves to be applied frequently enough for continual tracking of Hb. The purpose of this study is to validate the performance of the pulse independent, fully non-invasive, NBM-200MP system (OrSense Ltd) in continuous monitoring of hemoglobin and oxygen saturation, and to test its stability in extreme cases of low perfusion.
Materials and Methods: The study was conducted in the Rabin Medical Center, Petah-Tikva, Israel, and included 2 groups: 10 healthy volunteers and 19 ICU patients, in various levels of hypoxia. The healthy group underwent induced hypoxia (down to 70%), with NBM oxygen saturation readings every 50 seconds and reference values by a Masimo pulse oximeter. As an emulation of weak pulsation, we used a brachial cuff to reduce and almost occlude the blood flow in the measurement site vicinity. Patients in the ICU group were monitored for up to 24 hours, with NBM oxygen saturation and hemoglobin readings every 10 minutes. Reference values were obtained every 1-2 hours using a Radiometer blood gas analyzer and a Datex-Ohmeda oximeter.
Results and Discussion: In the healthy group, the NBM monitored oxygen saturation values with mean accuracy of 2.5% and a bias of -0.3%. During the low perfusion emulations, the NBM maintained its tracking, while the standard oximeter either failed to work or gave unrealistic values. In the ICU group we obtained oxygen saturation values down to 50%. The mean accuracy of the NBM system was 3.7% with 0.9% bias, and the tracking was maintained even when the regular pulse oximeter gave erroneous readings. Hb levels were in the range 7-14.5 g/dl, and the standard deviation of error was 1.17 g/dl.
Conclusion(s): Use of the device did not cause any discomfort for subjects, was safe and well tolerated. This study substantiates the potential of the NBM-200MP for non-invasive, continuous and reliable monitoring of hemoglobin and oxygen saturation, even in cases of weak pulsation.

3AP7-4

Peripheral nerve stimulation: Effect of the current polarity and inter-stimulating electrode distance

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Background and Goal of Study: The peripheral nerve stimulation is used in daily practice to evaluate neuromuscular relaxation. Among factors influencing muscle response, there are the location, the polarity and the intensity of the stimulation current[1, 2]. The goal of this experiment is to study the influence of the current polarity and the inter-stimulating electrodes distance (ISED) on the current threshold required to stabilize the maximal EMG response. Stimulation is applied via surface electrodes on the ulnar nerve.
Materials and Methods: MUSTIMEG[3] device was used to stimulate the nerve by rectangular pulses (200 µs) and to measure evoked EMG (eEMG) on the hypothenar of 10 normal voluntary subjects without muscle relaxant. In the first study, the distal stimulating electrode is located at 2 cm from the wrist and the ISED is 3 cm. The eEMG response is measured for cathode placed in distal and proximal position. In the second study, cathode is held in distal position and anode is displaced along the nerve from wrist to elbow by steps of 3cm. For each electrodes position, stimulation current is progressively increased from 0 until a stable maximal response is reached. eEMG responses are systematically displayed and archived thanks to MUSTIMEG Software[3].
Results and Discussion: Fig1 shows a typical influence of the current polarity on the EMG amplitude. Fig2 presents the measurements when anode, in proximal position, is moved along nerve. Tab1 presents two parameters: I10 and I90, respectively the current to obtain 10% and 90% of the maximal response.

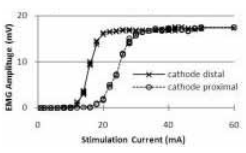

Fig1. Current Polarity Influence

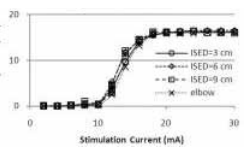

Fig1. ISED Influence

Table1. Distribution of I10 and I90 - Cathode Distal (A) – cathode Proximal (B)

n=10	I10 (A)	I90 (A)	I10 (B)	I90 (B)
Mean (mA)	15.71	23.71	18.86	28
StD (mA)	5.15	7.95	6.47	8.10
Min (mA)	9	16	10	19
Max (mA)	22	33	29	40

Conclusion(s): The cathode must be located on distal position to decrease the intensity threshold ensuring a maximal eEMG response, whereas inter-electrode distance is less important.

References:
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3 De Bel M et al. Eur. J. Anaesthesiol. 2009;26 Sup 45:127.

3AP7-5

Monotonic behaviour of an EEG-AEP based fuzzy logic index and BIS during decrease of anaesthesia

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Background and Goal of Study: EEG and auditory evoked potentials (AEP) have been suggested to quantify the hypnotic component of anaesthesia. It has been shown that a combination of EEG and AEP parameters based on a fuzzy logic separates different levels of anaesthesia [1]. The present investigation evaluates the monotonic behaviour of the EEG/AEP indicator (FLI) and BIS during decrease of the anaesthetic level from deep anaesthesia to return of consciousness (ROC).
Materials and Methods: Configuration of the FLI is based on previous studies [1,2]. The fuzzy inference includes two wavelet AEP parameters and EEG parameters approximate entropy, permutation entropy, weighted spectral median frequency and suppression ratio [1]. EEG analysis was performed using a 30Hz low pass filter on data from 15 volunteers under propofol and propofol/remifentanil general anaesthesia (cross over) [2]. The study includes a phase of deep anaesthesia with EEG burst suppression (BS), before propofol was discontinued and the FLI and BIS (offline [3]) were calculated until ROC. Spearman correlation (r_S) indicates the monotonicity between indicator values and normalized time (0: BS, 100: ROC).
Results and Discussion: Table 1 shows results for propofol (I), propofol/remifentanil (II) and both groups (III). Figure 1 indicates time series of FLI and BIS during decreasing anaesthesia.

Indicator	r_S group I	r_S group II	r_S group III
FLI	0.77	0.63	0.68
BIS	0.72	0.72	0.72

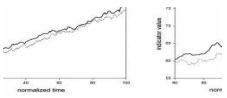

Figure 1. (A) Averaged time series of FLI (lined) and BIS (dotted) values vs. normalized time scale from 0 (BS) to 100 (ROC). (B) Detail plot of indicator trend before ROC.

Conclusion(s): FLI and BIS indicate a decrease of the anaesthetic level from BS to ROC with similar monotonicity, which is mainly independent from the influence of the opioid. Even if high frequencies above 30Hz were excluded from EEG analysis, the FLI reflects the transition to consciousness with increasing slope before ROC and reaches values near the expected threshold of 80 at ROC. BIS index indicates ROC below the recommended threshold and includes high frequencies, which may mainly reflect EMG.

References:
1 Anesth Analg 2009; 108: 1512-21.
2 Anesthesiology 2005; 103: A65.
3 Anesth Analg 2007; 104: 135-9.

3AP7-6

EMG response in profound neuromuscular block: Stimulation artifact or direct stimulation?

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Background and Goal of Study: Neuromuscular block (NMB) monitoring relies on peripheral nerve stimulation. A muscle may contract in response to nerve (indirect) stimulation (IS) as well to direct muscle stimulation (DS). Several studies[1, 2] have shown that DS requires a bigger stimulus than IS. In practice, DS is related to the presence of residual muscular responses during deep or intense NMB. The aim of this experiment is to analyse the components of the EMG responses with or without NMB.
Materials and Methods: MUSTIMEG[3] was used to stimulate the ulnar nerve by rectangular pulses (200 µs) and to record the evoked EMG of the hypothenar muscles in 10 informed and consenting patients. Negative stimulating electrode (Cathode) was stuck in distal position at the wrist and an inter electrodes distance of 3cm is respected to place the proximal anode. During anaesthesia, stimulation current is progressively increased from 0 to 70mA by steps of 5mA before and after 0.45 mg.kg-1 of rocuronium. We subtracted the artefact response (obtained during NMB) from the raw EMG (obtained without NMB) to plot the pure muscular response according to stimulation current.
Results and Discussion: Fig 1: Monitor responses recorded before and during NMB (at 50mA). **Fig 2:** relationship between the EMG amplitude at time T1 (Fig1) and the stimulation current. During NMB, the artefact grows with the stimulation intensity. Subtracting the artefact from the raw EMG measured before NMB demonstrates a stable supramaximal muscular response. Tab1 shows the distribution of the amplitude of artefact and corrected EMG at T1 for a 70mA stimulation.

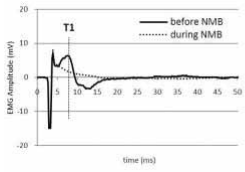

Fig1. Monitor Response Before and During NMB

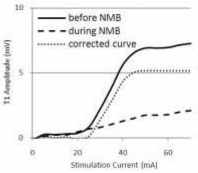

Fig2. T1 Amplitude vs Stimulation Current

Table1. Distribution of T1 on Artefact and on Corrected EMG

n=5	T1 (Artefact)	T1 (Corrected EMG)
Mean (mV)	1.45	5.13
StD (mV)	0.92	0.82

Conclusion(s): We conclude that the responses measured during deep NMB are only due to the stimulation artefact which increases linearly with the stimulation current. On the contrary, the maximal muscular response remains stable up to 70mA and no direct response is related to the stimulation.

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1 Fuchs-Buder T et al. Acta Anaesthesiol. Scand. 2007;51:789-808.
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3AP7-7

Acceleromyography using 0.1 Hz single twitch enables superior intubating conditions but with considerable delay of intubation time compared to either train of four stimulation or clinical assessment after rocuronium induced neuromuscular blockade

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Background and Goal of Study: Objective monitoring of neuromuscular blockade (NMB) is being strongly recommended in various indications of anesthesiological management, although clinical assessment is still widely used. The aim of this study was to evaluate advantages of acceleromyography using 0.1 Hz single twitch in determination of onset time and intubation conditions following administration of rocuronium.
Materials and Methods: In this prospective, randomised, double blind study, 60 ASA I-II patients undergoing elective abdominal surgery were assigned to one of three groups (n=20), depending on the type of NMB monitoring were used. After anesthesia was induced with propofol-remifentanyl, acceleromyography (TOF Watch® S) at adductor pollicis muscle was established to determinate intubating time (IT) using either 0.1 Hz single twitch stimulation (group ST) or train of four stimulation (group TOF). In 20 patients endotracheal intubation was carried out after predefined clinical criterions were fulfiled. Criterions including: good relaxation of the masseter muscle and the lower jaw, easy mask ventilation and fact that ≥ 60 sec elapsed since rocuronium was administered (group CI). IT was defined as the time period from the start of injection of 0.6 mg·kg^{-1} of rocuronium until 95% suppression of ST or complete disappearance of responses to TOF stimulation. Blinded investigator evaluated the quality of intubating conditions either as clinically acceptable (excellent or good), or clinically not acceptable (poor), according to the laringoscopy (easy, fair or difficult), vocal cord position (abducted, intermediate or closed), and reaction to insertion of the tracheal tube and cuff inflation (none, slight or vigorous).
Results and Discussion: IT was significantly shorther in CI group (66.5 ± 4.44 s, range 61-77 s.), compared to TOF group (75.44 ± 7.5s; range 65-98 s) and ST group (83.75 ± 6.08 s, range 69-96 s), (p< 0.001). Intubating conditions were judged as clinically acceptable more frequently in ST group (20/20) and TOF group (17/20) compared to CI group (10/20), (p< 0.01). Furthermore,

excellent intubating conditions were more frequently found in ST group (18/20) compared to both TOF (11/20, p<0.01) and CI group (4/20, p< 0.001).
Conclusion(s): Monitoring the onset of rocuronium induced neuromuscular blockade using 0.1 Hz single twitch enables irreproachable intubating conditions but it is associated with considerable delay of intubation time in comparison to either TOF stimulation or clinical assessment of neuromuscular blockade.

3AP8-1

Monitoring of absolute cerebral oxygen saturation (Fore-Sight technology) during endoscopic shoulder surgery: Beach chair positioning or conventional side positioning

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Background and Goal of Study: Recent developments in endoscopic shoulder surgery require beach chair positioning to provide better surgical conditions. Moreover, optimal surgical visualisation often requires use of controlled arterial hypotension. Combining beach chair positioning with induced hypotension could threaten the maintenance of adequate cerebral perfusion. Fore-Sight absolute cerebral oximeter uses 4 wavelengths of near-infrared light to determine absolute cerebral oxygen saturation (SctO2). In this study, we monitored SctO2 comparing beach chair positioning (BP) to conventional (side) positioning (SP).
Materials and Methods: With IRB approval, 160 patients were included (80 pts: BP/80 pts: SP). All procedures were performed under general anesthesia (with previous locoregional inter-scalene block). Before induction of anesthesia, bilateral SctO2 monitoring was applied.
Results and Discussion: Mean SctO2 before change in body position was not different between both groups (BP: m78.32% SD 6.89% vs CP: m81.52% SD 6.26%). After BP positioning, SctO2 was significantly lower compared to SP (after positioning BP: m59.34% SD 13.78% vs SP: m73.14 SD 5.34%). During procedure (mean systolic blood pressure BP: 86.2mmHg; SP: 85.4mmHg), lowest SctO2 observed in BP was significantly lower compared to SP (BP: m54.03% SD 6.28 % vs SP: m65.54% SD 5.56%). In BP, 48/80 pts revealed SctO2 values below 55%, which did only occur in 4/80 pts in SP. There was no significant difference between both groups as to any hemodynamic or respiratory parameter. No pt experienced any major postoperative neurologic deficit.
Conclusion(s): Cerebral oxygen saturation values were significantly lower (possibly below the threshold for cerebral ischemia) in patients in beach chair positioning compared to conventional positioning for endoscopic shoulder surgery.

3AP8-2

Monitoring of absolute cerebral oxygen saturation during induction of general anesthesia

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Background and Goal of Study: The FORE-SIGHT absolute cerebral oximeter uses 4 wavelengths to determine absolute cerebral oxygen saturation ($SctO_2$) at the microvascular level. Induction of general anesthesia induces major changes in cerebral perfusion to metabolism ratio. In this study, we monitored changes in SctO2 during transition from awake to asleep condition.
Materials and Methods: With IRB approval, 76 ASA I-II pts scheduled for orthopaedic surgery were included. Bilateral SctO2monitoring was started in awake conditions (15min before anesthesia induction). In all pts, anesthesia was induced with propofol TCI (8µg/ml), fentanyl-alfentanil and rocuronium, followed by propofol TCI (3µg/ml) 50%O2/N2O.
Results and Discussion: Mean awake SctO2 was 71.37% (SD 4.11%; range 68-80%). Induction of anesthesia (with administration of 100% O2), did result in an immediate and significant increase in SctO2 (mSctO2 84.22%; SD 5.79%; range 76-98%) with return to baseline SctO2 values at a mean of 12.3min (7-20min). During this induction period, there was no significant increase in SpO2 nor in hemodynamic parameters (blood pressure or heart rate). Immediately after intubation, ventilation was adjusted to strict normocapnic conditions (mEtCO2 35.7mmHg).
Conclusion(s): Induction of general anesthesia results in a significant, short-lasting increase in cerebral oxygen saturation. This could be mainly explained by influencing factors such as FiO2, EtCO2 and a decrease in cerebral metabolism by anesthesia induction.

3AP8-3

Postoperative monitoring of non-invasive absolute cerebral oxygen saturation after carotid endarterectomy

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Background and Goal of Study: Cerebral Hyperperfusion Syndrome (CHS), caused by inflow into maximally dilated fine cerebral vessels, is a recognized complication after carotid endarterectomy (CEA). Cerebral oximetry, based on NIRS, measures regional tissue oxygen saturation (SctO2) at the microvascular level. In this study, we evaluated SctO2 monitoring after CEA.
Materials and Methods: In 24 pts, bilateral SctO2 monitoring was applied for at least 12hrs after CEA. Early postoperative care was focussed on strict neurologic follow-up and maintenance of arterial normotension. SctO2 monitoring was blinded and unavailable for any interpretation.
Results and Discussion: In 5 pts, intra-operative EEG monitoring guided intraluminal shunt insertion. In all 24 pts, surgical procedure was uneventfull. In 8 of 24 pts, ipsilateral SctO2 increased above 85% in the postoperative course (m87.5%; range 86-93%), without any change in contralateral SctO2. This increase occurred at a mean of 3.8hrs (1.2-5.4hrs) after carotid declamping and mean duration was 5.3hrs (3.8-21.4hrs). In these 24 pts, we found no correlation between increased SctO2 values and arterial hypertension. None of these 8 pts experienced any neurologic deficit, except for headache (3pts).
Conclusion(s): Significant increases in ipsilateral SctO2values were observed in the early postoperative hours after CEA in about one third of all pts.

3AP8-4

Cerebrovascular reactivity (by CO2 challenge) can be monitored by non-invasive absolute cerebral oxygen saturation (Fore-Sight technology)

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Background and Goal of Study: The Fore-Sight monitor is a continuous wave, spatially resolved, near-infrared spectrometer that measures absolute cerebral tissue oxygen saturation (SctO2 %). It uses laser light, projected into the brain in 4 precise wavelengths. Cerebrovascular reactivity testing with CO2 challenge (by hyper-normoventilation) is used clinically as a measure of cerebrovascular reserve. In this study, we wanted to assess whether non-invasive absolute cerebral oxygen saturation could monitor the cerebral effects of changes in end-tidal CO2.
Materials and Methods: With IRB approval, 52 pts scheduled for elective orthopaedic surgery (under general anesthesia) were included. In all pts, bilateral SctO2 monitoring was applied before induction of anesthesia. Ventilation (after induction of anesthesia and ETT) was adjusted to normocapnic (EtCO2 32-38mmHg) conditions. Thereafter, 30 min of hyperventilation (EtCO2 22-25mmHg) was installed by increasing ventilatory frequency. This was followed by 30 min of strict normocapnia and finally by 30 min of mild normocapnia (EtCO2 40-45mmHg).
Results and Discussion: In all pts, installation of hyperventilation (mEtCO2 23.8mmHg) resulted in a significant decrease in bilateral SctO2 (m75.3% to m62.5%; range 64-84% before; range 56-74% after hyperventilation). Return to normocapnic conditions resulted in a significant increase in bilateral SctO2 (m74.8% to m81.3% with mEtCO2 44.2mmHg). We observed a mean delay of 8.2 min (range 4-15 min) between induced changes in EtCO2 and observed changes in SctO2. There were no significant hemodynamic or respiratory changes during these hyper-normo-ventilatory periods.
Conclusion(s): Induced changes in EtCO2 resulted in significant changes in SctO2, monitored by this new technology. Therefore, non-invasive absolute cerebral oxygen saturation monitoring mainly (if not exclusively) reflects pure cerebral oxygen saturation, excluding large interference from extracerebral tissues.

3AP8-5

Bite blocks and tongue injuries during motor evoke potential monitoring

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Background and Goal of Study: Transcranial electrical stimulation motor evoke potential monitoring became a standard procedure during total intravenous anesthesia. However, tongue and lip injuries can occur and has been reported by MacDonald.[1] They are very few studies regarding tongue injuries related to different types of bite blocks. This study is a retrospective review of tongue injuries associated with different types of gauze bite blocks.
Materials and Methods: Three types of gauze bite blocks which was used by different anesthesiologists and neurophysiologists were reviewed and examined. The cases of tongue injuries were collected after surgery. Type A: 4 inch roll-up (glue stick style) Type B: 4 inch thin roll-up (tampon style bilateral) Type C: 2 inch roll-up (short glue stick and secure with tape).

Results and Discussion: Total of 1015 cases were included in the study. The incidence of tongue injury which includes laceration, and hematoma is listed below: Type A: 5 injuries in 652 cases (0.76%) Type B: 1 injury in 98 cases (1%) Type C: 0 injury in 265 cases (0%) The common cause of tongue injury in type A was due to the gauze stick pushed in too far which caused the tongue to be situated between teeth on one side. Type B caused dislogement of bite block on one side during prone position. So far Type C is the best bite block without causing tongue injury. This is an initial review of three types of bite blocks. More types of bite blocks will be included in a future study. If Toothette adult bite block is available which may be used to prevent tongue injuries.[2]

Conclusion(s): A short gauze bite block secured with tape is an advantage to prevent tongue injuries during intraoperative transcranial electrical stimulation motor evokd potential monitoring.

References:

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2 Deiner SG, Osborn IP. Prevention of airway injury during spine surgery: Rethinking bite blocks. J Neurosurg Anesthesiol. 2009; 21:68-69.

3AP8-6

Anesthesia steady-state index: A combined measure of BIS, blood pressure and heart rate

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Background and Goal of Study: Anesthesia aims at maintaining the patient in a stable condition, avoiding over/subdosing and it's consequences. The goal of this study was to extract drugs steady-state (SS) periods and calculate a combined indicator of BIS, ECG heart rate and mean blood pressure SS, using a wavelet technique [1].

Materials and Methods: Data collected every 5 s (RugloopII) during 22 urological procedures under TCI of propofol and remifentanil (Schnider [1] and Minto's [2] PkPd models). Data from 5 patients used to extract periods of SS by visual analysis, and tuning parameters for the wavelet detector [4]. The tuned algorithm was applied to all patients. Drugs SS periods were identified by an arithmetic rule. Fig. 1 summarizes the algorithm. The SS index varies from 0 (non-SS) to 1 (SS), with smoothing period of 15s. MATLAB R2007a was used for signal analysis.(Data:Mean±SD)

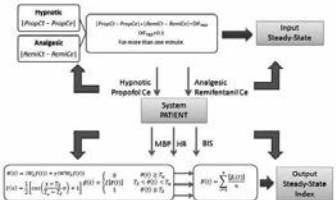

Figure 1. Diagram presenting the algorithm steps: the patient is the system, with propofol and remifentanil drugs effect-site concentrations (Cc) as inputs, and mean blood pressure (MBP), ECG heart rate (HR) and BIS as measurable outputs. On top we have the steady-state detection arithmetic rule for the inputs, and on bottom we have the wavelet based algorithm summary to determine the combined steady-state index.

Results and Discussion: 22 patients, 12 men, 55.9±13.0 years, 69.3±13.4kg and 164.3±6.9cm. Fig. 2 presents the results for one patient outside the training set, with the inputs SS detection followed by the filtered signals (BIS, ECG heart rate and blood pressure) and combined measure of SS. The performance of the method was visually evaluated, with the results indicating an adequate detection of the SS periods. We also observe that SS in the inputs is not always followed by SS in the output signal [4], this may be the result of external interferences not only related to the input drugs.

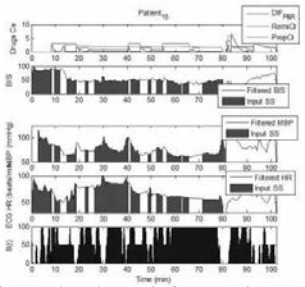

Figure 2. Steady-state detection results for one patient outside the training set. From top to bottom: drug's effect-site concentration targets and arithmetic rule DIF; filtered BIS, filtered mean blood pressure and filtered ECG heart rate with the input steady-state periods overlapping; combined measure of output steady-state.

Conclusion(s): A combined measure of SS was obtained; this tool may be useful to model the drugs interactions and consequences on the measurable effects, producing stationary models. Also the combined SS index may introduce information to the original signals reflecting outer stimuli and interferences other than drugs.

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Acknowledgements: FCT; UISPA IDMEC, Portugal.

3AP9-1

Noninvasive estimation of cardiac output by thoracic bioimpedance: A comparison with doppler echocardiography

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Background and Goal of Study: Thoracic bioimpedance has been proposed as a noninvasive, continuous, easy to use and operator-independent method for cardiac output (CO) monitoring. Its reliability, however, remains controversial [1,2]. The objective of this prospective study was to evaluate the validity of measurements of CO obtained with the thoracic bioimpedance monitor Physioflow® (Manatec Biomedical, France) in comparison with those obtained using transthoracic Doppler echocardiography as a reference.

Materials and Methods: After informed consent, 20 healthy volunteers and 18 critically ill patients (including 10 under mechanical ventilation) were included in the study. Data from Doppler echocardiography (at the aortic valve; monitor Vivid i, GE Medical Systems) and Physioflow ® were recorded before and after an intervention susceptible to alter CO (a 5 min-exercise in healthy volunteers, fluid replacement, blood transfusion, haemodialysis, change in positive end expiratory pressure, or tracheal extubation in patients). Each operator was blinded to values acquired simultaneously with the other technique. Statistical analysis consisted of analysis of correlations and Bland and Altman method.

Results and Discussion: In healthy subjects, the correlation coefficient (r) was 0.71 (p = 0.0004; n = 20), the bias was -1.65 L/min, 95% limits of agreement were +0.37 to -3.67 L/min, and the average error was 37%. In the group of patients, these values were respectively 0.59 (p = 0.006; n = 18), -0.29 L/min, +2.61 to -3.19 L/min, and 45%. Changes in CO and stroke volume measured by each technique were correlated: r = 0.61 (p = 0.0031) and 0.47 (p = 0.0036) in healthy subjects, r = 0.84 (p <0.0001) and 0.86 (p <0.0001) in patients (figure). In the whole population studied, changes in cardiac output were measured in the same direction (positive or negative) in 36/38 subjects.

Conclusion(s): We found clinically unacceptable agreement between absolute values of CO measured by both techniques in volunteers as well as in critically ill patients. However, the Physioflow® may be sufficiently reliable for estimating changes in CO during haemodynamic load challenge. Its usefulness for monitoring CO for prediction of volume responsiveness should be evaluated.

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3AP9-2

Non invasive pulse pressure variation as an indice of preload responsiveness

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Background and Goal of Study: A perioperative hemodynamic strategy appears associated with improved patients' outcome. In this context, automated preload-dependency indices help in optimizing preload. The aim of this study was to assess a non invasive and automated measurement of pulse pressure respiratory variation (PPV) with the CNAP monitor (CNSystem, Austria).

Materials and Methods: 23 patients were included (after study approval): 4 were admitted in surgical intensive care unit, 9 undergoing digestive surgery and 10 undergoing thoracic surgery. All patients were monitored with an invasive artery catheter as well as with the CNAP probe. Both signals were recorded on the Intellivue monitor (Philips). As a reference, PPV was manually calculated during 3 consecutive respiratory cycles from the invasive artery curve and compared to the two automated measurements of PPV: one being provided by the Intellivue (PPVphi); the other being noninvasive and measured by the CNAP (PPVcnap). The measurements were made each time the clinician in charge of patients decided to conduct a fluid challenge (just before and after).

Results and Discussion: There was a good correlation between PPV and PPVphi (r = 0.877; p< 0.001). Bias between these two variables was -1.2% and limits of agreement were -5.6% – 3.5%. The correlation between PPV and PPVcnap was weak (r = 0.419; p< 0.001). Bias between these two variables was -3.51% and limits of agreement were -14.51 – 7.49%. With these results PPVcnap cannot be used as a reliable tool to predict preload dependency. To explain these results we calculated PPV manually from the non invasive artery curve directly obtained from the CNAP monitor. This time, correlation was better (r = 0.790; p< 0.001). Bias was -0.34% and limits of agreement were -6.94% – 6.26%.
Conclusion(s): Invasive and automated measurement of PPV by the Intellivue monitor (Philips) appears as a reliable tool to predict fluid responsiveness. This first algorithm proposed by the CNAP monitor has to be improved. But the quality of the noninvasive signal seems to be sufficient as manually PPV calculated from this signal was well correlated to the PPV measured from the invasive artery curve.

3AP9-3

Comparison of non-invasive continuous bloodpressure measured by Nexfin® and invasive radial artery readings

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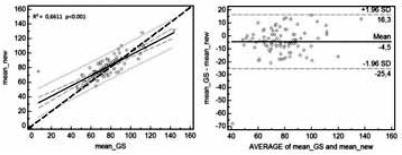
Background and Goal of Study: Continuous blood pressure (BP) registration always has been a goal for anaesthesiologists. The monitor allows non-invasive continuous BP measurements using the Finapres methodology. Hereby brachial arterial BP is reconstructed by measurements at the finger. This method was validated against the Riva-Rocci & Korotkoff sounds (1). We intended to evaluate the monitoring comparing Nexfin® during surgery with the golden standard (GS): continuous invasive radial catheter BP readings.
Materials and Methods: Following institutional guidelines, 8 consenting patients scheduled for were prospectively studied. Simultaneously, non-invasive BP readings as provided by the Nexfin® and invasive radial pressure as the GS were registered at different time points and varying haemodynamic conditions. Statistical analysis included classical regression and correlation followed by a Bland and Altman analysis (2).
Results and Discussion: Ninety five valid simultaneous measured BP values in 8 patients could be recorded. A significant correlation was found between both methods. Typical B&A plot with averages of measurements on the x-axis versus their differences on the y-axis were constructed for systolic, diastolic and mean BP (last shown in figure 1). Accordingly the bias and limits of agreement (precision) are illustrated. Mean bias was consistent and a weak linear relationship was found between differences and averages. Figure 1: Left panel: a significant correlation is found; regression line does not fit exactly the line of identity (dashed). Right panel: B&A plot: mean negative bias reflects a frequent overestimation of mean BP measurements by Nexfin® (new) versus the gold standard.



Conclusion(s): Nexfin® monitoring can be useful under conditions continuous BP measurement is mandatory and an invasive technique is not necessarily indicated such as C-sections, medium or minimal surgery performed on geriatric patients or ENT surgery requiring hypotension. However, it will not replace the golden standard in all conditions since the measurements cannot considered as fully exchangeable.
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3AP9-4

Non-invasive estimation of stroke volume index and its variation by using pulse wave transit time

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Background and Goal of Study: For cardiovascular monitoring, stoke volume index (SVI) and stroke volume variation (SVV) have been shown as useful parameters to monitor 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. Feasibility of continuous monitoring of SVI and SVV by using PWTT technique was evaluated in clinical settings.
Materials and Methods: 18 adult 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. Also, PWTT-derived SVV (esSVV) was compared with pulse pressure variation (PPV). Statistical analysis was done by linear correlation and Bland-Altman analysis.
Results and Discussion: 71 pairs of SVI data were collected, and there was a good correlation between esSVI and iSVI (R=0.730). Bias and precision was -3.12 and 10.24 cc/m^2, respectively. There was a good correlation between esSVV and PPV (R=0.568, n=5456). The result of the present study shows that the estimation of SVI and SVV by using PWTT is a good candidate for non-invasive and continuous cardiovascular monitoring.
Conclusion(s): The way and timing of calibration should be clarified in the future study, since the change in physical property of arteries should be expected during anesthesia and critical care.

3AP9-5

Tissue doppler imaging reliably detects right ventricular dysfunction induced by mechanical ventilation

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Background and Goal of Study: Right ventricle (RV) plays a pivotal role in various pathological conditions, but echographic assessment of RV function remains difficult. Tissue Doppler imaging (DTI) is used to reliably assess RV function in spontaneously breathing cardiac patients. The goal of our study was to compare DTI-derived and classical transthoracic echocardiographic (TEE) parameters in RV function changes induced by mechanical ventilation (MV).
Materials and Methods: After informed consent, we studied 15 ASA2-3 patients scheduled for coronary artery bypass surgery(Cardiac group) and 15 ASA1 patients scheduled for orthopaedic surgery(Control group). A TEE was done:(1) before general anesthesia (GA) induction (**T baseline**),(2) after intubation and MV(Vt=8 ml/kg, zero end expiratory pressure (**T ZEP**)),and (3) after 10min of end expiratory pressure=5cmH20(**T PEP5**). We recorded the following parameters:(1)tricuspid annular plane systolic excursion(TAPSE);(2)RV surfacing fractional shortening(RVSfs);(3)right/left ventricular telediastolic diameter ratio(RV/LV);and (4)color DTI derived parameters including the myocardial wall velocities and the strain in the basal, mid and apical segments of the RV free wall. Intragroup and intergroup comparisons were done using non parametric tests. p<0.05 significant.
Results and Discussion: Patients were 68±10years old in cardiac group and 35±12 in control group. The main results are given in Table1. At **T baseline**, TAPSE, RVSfs, RV/LV and the DTI derived parameters were not significantly different between the 2 groups. GA and MV significantly altered RVSfs, RV/LV and DTI derived parameters in Cardiac group but not in Control group. Positive end expiratory pressure only altered significantly the DTI derived parameters in Cardiac group.
Conclusion(s): Our study suggests that DTI is a sensitive tool to assess RV function in MV patients and may be useful to assess cardiac-lung interaction during MV.

Abstract-3AP9-5

	Tbaseline (Cardiac)	TZEP(Cardiac)	TPEP5(Cardiac)	Tbaseline(control)	TZEP(control)	TPEP5(control)
TAPSE(mm)	21.4±2.6	20.8±3.0	19.4±2.6	23.2±1.7	23.0±1.9	23.0±2.0
RVSfs(%)	51±6	49±10*	48±12	48±4	48±4	48±4
RV/LF	0.63±0.13	0.66±0.19*	0.66±0.2	0.57±0.03	0.58±0.02	0.57±0.01
Strain Basal(%)	28.6±6.5	24.7±6.0*	19.5±6.3$	30.3±3.2	30.7±4.2µ	31.5±3.4µ
Strain Apical(%)	31.0±4.2	23.5±5.7*	20.9±6.7$	32.8±3.9	31.4±4.0µ	31.3±3.8µ

*: p<0.05 TZEPvsTbaseline; $:p<0.05 TPEP5vsTZEP; µ:p<0.05 cardiac vs control

3AP9-6

Clinical proof of practicability of a contactless ECG device

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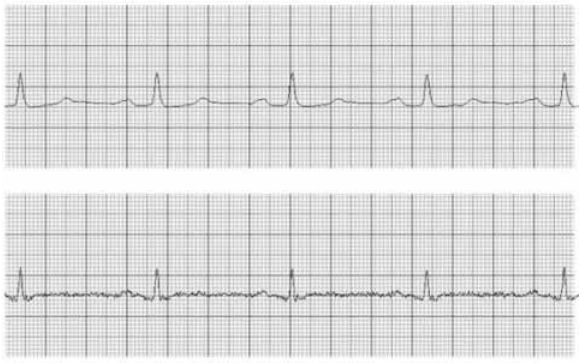
Background and Goal of Study: Heart rhythm disturbances are common symptoms for several heart disorders. One of the most effective used exami-

nation methods for heart disorders is the traditional, electrode-based ECG. However, this is time and ressources consuming. In contrast, capacitive ECG works without any conductive electrical contact to the patient. In this study, we wanted to examine the practibility of the so-called “Aachen ECG chair” in a clinical setting.

Materials and Methods: Thirty patients above 50 years, who had to wait within the scope of anaesthesia examination at the pre-medication ambulance, were included into our study. During their waiting period, they were asked to sit on the “Aachen ECG chair”. The device we used in this study allows ECG measurement through clothing without direct skin contact. Simultaneously to the capacitive ECG, we recorded a conventional, conductive ECG for validation. For the determination of the acceptability of the system in comparison with a conventional ECG both patients and physician were interviewed about the expenditure of time and preparation as well as the stress for patient and physician.

Results and Discussion: Data of thirty patients, mostly without any heart disorders, were collected during our study. Due to the easy and quick application of the cECG system, the feedback of the examined patients and the medical staff was consistently positive. The recorded cECG signals show a good correlation to the simultaneously recorded second lead of ECG. Data recorded in supine position contained less motion artefacts, especial less breathing artifacts. Nevertheless, recorded cECG data in a sitting position had a sufficient quality. Reducing the artefacts, which are caused by moving and breathing of the patient and interferences of the electromagnetic environment, could be reached by improving the signal filtering and using triax cables.



Conclusion(s): To sum up, cECG recording by contactless, capacitively coupled electrodes integrated into a chair, is a convenient screening method for heart rhythm disturbances. It can be realized economically without more efforts for patient or doctor.

Acknowledgements: This study was supported by the START research program of the RWTH Aachen (No. 690604).

3AP9-7

Performance of cardiac output measurement derived from arterial pressure waveform analysis in patients undergoing high-dose vasopressor-therapy

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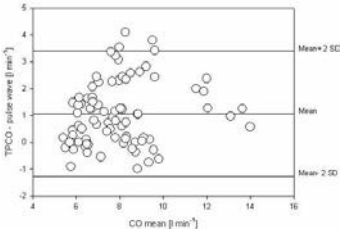
Background and Goal of Study: The validity of an arterial waveform-based device for measuring cardiac output (CO) without the need of invasive calibration (FloTrac/Vigileo™, Edwards Lifesciences, Irvine, CA, USA) has not been systematically studied in patients needing large doses of vasoactive medication1. We performed the present study to assess the validity of the recently introduced 3rd generation software compared with transpulmonary thermodilution CO measurement using the PiCCO®-technology (Pulsion, Munich, Germany) in patients undergoing triple-H-therapy (hypertonia, hypervolemia, hemodilution) of cerebral vasospasms after subarachnoidal hemorrhage.

Materials and Methods: 13patients (10females and 3males, age 48.5±6.6years, body weight 77±14.4kg) were included in this study. They were all suffering from a subarachnoidal haemorrhage (Hunt&Hess grade I-V) due to rupture of a cerebral aneurysm. Triple-H-therapy was initiated for the treatment of cerebral vasospasm. Simultaneous CO measurements by bolus thermodilution and the FloTrac/Vigileo™ device were obtained at baseline as well as 2h, 6h, 12h, 24h, 48h and 72h after inclusion. A percentage error of 30% or less was established as the criterion for method interchangeability.

Results and Discussion: Patients received vasoactive support with 0,56±0,55µg•kg^{-1}•min^{-1} norepinephrine in order to achieve a mean arterial pressure of 100±11mmHg and a systemic vascular resistance index of 1788±447.1dyn•s•cm^{-5} •m^{-2}. Eighty-four CO-data pairs were analyzed. Transpulmonary thermodilution CO ranged from 5.30to14.28l•min^{-1} (mean 8.45±2.05l•min^{-1}) and FloTrac/VigileoTM-CO ranged from 5.1to13.7l•min^{-1} (mean 7.37±1.84l•min^{-1}). Bias and precision (1.96 SD of the bias) were 1.07l•min^{-1} and 2.32l•min^{-1}, resulting in an overall percentage error of 27.5%.



Conclusion(s): In patients undergoing triple-H-therapy and needing extensive vasoactive support, CO values obtained by arterial waveform analysis using 3rd generation software showed good agreement with intermittent transpulmonary thermodilution CO measurements.

Reference:

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3AP9-8

Quantification of low grade myocardial ischaemia by a miniaturized epicardial ultrasonic sensor

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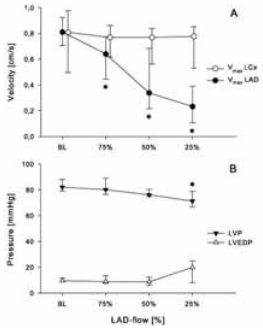
Background and Goal of Study: Detection of myocardial ischaemia during heart surgery is crucial to protect ventricular function. Sensitive methods for continuous perioperative assessment of myocardial function are needed. We aimed to test a miniaturized epicardial ultrasonic sensor for detection of graded myocardial ischaemia.

Materials and Methods: In six pigs, a left ventricle (LV) micromanometer measured peak (LVP) and end-diastolic pressures (LVEDP). After thoracotomy, two ultrasonic sensors (Ø 5mm) were sutured on the epicardium in the regions supplied by the left anterior descending artery (LAD) and the left circumflex artery (LCx). A continuous M-mode registration was obtained and a time-velocity trace was calculated in a fixed depth in the subendocardium. Peak systolic velocity (Vmax) was measured from this curve. To experimentally reduce coronary perfusion in the LAD-region, left internal mammary artery (LIMA) was anastomized to the proximal LAD. LAD was constricted immediately proximal to the anastomosis. LIMA-flow was continuously monitored by a flow sensor and flow was reduced with a balloon-occluder. Registrations were performed at baseline and after 5 min of 75%, 50% and 25% flow in the LIMA. LIMA-flow was normalized for at least 30 min between each step of flow-reduction. Non-parametric statistical analyzes was used.

Results and Discussion: Regional myocardial function was significantly ($p< 0.05$) reduced during all graded occlusions. Vmax was reduced from 0.81 (0.71;0.92) cm/s at baseline to 0.64 (0.45;0.77) cm/s during 75% LIMA-flow and was further decreased at 50% (0.34 (0.22;0.72) cm/s) and 25% (0.24 (0.11;0.39) cm/s), (fig. 1A). No changes were seen in the LCx region. Invasive hemodynamic measurements were insensitive to detect low and moderate coronary flow reduction, although a small but significant decrease in LVP occurred at 25% LIMA-flow ($P<0.05$) (fig. 1B).



Conclusion(s): During different levels of coronary flow reduction, myocardial ischemia can be quantified by tissue velocity measurements from an epicardial ultrasonic sensor. This sensor is a promising tool to detect ischemia continuously and in real-time during heart surgery, and with further miniaturizing of the sensor also in the postoperative period.

3AP9-9

Measurement of cardiac output in abdominal aortic surgery: A comparison between uncalibrated pulse contour analysis (FloTrac™/Vigileo™) and aortic doppler (transesophageal echocardiography)

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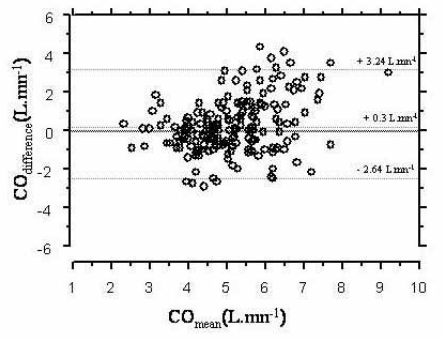
Background and Goal of Study: Cardiac output (CO) assessment is of particular importance in the perioperative management of high risk patients undergoing major surgery. The FloTrac™/Vigileo™ (FTV) is a new device based on arterial pressure waveform analysis that allows continuous CO determination and that does not require previous calibration. We compared determinations of CO made with FTV (software 1.14) to simultaneous measurements using transesophageal echocardiography (TEE) in patients undergoing aortic abdominal surgery.
Materials and Methods: 29 patients scheduled for abdominal aortic surgery were studied. Exclusion criteria were patients with cardiac rhythm disturbances, aortic valvulopathy, subclavian artery stenosis or contraindication for TEE utilisation. CO measurements were simultaneously collected at different times of surgery including aortic clamping and declamping. For the comparison of CO measurements Bland-Altman method was applied. Percentage error was calculated as described by Critchley and Critchley.
Results and Discussion: A total of 195 pairs of CO measures from 25 patients were analysed. Bias was 0.3 litre min^{-1} (95% CI ±2.9), precision was 1.1±1 litre min^{-1} and percentage error was 59%. 113 pairs of measures excluding the clamping and declamping periods were also analysed. Bias was 0.2 litre min^{-1} (95% CI ±2.5), precision was 1±0.9 litre min^{-1} and percentage of error was 51%. 23 pairs of CO measures were collected before and after aortic clamping and declamping. Aortic clamping induced a decrease of CO_{TEE} (-11.3%) and an increase of CO_{FTV} (+21.7%). Aortic declamping produced a decrease of CO_{FTV} (-23.4%) whereas CO_{TEE} measurements showed no variation during the same period. A high correlation between blood pressure changes and CO_{FTV} was observed.



Conclusion(s): Despite the absence of bias observed between the two methods, the lack of agreement and the high percentage of error may suggest that this new device is not suitable for aortic surgery. The algorithm of this new system showed a high correlation with systemic blood pressure and was unable to take into account changes of vascular resistance.

3AP9-10

Comparison of noninvasive continuous arterial waveform analysis (Nexfin HD) with transthoracic doppler echocardiography for monitoring of cardiac output

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Background and Goal of Study: Non-invasive methods for cardiac output monitoring has become increasingly important to avoid the risk of invasive techniques. The Nexfin HD monitor uses the volume-clamp method of Penaz[1] and the Physiocal criteria of Wesseling *et al.*[2] and computes cardiac output (CO) from continuous reconstructed brachial artery blood pressure waveforms. In this study, we compared the CO derived from Nexfin blood pressure measurements with the CO obtained with transthoracic Doppler echocardiography (TTE).
Materials and Methods: In 33 patients scheduled for routine TTE examination CO was simultaneously measured with Doppler ultrasound and derived from Nexfin HD (BMEYE, Amsterdam, the Netherlands) blood pressure measurements. Patients with irregular a heart rhythm or peripheral vascular disease were excluded from this study. The finger cuff of the Nexfin device was applied the middle finger according to the instructions of the manufacturer. Correlation and level of agreement between Nexfin and TTE were analyzed using Pearson correlation coefficients and Bland-Altman plots. Values are represented by mean ± SD. $P < 0.05$ was considered to be statistically significant.
Results and Discussion: There was no difference in mean CO measurements derived from the Nexfin and TTE (Nexfin: 5.3 ± 1.4 L/min *vs.* TTE: 5.8 ± 1.3 L/min, $P > 0.05$). The Pearson correlation coefficient for Nexfin *vs.* TTE was 0.68 (CI: 0.43 – 0.83, $P < 0.0001$). Blant-Altman analysis revealed a bias of 0.52 ± 1.1 L/min and limits of agreement of -1.6 – 2.6 L/min with a percentage error of 38%.
Conclusion(s): Considering limits of precision of CO measurements with Doppler echocardiography (±30%), our data show that the agreement between non-invasive cardiac output measurement with the Nexfin and TTE is reasonable. These results may suggest clinical applicability of Nexfin CO measurements and warrant validation in more diverse patients groups under various clinical conditions.
References:

1 Wesseling KH. Homeostasis 1995;36:50-65.
2 Wesseling KH et al. Homeostasis 1995;36:67-82.

Clinical and Experimental Circulation

4AP1-1

Can cardio-pulmonary exercise testing predict risk of adverse events following abdominal aortic aneurysm surgery?

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Background and Goal of Study: Studies utilising cardiopulmonary exercise testing (CPET) have defined anaerobic threshold (AT) levels to risk stratify patients prior to major surgery [a]. Values above and below 11mlO_2/kg/min define low and high risk respectively. Data is limited utilising these threshold values in patients awaiting abdominal aortic aneurysm (AAA) surgery. Carlisle demonstrated that mid-term survival after open AAA repair correlated closely with ventilatory equivalents of carbon dioxide (VE/VCO_2) and AT to a lesser extent [b]. This study aims to investigate if AT and VE/VCO_2 values derived from our patient population undergoing aortic surgery (including endovascular, EVAR) could be used to define risk of adverse outcome.
Materials and Methods: Individuals who had undergone CPET and subsequent AAA repair were identified. Peri-operative morbidity (cardio-respiratory or metabolic complications) was utilised as an end-point for adverse outcome. A trained observer established AT and VE/VCO_2 values for all patients. Data were analysed using simple descriptive statistics.
Results and Discussion: 117 patients were identified. Overall mean AT was 10.67mlO_2/kg/min (sd 3.30) and mean VE/VCO_2 was 35.53 (sd 5.67).

	Open AAA repair	EVAR
n	56	61
AT[mean(sd)]	10.83 (3.61)	10.55 (3.01)
VE/VCO_2[mean(sd)]	35.13 (5.72)	35.90 (5.66)
30 day mortality	2 (3.6%)	0
Morbidity	57.1%	19.7%

	Peri-op morbidity	No morbidity	Peri-op morbidity	No morbidity
n	32	24	12	49
AT[mean(sd)]	9.86 (3.39)	12.15 (3.54)	10.05 (1.68)	10.67 (3.26)
VE/VCO_2[mean(sd)]	35.91 (6.14)	34.04 (4.97)	36.17 (4.45)	35.84 (5.96)

AT(mlO_2/kg/min)

Conclusion(s): Patients suffering morbidity following both types of surgical intervention had mean AT values which stratify them as high risk (<11mlO_2/kg/min). This patient group also had higher mean VE/VCO_2 values which consolidates results of previous work suggesting this maybe a good predictor of adverse outcome. Despite small patient numbers, consistency of our results with previous work reinforces CPET parameters currently used to assess risk. Our results for EVAR surgery provide an invaluable addition to sparse literature available for these patients.

References:

1 Older P, Hall A, Hader R. Cardiopulmonary exercise testing as a screening test for perioperative management of major surgery in the elderly. *Chest* 1999. 116: 355–363.

2 Carlisle J, Swart M. Mid-term survival after abdominal aortic aneurysm surgery predicted by cardiopulmonary exercise testing. *British Journal of Surgery* 2007. 94/8: 966-999.

4AP1-2

The effects of the pneumoperitoneum on right ventricular systolic function

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Background and Goal of Study: Several authors have shown that during laparoscopic procedures the pulmonary vascular resistances are augmented. In our study we investigated, through transthoracic echocardiography, some of the most common variables regarding the right ventricular function.

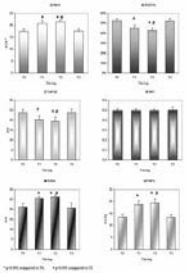
Materials and Methods: We enrolled 20 healthy women (ASA I) scheduled for laparoscopic hysterectomy. The echocardiographic parameters were measured at baseline time (T0), 5 and 15 minutes after the induction of pneumoperitoneum with an intraabdominal pressure of 12 mmHg (T1 and T2 respectively), and at the end of surgery (T3).

Results and Discussion: At T1 we found a significant increase of the systolic pulmonary arterial pressure (PAPs); at the same time (T1) both the tricuspid anular plane systolic excursion (TAPSE) and the right ventricular outflow tract fractional shorthening (RVOTfs) significantly decreased, while we found an increase of right atrial volume index (RAVI) and right ventricular end-diastolic diameter (RVDd). The myocardial performance index (MPI), as expressed by the TEI index, did not modified from baseline values after the capnopneumoperitoneum. At T2 we registered a further increase of PAPs, RAVI and RVDd and a drop of TAPSE and RVOTfs.

Echocardiographic variables at different times of the study

	T0	T1	T2	T3
RAVI (ml/m2)	17,39 ± 1.12	20,62 ± 1.25	21,26 ± 1.01	17,47 ± 1.21
RVOTfs (%)	0,53 ± 0.02	0,45 ± 0.03	0,43 ± 0.02	0,52 ± 0.03
TAPSE (mm)	23,95 ± 1.32	20,35 ± 1.70	19,48 ± 2.07	23,79 ± 1.67
MPI	0,49 ± 0.02	0,50 ± 0.02	0,50 ± 0.02	0,50 ± 0.03
RVDd (mm)	21,10 ± 1.74	25,75 ± 0.79	26,15 ± 0.93	20,80 ± 2.12
PAPs (mmHg)	13,33 ± 1.45	18,70 ± 1.60	19,40 ± 1.71	13,23 ± 1.42

Conclusion(s): Our study demonstrated that during laparoscopic gynaecological surgery the pneumoperitoneum significantly affects the systolic function of the right ventricle. We hypothesize that echocardiographic alterations observed in this work reflect the established augmented pulmonary vascular resistance.



4AP1-4

Influence of general anesthesia on microcirculation evaluated by a vascular occlusion test with infrared spectroscopy

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Background and Goal of Study: The influence of general anesthesia on microcirculation is poorly understood in the Man. Infrared tissular spectroscopy can measure oxygen saturation of hemoglobin in tissues (StO2) and evaluate the microvascular response to a vascular occlusion test. The analysis of the reperfusion slope may give information on microvascular failure. The main goal of our study was to study if general anesthesia with sevoflurane changes microvascular reactivity explored by the reperfusion slope of StO2. The secondary objective was to study StO2 variation during general anesthesia.

Materials and Methods: 10 in-hospital patients (18-60 yr old ASA 1-2) planned for general surgery were included. All patients were anesthetized with the same protocol. General anesthesia was maintened by sevoflurane. Hemodynamic optimization (fluid infusion of 250 ml of a starch solution or vasopressor administration) was driven by an algorithm based on the Pleth Variability Index of the Massimo Radical Set. StO2 was measured by the InSpectra device (Hutchinson) using a sensor placed on the thenar eminence. The vascular occlusion test was performed with a sphygmanometer on the forearm above the StO2 device inflated 50 mmHg above the systolic arterial pressure till the StO2 drop to 40%. The occlusion test was performed before induction (T0), after 1 hour under general anesthesia (T1), before awakening the patient (T2) and in post-operative care area when the Aldrete score was above 7 (T3). The reperfusion slope of StO2 was obtained and analyzed by a dedicated software (Hutchinson). StO2 values and the slope of the reperfusion phase were compared to reference values (before anesthesia T0) using a Wilcoxon signed-rang test)

Results and Discussion: After the induction of anesthesia, we do not found a significative statistical difference between reperfusion slope values (T0=3,1+/-0,87 vs T1=2,9+/-1,66, p=0,831 & T0=3,1+/-0,87 vs T2=3,3+/-1,66, p=0,595). StO2 also remained unchanged compared to values before anesthesia (T0=72%+/-12% vs T1=79%+/-15%, p=0,126). The values of the reperfusion slope and the StO2 were also not statistically different before anesthesia and before returning to the ward : reperfusion slope T0=3,1+/-0,87 vs T3=2,4+/-1,4, p=0,126); StO2 T0=72%+/-12% vs T3=64%+/-16%, p=0,138)

Conclusion(s): Our study suggest that general anesthesia with sevoflurane does not cause microcirculatory changes through analysis of the slope of the reascent StO2. Under these conditions, the StO2 also remained unchanged in our population.

4AP1-5

Changes in left ventricular filling pattern during hypothermia is related to changes in myocardial passive-elastic properties

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Background and Goal of Study: Therapeutic moderate hypothermia is used in post-cardiac arrest patients. However, the treatment is associated with changes in left ventricular (LV) function. This study aimed at exploring the effects from hypothermia on diastolic function, hypothesizing that altered LV wall properties impedes early diastolic filling.

Materials and Methods: In a porcine model (n=8) we measured LV transmural pressure (LVP) by micromanometry, and calculated left ventricular relaxation constant (τ) from LVP during isovolumic relaxation time (IVRt). An ultrasonic transducer was fixed to the anterior LV wall providing continuous M-mode images for wall thickness measurements, and for subsequent calculations of early diastolic (e') and atrially induced (a') wall thickening velocities. Corresponding LV end diastolic volume(EDV) and stroke volume (SV) was obtained by echocardiography. Restoring forces responsible for diastolic recoil were calculated as systolic wall thickening (WTh_{max}) above resting wall thickness (WTh_0). The WTh_0 was estimated at EDP=0 during caval constriction. Measurements were made at 38° and 33° C. Data are presented as median (interquartile range), $p<0.05$ was considered significant.

Results and Discussion: During hypothermia EDV and SV remained unchanged. E' was reduced (-2.6 (1.8) to -1.4 (1.6) cm/s, $p<0.01$), while a' remained unchanged, resulting in inverted e'/a' ratio (1.66 (0.44) to 0.94 (0.56), $p<0.01$), reflecting a shift from predominantly early- to late diastolic filling during hypothermia. τ increased at hypothermia (32 (8) to 55 (13) ms, $p<0.01$), indicating a delayed relaxation. WTh_0 increased during hypothermia (14.9 (2.0) to 17.5 (2.1) mm, $p<0.02$), indicating less restoring forces at similar WTh_{max} and an upwards shift of the diastolic portion of pressure-thickness loop, suggesting increased LV stiffness (passive-elastic force).

Conclusion(s): The present study demonstrates a shift towards late diastolic filling during hypothermia, which may be attributed to decreased magnitude of restoring forces as well as increased LV stiffness and delayed relaxation. The early filling impediment makes the atrial contribution more important during hypothermia, and might implicate that heart rate reduction allowing longer filling time may be beneficial.

References:

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4AP1-6

Effect of psychosocial factors on the mortality of patients after cardiac surgery

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Background and Goal of Study: Introduction: Psychosocial factors have been shown to predict long-term mortality after myocardial infarction and cardiac surgery. We have hypothesized that these factors, particularly anxiety and stress contribute to long term mortality and morbidity.

Materials and Methods: After Institutional Review Board Approval and patient informed consent 271 patients undergoing elective cardiac surgery were enrolled into the study between November 01, 2006 and October 31, 2007. Preoperative and postoperative anxiety was measured by Spielberger State Trait Inventory test, Rahe stress/coping and perceived stress (Sheldon-Cohen; SCPS) questionnaires; depression was tested by Beck Depression Inventory (BDI) test. Somatic severity score, self-rated health and illness intrusiveness were recorded beside clinical risk factors, perioperative characteristics and postoperative complications. End points were death and the occurrence of major adverse cardiovascular event (MACE). Cox regression was used for statistical analysis.

Results and Discussion: During a median follow up of 17 months (25th to 75th percentile: 13-22 months), 29 patients died (4.5 %) and 34 (5.4 %) patients suffered from MACE. Cox regression showed, that preoperative STAI-T (Hazard Ratio [HR] 1.08, 95 % Confidence Intervall [CI] 1.03-1.14, p=0.004), SCPS test (HR 1.08, 95 % CI 1.01-1.15; p=0.029), Rahe-stress (HR 0.83, 95 % CI 0.,69-0.99; p=0.038), and the illness intrusiveness test (HR 1,024, 95 % CI 1,01-1.05; p=0.048) were independently associated with the mortality, after adjustment for medical variables. MACE was not associated with psychosocial factors.

Conclusion(s): Mortality after cardiac surgery seems to be influenced by psychosocial factors, like stress, anxiety and illness intrusiveness.

4AP1-7

Transapical vs transfemoral aortic valve replacement: Are there significant differences?

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Background and Goal of Study: We want to **compare** the patients demographics, perioperative complications, procedure time and hospital stay between **transapical** and **transfemoral** approach in 14 patients during the last year.

Materials and Methods: All patients were diagnosed with **severe aortic stenosis** and had been rejected for conventional surgery due to high surgical **risk**. Six of them underwent antegrade transapical approach and eight of them retrograde transfemoral approach. The decision to use transapical or transfemoral approach is based on assessment of aortic and iliac artery size and pathology and the presence of patholoy in the region of the LV apex. Both approaches utilize the same valve (Cribier – Edwards 23 or 26mm) and delivery system. Each approach has advantages and disadvantages, as determined by the procedure itself. Univariate analysis was performed between the type of intervention and the rest of the categories.

Results and Discussion: No significant differences were found between patients demographics (age, sex, BMI, hypertension, diabetes mellitus, chronic lung disease, coronary heart disease, previous stroke, atrial fibrillation, peripheral vascular disease, chronic renal failure, pulmonary hypertension, EuroSCORE), procedural characteristics, complications, use of amines, the probability of transfusion, procedure time or hospital stay.We found significant differences for the categories of extubation in the operating room (p<0.024 for affirmative answer) and prosthesis size (p<0.08 for Transapical-23mm and Transfemoral-26mm).

Patients demographics and procedural characteristics

	P/T	N	Mean	SD	SEM
Age	P	8	81.38	6.94	2.45
	T	6	81.67	5.53	2.26
BMI	P	8	28.22	4.29	1.51
	T	6	22.82	10.69	4.36
LE	P	8	15.08	10.89	3.85
	T	6	16.49	9.65	3.94
Time	P	8	3.18	0.92	0.326
	T	6	2.91	0.80	0.327
PVA	P	8	0.72	0.19	0.08
	T	6	0.76	0.15	0.06
Pre	P	8	93.13	20.05	7.09
	T	6	81.33	19.42	7.93
Pos	P	8	27.25	10.38	3.67
	T	6	30.83	20.74	8.46
Trop	P	8	13.75	31.75	11.22
	T	6	11.43	8.03	3.27

P=Transfemoral approach; T=Transapical approach; LE=Logistic EuroSCORE; Time=Procedure time (h); PVA=Preoperative Valvular Area (cm2); Pre=Preoperative peak gradient; Pos=Postoperative peak gradient; Trop=Postoperative troponin peak; SD=Standard Deviation; SEM=Standard Error of the Mean

Conclusion(s): Transcatheter techniques are new procedures with **few complications**. During the first year of experience, we have no found statistically significant differences between them.

4AP1-8

Possible mechanism of helium induced organ protection in humans

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Background and Goal of Study: Helium (He) induces early (EPC) and late (LPC) preconditioning in animals. Ischemia/Reperfusion of the human forearm can result in endothelial dysfunction characterized by a blunted response to endothelium-dependent vasodilator acetylcholine (Ach), and production of endothelial cell derived microparticles (EMP). EMPs from patients with myocardial infarction caused impairment of vasodilator response to Ach in isolated vessels, indicating a role of EMP in IR-induced endothelial dysfunction. We hypothesized that He induces EPC and LPC in human endothelium in vivo. We also investigated the effect of He on EMP in the blood.

Materials and Methods: With ethical approval, 50 volunteers were randomised to 5 groups; except controls (CON) all volunteers underwent 20 min of forearm ischemia followed by 15 min of reperfusion. The IR group (IR) received no preconditioning stimulus and the He-preconditioning groups received 3 x 5 min He (79% He, 21% O2) either 5 min (EPC) or 24 h before ischemia (LPC). Another group received 3 x 5 min of ischemic preconditioning and served as positive control (IPC). Endothelial function was measured by venous occlusion plethysmography and endothelium-dependent vasodilation was determined after intra-brachial infusion of Ach (0.1-5.0 µg/100mlFAV/min) before and after ischemia, respectively. Venous blood samples were taken at baseline, 10 min after reperfusion and 4 h after onset of ischemia. Origin of MP's was analysed using flowcytometry and particles positive for CD144-FITC and CD62e-PE were considered to be derived from endothelial cells.

Results and Discussion: I/R of the forearm resulted in a blunted dose response curve to Ach: flow was 182±25% from baseline (mean±SEM) after highest dosage of Ach compared to 356±48% before I/R. He-EPC improved postischemic endothelial function and preserved response curve to Ach (595±156% after IR vs. 452±77% before). Even 24 h before I/R, He-LPC improved postischemic endothelial function (324±38% after IR vs. 344±33% before), comparable to protection by IPC. Forearm ischemia resulted in production of circulating EMP's (CD144+/CD62e+) during early reperfusion (85 particles, 4,37% of all particles), which were cleared after 3 h of reperfusion. After He-EPC the amount of EMP's dropped (8 particles, 0.2%). No EMP were observed in controls not subjected to ischemia.

Conclusion(s): He induces EPC and LPC in human endothelium. It is possible that EMP's are involved in this protection.

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4AP1-9

Transcatheter aortic valve implantation: Perioperative management of our first 14 patients

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Background and Goal of Study: We want to present the perioperative management and preliminary data from 14 patients undergoing **transcatheter aortic valve replacement**.
Materials and Methods: All patients presented severe aortic stenosis and had been rejected for conventional surgery due to high surgical risk. Under general anaesthesia, 6 **transapical** (T) and 8 **transfemoral** (P) approaches were performed. One of the P valves was implanted on a previous bioprosthesis. Fluoroscopy an TEE.
Results and Discussion: 14.3% of patients presented porcelain aorta. 28.6% of patients had moderate or severe mitral regurgitation. 14.3% of patients had pulmonary hypertension. **Cribier – Edwards prosthesis** (23 or 26mm) was successfully implanted in 92.8% of patients. All P patients and 3 (50%) T patients met extubation criteria in the operating room. The median of the postoperative troponin peak was 3.81 with a standard deviation of 23.85. The most frequent intraoperative complications were transient **hypotension** and **arrhythmias**. Other complications were: 7.2% of procedures were converted to open surgery due to valve migration, 14.3% of patients underwent open surgical patch repair of the arterial access site, 7.2% lymphocele, 7.2% intraoperative pericardial effusion, 7.2% postoperative pleural effusion, 7.2% inferior AMI due to obstruction of the right coronary artery. One of the P patients required percutaneous septal ablation due to hypertrophic obstructive cardiomyopathy. **30-day mortality was 0%**.

Procedural Characterisctics

	LE	AoD	PVA	Pre	Pos	Time	Stay
Median	12.03	22	0.80	89.50	23.5	3	7
25 quartile	7	21.5	0.57	72.50	17.75	2.37	5.75
75 quartile	24.43	22	0.80	102	37	3.62	18

LE=Logistic EuroSCORE; AoD=Aortic diameter (mm); PVA=Preoperative valvular area(cm2); Pre=Preoperative peak gradient; Pos=Postoperative peak gradient; Time=Procedure time (h); Stay=Hospital stay (d)

Conclusion(s): These **minimally invasive** techniques represent a **new alternative** for patients in whom open heart surgery is not feasible or for patients who pose unacceptable risks.

4AP1-10

Does transthoracic echocardiography identify left ventricular impairment diagnosed during cardiopulmonary exercise testing?

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Background and Goal of Study: The predictive value of heart failure for perioperative cardiac events is well documented[1]. Resting transthoracic echocardiography (TTE) is often used routinely to identify such patients: recent consensus guidance supports consideration of TTE prior to major surgery[1]. This is despite the low sensitivity of TTE(50%) in detecting left ventricular impairment (LVI). Cardiopulmonary exercise testing (CPET) is validated in cardiac populations to detect dynamic LVI utilising ventilatory equivalents (Ve/VCO_2), peak oxygen consumption (VO_2p) and anaerobic threshold (AT)[2]. The functional classification of LVI using Weber-Janicki criteria better predicts morbidity and mortality than other assessments of cardiac function[2]. Based on this evidence our institutional practice is to perform CPET as the investigation of choice prior to major vascular surgery: TTE is rarely performed. The aim of this prospective series was to ascertain the predictive value of TTE in identifying LVI in patients with functional LVI on CPET.
Materials and Methods: Patients attending preoperative assessment performed CPET prior to major vascular surgery. Using cycle ergometry our subjects exercised to symptom-limited fatigue (VO_2p) allowing identification of AT and Ve/VCO_2. Patients identified with Weber-Janicki class C/D LVI (VO2p <16ml/kg/min and AT <11ml/kg/min) and Ve/VCO2 >34 underwent resting TTE.
Results and Discussion: We identified 21 pts with class C/D LVI and Ve/VCO_2>34 during CPET who underwent subsequent TTE. Patient characteristics and CPET data are shown in table 1. Eight patients had LVI on TTE (3 mild, 4 moderate and 1 severe) and 5 patients had minor valve disease. The sensitivity of TTE used to detect CPET defined LVI was low: 38%.

Table 1. CPET results

Mean age (SD)	74.1 (8.2) yrs
M:F	17:4
Mean VO2p (SD)	10.4 (3.0) ml/kg/min
Mean AT (SD)	7.3 (1.7) ml/kg/min
Mean Ve/VCO2 (SD)	41.9 (5.9)

Conclusion(s): In this series TTE does not accurately identify LVI in high risk patients. The sensitivity of the test is low which is consistent with the findings of Kleber. For accurate risk stratification of patients undergoing high risk surgery, we recommend dynamic non-invasive testing rather than TTE.
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4AP2-1

Dipeptiven® solution minimizes enzymes release after cold ischemia in *ex vivo* perfused rat liver

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Background and Goal of Study: Ischemia-reperfusion (I/R) injury of the liver is a major clinical problem after liver transplantation. Glutamine may prevent hepatic I/R injuries by attenuating inflammatory response (1). The aim of this study was to determine the role of alanyl-glutamine dipeptide (Dipeptiven®) on hepatic injury after cold ischemia in *ex vivo* perfused rat livers.
Materials and Methods: After University Animal Care Committee approval, female Wistar rats were divided into 2 groups: one had free access to food; the other was fasted for 16 hours. After they were anaesthetised, the portal vein was cannulated, the liver removed and perfused at a flow rate of 5 ml/min in a closed *ex vivo* system with HBSS supplemented with insulin, HEPES and O_2. The experiment consisted of 3 phases: perfusion for 15 min at 4°C, cold ischemia (4°C) for 24 hours, and reperfusion during 60 min at 37°C. Animals were randomly divided into 3 subgroups (n=5): control fed and fast animals in which livers were perfused with HBSS (glucose 1 g/l) and fasting animals in which Dipeptiven® (0.2 mg/ml without glucose) was added to perfusate from the start of experiment. Glucose, lactate, potassium, ALT, AST, and LDH were analysed in perfusate samples at different time-points. The oxidized/reduced glutathione ratio (GSSG/GSH) was measured in tissue biopsies. Mean ± SD. ANOVA test.
Results and Discussion: Glucose and lactate concentrations in perfusate were higher in fed animals. Dipeptiven® minimizes potassium and

Abstract 4AP1-9 – Patients Demographics

	Age	Sex	Hypertension	Chr Lung Disease	Coronary Disease	Chr Renal Failure	NYHA
T1	82	F	N	Y	N	N	3
T2	81	F	Y	N	N	N	3
T3	84	F	Y	N	Y	N	4
T4	73	M	Y	Y	Y	N	2
T5	80	F	Y	N	N	Y	3
T6	90	F	Y	N	Y	N	4
P1	86	M	Y	Y	N	N	2
P2	77	M	Y	Y	N	N	2
P3	81	F	Y	N	N	N	4
P4	75	F	Y	N	Y	N	3
P5	93	F	Y	N	N	N	2
P6	72	M	Y	N	Y	Y	3
P7	80	M	Y	Y	Y	N	2
P8	87	M	Y	N	N	N	3
T(42.9%)P(57.1%)	Median 81	M(42.9%)F(57.1%)	Y(92.9%)N(7.1%)	Y(35.7%)N(64.3%)	Y(42.9%)N(57.1%)	Y(14.3%)N(85.7%)	

enzymes release at the time of reperfusion when compared to fasting state. GSSG/GSH was lower in Dipeptiven®-treated group (Table 1). Glutamine as a precursor of glutathione synthesis could contribute to antioxidant defense (2).

Biological variables at the end of experiment

Variable	Fast (n=5)	Fed (n=5)	Dipeptiven® (n=5)
Glucose (mg/dl)	66 ± 10	157 ± 52 a	9 ± 9 a,b
Potassium (mEq/l)	8.2 ± 0.7	6.5 ± 0.4 a	2.9 ± 0.9 a,b
Lactate (mg/dl)	3.4 ± 1.1	35.0 ± 8.8 a	2.5 ± 0.9 b
AST (mU/ml)	1,029 ± 174	116 ± 84 a	45 ± 18 a
ALT (mU/ml)	801 ± 101	119 ± 153 a	39 ± 10 a
LDH (mU/l)	7,514 ± 2,508	244 ± 395 a	158 ± 97 a
GSH/GSSG (%)	13.5 ± 4.3	6.1 ± 1.6 a	1.2 ± 0.6 a,b

a p<0.05 vs fast; b p<0.05 vs fed

Conclusion(s): Dipeptiven® minimizes enzymes release and glutathione oxidation in *ex vivo* perfused liver after cold ischemia.

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4AP2-2

Effects of sevoflurane and propofol on acute ischemia-reperfusion and DNA damage in rabbits

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Background and Goal of Study: During reperfusion of ischemic tissues, free oxygen radicals and DNA injury develop (1). The genotoxic effect of sevoflurane and antioxidant effect of propofol are well known (2,3). In this study, the effects of sevoflurane and propofol on free oxygen radicals and DNA injury as a result of ischemia-reperfusion of the lower extremities were investigated.

Materials and Methods: Fourteen New Zealand Albino rabbits were randomly divided into two groups. The animals in one group (Group S) inhaled 2.5-4 % sevoflurane using a face mask, and the animals in the other group (Group P) were infused 1-2 mg/kg/min propofol. Pneumatic tourniquet was placed on the lower extremity. The heart beat rate, invasive blood pressure, peripheric oxygen saturation, and anesthesia depth were monitored. Blood samples were obtained before the tourniquet application (control), 120 min. after the tourniquet application, and at 15 min. and 120 min. after the tourniquet was removed. Malondialdehyde (MDA) levels and COMET assay (tail moment, tail length, and tail intensity) were determined to evaluate the ischemia-reperfusion and DNA injuries.

Results and Discussion: Fifteen minutes after the tourniquet was removed, the mean MDA level of Group P was higher (8.15±2.61 μM) than those of the control (6.26±3.19 μM) and Group S (4.98±0.77 μM) ($p<0.05$). Although the increase of DNA injury was similar in both groups, this effect was more marked in the propofol group during the early reperfusion period (tail moment 1.05±0.45; tail intensity 5.33±1.56; $p<0.05$). These increases in the tail moment and tail intensity were normalized in both groups 2 hours after the tourniquet was removed. Two hours after the removal of tourniquet, the increase in the MDA level of Group S and the increase in the tail moment and tail intensity were found to be correlated (Tail moment: $r=832$; $p=0.020$; Tail intensity: $r=817$, $p=0.025$).

Conclusion(s): The oxidative stress and genotoxic effect determined in this study are reversible; thus, sevoflurane and propofol used in anesthesia for extremity surgery that leads to ischemia reperfusion were not found to be superior to each other.

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4AP2-3

Ischaemic and morphine-induced postconditioning: Impact of mK_{Ca}-channels

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Background and Goal of Study: Mitochondrial calcium-sensitive potassium (mK_{Ca}) channels are involved in preconditioning [1]. It is unknown, whether mK_{Ca}-channels play a crucial role in ischaemic- and/or morphine-induced postconditioning. In the present study we investigated whether ischaemic- and/or morphine-induced postconditioning is mediated by activation of mK_{Ca}-channels in the rat heart in vitro.

Materials and Methods: Animals were treated in compliance with institutional and national guidelines. Male Wistar rats were randomly assigned to one of seven groups (each n=7). Control (Con) animals were not further treated. Postconditioning was induced by 3x30 sec of ischaemia/reperfusion (I-PostC) and administration of morphine (M-PostC, 1 μM) for 15 min at the onset of reperfusion, respectively. The mK_{Ca}-channel inhibitor paxilline (10 μM) was given with and without postconditioning interventions (M-PostC+Pax, I-PostC+Pax, Pax). As a positive control we determined whether direct activation of mK_{Ca}-channels with NS1619 (1 μM) induces cardiac postconditioning (NS1619). Animals underwent 35 minutes ischaemia followed by 120 minutes reperfusion. At the end of reperfusion infarct sizes were measured by TTC staining. Statistics: One-way ANOVA followed by Tukey´s post hoc test. Data are Mean±SD.

Results and Discussion: In the control group infarct size was 53±5% of the area at risk. Morphine- and ischaemic postconditioning reduced infarct size in the same range (M-PostC: 37±4%, I-PostC: 35±5%; each $P<0.05$ vs. Con). The mK_{Ca}-channel inhibitor paxilline completely blocked postconditioning (M-PostC+Pax: 47±7%, I-PostC+Pax: 51±3%; each $P<0.05$ vs. M-PostC and I-PostC, respectively). NS1619 reduced infarct size to 33±4% ($P<0.05$ vs. Con).

Conclusion(s): Ischaemic- and morphine-induced postconditioning are mediated by activation of mK_{Ca}-channels.

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4AP2-4

Sevoflurane-induced cardioprotection in the rat heart is modulated by long-term macronutrient diet composition

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Background and Goal of Study: Evidence suggests that cardioprotective strategies are less effective in patients with type 2 diabetes mellitus (T2DM), which may relate to alterations in cardiomyocyte substrate metabolism and insulin resistance. In this study we investigated whether the efficacy of sevoflurane-induced cardioprotection in a rat model is influenced by diet-induced T2DM. We hypothesized that macronutrient diet composition, like fat and simple carbohydrates, reduces sevoflurane-induced preconditioning by altering cardioprotective signaling kinases, such as 5-adenosine monophosphate activated protein kinase (AMPK) and glycogen synthase kinase 3 beta (GSK3b).

Materials and Methods: Male Wistar rats (11 wks) received for 20 wks either a high sugar diet (n=8, HSD, 47% of calories consist of sugars), a high-fat diet (n=10, HFD, 50% of calories consist of fat) or a standard diet (n=10, STD, 11% and 6% of calories of fat and sugar). After 20 weeks oral glucose tolerance testing (OGTT) (2g glucose/kg body weight) was performed. Isolated right ventricular trabeculae were subjected to 40 min simulated ischemia followed by 60 min of reperfusion (I/R) with or without sevoflurane pretreatment (3.8vol% for 15 min). Phosphorylation levels of AMPK and GSK3 were determined by Western blot analysis.

Results and Discussion: Plasma glucose- and insulin levels after OGTT were increased in HSD and HFD rats (glucose area under the curve (AUC): 703±76 mM.min [HSD] and 671±81 mM.min [HFD] vs. 477±11 mM.min [STD], $p<0.05$), plasma insulin AUC: 6474±822 pM.min [HSD] and 8110±929 pM.min [HFD] vs. 3750±380 pM.min [STD], $p<0.05$) indicating impaired insulin sensitivity. Contractile recovery after I/R was reduced in HSD (21±8% vs. STD: 50±27%, $p<0.05$), but not in HFD trabeculae (HFD: 35±11% vs. STD, $p>0.05$). Sevoflurane improved contractile recovery in HSD muscles (HSD-SEVO: 50±12% vs. HSD, $p<0.05$), whereas it was absent in the HFD group (HFD-SEVO: 45±5% vs. HFD, $p>0.05$). Post-ischemic AMPK and GSK3b phosphorylation was reduced in preconditioned HSD and HFD trabeculae.

Conclusion(s): In a rat-model of diet-induced T2DM, we showed that diet composition modulates myocardial tolerance to ischemia and anesthetic preconditioning. In response to ischemia and sevoflurane preconditioning phosphorylation levels of cardioprotective kinases AMPK and GSK3b proved to be macronutrient-dependent. The present data suggest that the efficacy of anesthestic-induced cardioprotection is diet-dependent, which may have important consequences for clinical cardioprotective strategies.

4AP2-5

Sevoflurane-induced preconditioning in the isolated mouse heart is mediated by A1- and A3-adenosine receptors

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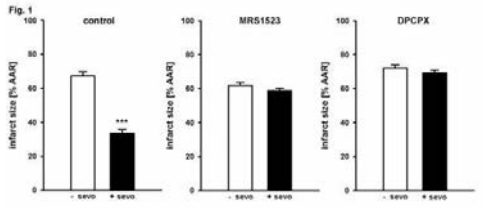
Background and Goal of Study: Previous studies showed the contribution of ecto-5'-nucleotidase and of A2B-adenosine receptors in sevoflurane (sevo) -induced preconditioning in the isolated mouse heart [1; 2]. This study addressed the role of A1-adenosine receptors (A1-AR) and A3-adenosine receptors (A3-AR) in sevo-induced preconditioning.

Materials and Methods: Experiments were performed with isolated hearts from 36 (6-wk-old) male C57BL/6 mice. Controls were matched to hearts subjected to 15 min of 2.8 vol. % sevo. Infarction was induced by 60 min of left coronary artery occlusion followed by 30 min reperfusion. Hearts received the specific A1-AR antagonist MRS1523 (10 µM; n=6) or the specific A3-AR antagonist DPCPX (1 µM; n=6) alone or 10 min prior to 15 min of 2.8 vol. % sevo. Ventricular pressure, +dP/dtmax, 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 propidium iodide staining and microspheres. Data analysis was performed using Two-Way-ANOVA and post-hoc analysis by Bonferroni.

Results and Discussion: Infarct size in the control group was 67.3 ± 2.3 % of AAR. Neither MRS1523 (61.8 ± 1.7 % of AAR) nor DPCPX (72.1 ± 1.8 % of AAR) revealed any effect on infarct size. Application of sevo reduced infarction significantly (33.6 ± 2.1 % vs. 67.3 ± 2.3 % of AAR; with sevo vs. without sevo; n=6 each; p ≤ 0.01). MRS1523 (58.6 ± 1.5 % vs. 61.8 ± 1.7 % of AAR; MRS1523 with sevo vs. MRS1523 without sevo; n=6 each) and DPCPX (69.3 ± 1.6 % vs. 72.1 ± 1.8 % of AAR; DPCPX with sevo vs. DPCPX without sevo; n=6 each) completely blunted sevo-induced preconditioning (Figure 1).



Conclusion(s): These data suggest that sevo-induced preconditioning is at least in part mediated by A1-AR and A3-AR.

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4AP2-6

Carbon monoxide inhalation reduces acute lung injury following cardiopulmonary bypass in pigs therapeutically

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Background and Goal of Study: Inhalative carbon monoxide (CO) has been demonstrated to exert organ protection with anti-inflammatory and anti-apoptotic properties.[1] Inhalation of CO *prior* to cardiopulmonary bypass (CPB) reduces pulmonary inflammation and apoptosis.[2] These effects are mainly mediated via an inducible heat shock response.[3] We hypothesized that inhaled CO *after* the harmful event of CPB would attenuate acute lung injury (ALI) therapeutically.

Materials and Methods: Thirty pigs were randomised either into SHAM group [n=5], SHAM+CO [n=5], CPB [n=10] or CPB+CO [inhalation of 250 ppm CO after CPB; n=10]. CPB was established for 2 hours, followed by 5 hours post CPB observation time. Pulmonary tissue was harvested before CPB and every hour during the experiment. The protein expression of TNF-α, IL-6, IL-10, and HSP-70 were analysed by ELISA. Apoptosis was determined using the caspase-3-activity assay. Histological analysis was used to determine ALI and pulmonary infiltration of macrophages. Statistial significance was assumed at a p-value <0.05.

Results and Discussion: Haemodynamic parameters revealed significantly lower pulmonary artery pressure and pulmonary vascular resistance in the CO groups. Compared to standard CPB, CPB+CO treated animals showed significantly reduced CPB-induced pulmonary expression of TNF-α (534 vs. 801 pg/ml; p<0.001) and IL-6 (324 vs. 856 pg/ml; p<0.001), while inducing HSP-70 (83 vs. 45 pg/ml; p<0.05) and IL-10 (161 vs. 48 pg/ml; p<0.001). In addition, CO significantly attenuated caspase-3 activity (0.74 vs. 0.98 RFU; p<0.05) and reduced ALI and macrophage infiltration. These results demonstrate that CO inhalation *after* CPB reduces lung inflammation and pulmonary apoptosis with beneficial effects in regards to lung architecture.

Conclusion(s): We conclude that inhalative CO is capable to treat CPB associated ALI in a therapeutic manner in pigs.

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4AP2-7

Cardiac opioid receptors as potential targets for local opioid regulation

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Background and Goal of Study: Increasing interest focuses on the protective role of the cardiac opioid receptors and their endogenous ligands (cardiac opioid system, COS). However, little is known whether the COS plays a role during diseases such as congestive heart failure (CHF). Therefore, in a first step we aimed to characterize such target sites for opioids in rat heart. Secondly, this project aims to elucidate possible adaptive changes in the COS system during the progressive course of CHF.

Materials and Methods: In a first part, tissue samples from normal rat heart were subjected to RT-PCR, Western blot, radioligand-binding and immunofluorescence confocal analysis of µ- (M) and κ- (K) opioid receptors (OR) with the neuronal markers vesicular acetylcholine transporter (VAChT), tyrosine hydroxylase (TH), calcitonin gene-related peptide (CGRP) and substance P (SP). In a second part, we have established a model of CHF in rats which is induced by creating an aortocaval fistula with the needle-technique described by Garcia and Diebold. 28 ± 2 days after induction, when the animals will have developed a significant cardiac hypertrophy with signs of CHF as shown by an increased heart and lung weight, hemodynamic measurements will be performed and the cardiac opioid receptors and their endogenous ligands will be assessed for adaptive changes.

Results and Discussion: Our results demonstrated MOR and KOR specific mRNA, receptor protein and selective ligand binding. Double immunofluorescence confocal microscopy allowed the anatomical localization of MOR and KOR. They colocalized with VAChT in large diameter principal neurons and pericellular boutons surrounding them. KOR and MOR immunoreactivity was also demonstrated in TH-immunoreactive (IR) small intensely fluorescent (SIF) cells and their nerve terminals. CGRP- or SP-IR sensory nerve fibres co-expressed MOR or KOR throughout intracardiac ganglia and atrial myocardium.

Conclusion(s): Our results substantiate evidence of the expression of opioid receptors in rat heart. The colocalization of MOR and KOR with sympathetic and parasympathetic neurons suggests a modulatory role for the intrinsic cardiac nervous sytem. These preliminary data are a first step in the direction to investigate possible adaptive changes of the cardiac opioid sytem in diseases such as CHF.

4AP2-8

Micro-RNA-223 is upregulated by cardiac ischaemic preconditioning

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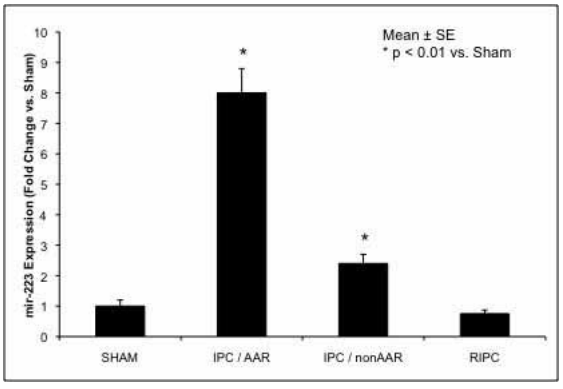
Background and Goal of Study: Micro-RNAs (miRs) are small noncoding RNAs that regulate cellular protein levels by degrading mRNAs or inhibiting translation. They emerged as a critical node in posttranscriptional regulation of growth, apoptosis and other cellular processes. It has been recognized that miRs play an important role in cardiac diseases such as cardiac ischaemia, hypertrophy and arrhythmogenesis. Ischaemic (IPC) and remote ischaemic pre-

conditioning (RIPC) have been shown to protect the heart against subsequent ischaemia. The exact molecular mechanisms of cardiac protection by ischaemic and remote ischaemic preconditioning and a possible involvement of miRs are unclear.

Materials and Methods: Male Wistar rats were randomised into 3 groups. Group 1 was sham operated (Sham, fig.1), group 2 received 4 cycles of 5 minutes ischaemic preconditioning by coronary occlusion without subsequent ischaemia (IPC, fig.1). The hearts of IPC animals were separated into the area at risk (AAR) and the non AAR. Group 3 received 4 cycles of 5 minutes remote ischaemic preconditioning by transient limb ischaemia without subsequent ischaemia (RIPC, fig.1). MiR-223 levels of 6 animals per group were analyzed by real time quantitative PCR.

Results and Discussion: MiR-223 level is about 8-fold increased in the AAR of IPC hearts ($p = 0.002$), about 2.5 fold in the non AAR of IPC animals ($p = 0.033$). Remote ischaemic preconditioning has no effect on the miR-223 level ($p = 0.366$) in the heart. Target prediction of miR-223 was performed using two seperate target prediction tools (TargetScan and PicTar). Potential targets in the heart like IGF1-receptor, plasma membrane Ca2+-ATPase 1 and Cathepsin L1 were identified. Protein levels of the predicted targets of miR-223 may be reduced following cardiac ischaemic preconditioning and thus contribute to the molecular events following cardiac ischaemic preconditioning.



Conclusion(s): MiR-223 may play an important role in the molecular events following cardiac ischaemic preconditioning.

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4AP3-1

Increase in endogenous erythropoietin has no cardioprotective effects after coronary artery bypass graft surgery

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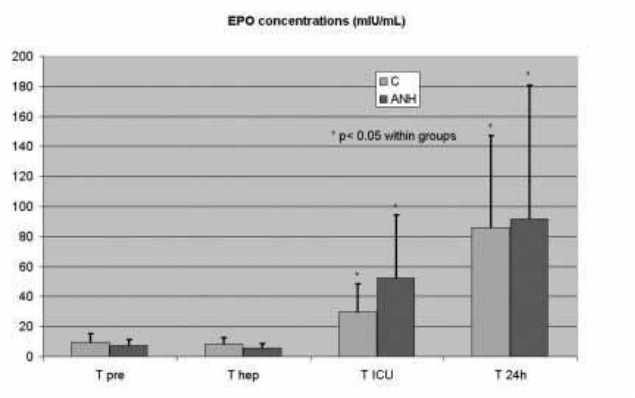
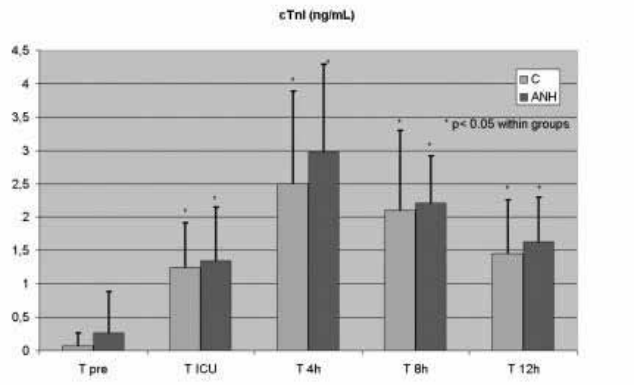
Background and Goal of Study: High levels of endogenous erythropoietin(EPO) are associated with smaller size of myocardial infarction. Acute Normovolemic hemodilution(ANH)has shown cardioprotective effects. We hypothetized this induced cardioprotection could result from increasing EPO production.

Materials and Methods: 29 consecutive patients undergoing CABG with cardiopulmonary bypass(CPB) were enrolled. Exclusion criteria were emergencies, combined surgery,Hb concentration< 12g L^{-1} in men or< 11g L^{-1} in women, poor LV function, renal or hepatic insufficiency and carotid stenosis. Patients were randomized to ANH or C (control) group. In ANH, after induction a calculated amount of blood was withdrawn, kept in a sterile bag and replaced by colloids in a 1:1 ratio. The blood was returned when needed. Serum EPO concentrations were measured at 4 intervals: preinduction (T_{pre}), after heparinization (T_{hep}), arrival at ICU (T_{ICU}) and 24 hours postoperatively (T_{24h}). Cardiac troponin I (cTnI) was measured at preinduction (T_{pre}), after arrival at ICU (T_{ICU}), at 4,8 and 12 hours postoperatively (T_{4h}, T_{8h}, T_{12h}). Mann Whitney rank sum was used to compare both groups. P<0.05 was considered significant.

Results and Discussion: Preoperative characteristics of both groups were similar. All remained hemodynamically stable and received a constant amount of oxygen. There was a significant increase in EPO at T_{ICU} and T_{24h} in both groups without difference between groups. No significant difference was found between cTnI values of both groups. There was no relationship between peak cTnI and peak EPO values, nor between the decrease in Hct and the increase in EPO concentrations.





Conclusion(s): In contrast to our hypothesis ANH did not increase EPO more than in the C group and has no cardioprotective effects. There was no correlation between increase in EPO and cTnI. Further studies in off pump surgery are needed to elucidate if CPB induces EPO production.

4AP3-2

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

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Background and Goal of Study: Sevoflurane induces pharmacologic preconditioning during on-pump coronary artery bypass grafting. Off-pump coronary artery bypass grafting (OPCAB) avoids the damage induced by cardiopulmonary bypass. But displacement and immobilization of the heart result in significant hemodynamic instability and can cause myocardial ischemia-reperfusion injury. We hypothesized that the use of sevoflurane during OPCAB would decrease postoperative myocardial damage.

Materials and Methods: With IRB approval and informed consent obtained from each patient, 90 patients undergoing scheduled OPCAB were enrolled in this study. Patients were randomly allocated to SEVO-5, SEVO-20 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 SEVO-5 group, patient received 2 vol% end-tidal sevoflurane (approximately 1 MAC) for 5 minutes at pericardial incision. In SEVO-20 group, patient received 1 MAC of sevoflurane for 20 minutes during harvesting the last graft. The primary outcome was the postoperative peak level of serum creatine kinase isoenzyme MB (CK-MB). The secondary outcomes were cardiac index at the arrival in ICU (CI), dopamine dose at 12-hour postoperatively (DA), the postoperative peak level of creatine kinase (CK) 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 30 patients. Numbers of grafts of SEVO-5, SEVO-20 and control group were 3.4 ± 1.3, 3.5 ± 1.3 and 3.7 ± 1.3 respectively and P-value was 0.268. Other demographic data also showed no significant difference. The other results are shown in table. P-value of DA was less than 0.05 but Games-Howell test did not show significant difference between groups (P-values were 0.216 – 0.393). SEVO-5 group showed the lowest average of CK-MB, CK and the length of ICU stay. That suggests no dose-dependency.

Postoperative data

OPCAB	SEVO-5	SEVO-20	control	P-value
CK-MB (ng/ml)	24.3 ± 32.3	42.6 ± 79.4	29.2 ± 47.6	0.973
CI (l/min/m²)	3.1 ± 1.1	3.2 ± 0.8	3.1 ± 0.7	0.881
DA (µg/kg/min)	0.1 ± 0.4	0.1 ± 0.3	0.3 ± 0.8	0.038
CK (IU/l)	496 ± 233	721 ± 468	946 ± 2427	0.742
ICUstay (days)	2.6 ± 1.3	3.6 ± 1.7	3.4 ± 4.0	0.666

Data are expressed as mean ± SD.

Conclusion(s): Sevoflurane did not induce pharmacologic preconditioning during OPCAB.

4AP3-3

Effects of intensive intraoperative glycemic control on postoperative complications in patients undergoing cardiac surgery: A randomized trial

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Background and Goal of Study: Hyperglycemia occurs commonly in patients with cardiac surgery, especially during cardiopulmonary bypass surgery. The poorer glycemic control has been associated with higher morbidity. This study sought to determine whether intensive glycemic control with modified glucose-insulin-potassium (GIK) solution during cardiac surgery would improve perioperative and postoperative outcomes.

Materials and Methods: A prospective, randomized, double-blind trial was conducted at Songklanagarind Heart Center. One hundred and ninety-nine adult patients undergoing cardiac surgery with cardiopulmonary bypass were enrolled to receive GIK with a target glucose level of 80-150 mg/dL or a conventional treatment with blood glucose less than 250 mg/dL. The primary end point was the infection rate during admission and postoperative 30 day (D +30). The secondary outcomes were hypoglycemia, neurological or renal dysfunction, incidence of perioperative atrial fibrillation, duration of mechanical ventilation and length of hospital stay.

Results and Discussion: Mean glucose levels had been statistically significantly lower in the intensive glycemic treatment group from 60 minutes after induction to the end of surgery. The infection rate during admission and D +30 were 8.5 % and 3.0 %, respectively in the GIK group versus 7.1 % and 3.8 % in the control group (p = 0.76). Twenty out of 99 patients (20.2 %) in the intensive treatment group and 3 out of 100 patients (3.0 %) in the conventional treatment group developed hypoglycemia (p < 0.001). Neurological dysfunction (3.0 % vs 1.2 %, p = 0.28), renal dysfunction (3.0% vs 3.5%, p = 0.95), incidence of atrial fibrillation (10.4 % vs 12.4 %, p = 0.69), duration of mechanical ventilation (median (IQR)) (19 hr. (16, 24.2) vs 20 hr. (15.5, 32), p = 0.69) and length of hospital stay (median (IQR)) (13 day (10, 17.2) vs 13 day (10, 17), p = 0.60) were similar for both groups. Mortality rate was 3.0 % in the intensive control group and 4.1 % in the standard control group (p = 0.82).

Conclusion(s): Intensive intraoperative glycemic control during cardiac surgery does not reduce the infection rate or morbidity. A significantly increased incidence of hypoglycemia and difficulty in achieving strict glycemic control in intensive insulin therapy should be considered for implementation of this protocol into routine practice.

4AP3-4

Transpulmonary plasma catecholamines in acute high altitude pulmonary hypertension

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Background and Goal of Study: Hypoxia-induced pulmonary hypertension plays a major role in the pathophysiology of hypoxic pulmonary edema formation (e.g. high altitude pulmonary edema; HAPE). We hypothesized that the rise in pulmonary artery pressure (PAP) during hypoxic exposure is related to an increased transpulmonary production of plasma catecholamines. To assess the transpulmonary exchange of plasma catecholamines, and to investigate their significance in high altitude-induced pulmonary hypertension we measured plasma norepinephrine and epinephrine concentrations across the lung of 34 mountaineers. The measurements were performed during both rest and exercise at low altitude and after 20 hours at high altitude (4559 m).

Materials and Methods: The study was conducted in accordance with the Declaration of Helsinki and its current amendments, and was approved by the Ethics Committee of the Medical Faculty of the University of Heidelberg. For determination of plasma norepinephrine and epinephrine blood samples were obtained via central venous and radial artery catheters before and during exercise on a bicycle ergometer, and were measured by high-performance liquid chromatography. Pulmonary blood flow was measured by inert gas re-breathing, and systolic PAP (PASP) was assessed by transthoracic Doppler-echocardiography. Chest radiography was used to diagnose pulmonary edema. Data are expressed as Mean±SEM, a p-value <0,05 indicates statistical significance.

Results and Discussion: During the stay at high altitude 4 mountaineers developed HAPE. Exercise and high altitude increased PASP (p<0,01) and increased arterial and central venous plasma norepinephrine (p<0.01). In contrast, only exercise (p<0,05) but not high altitude increased arterial and central venous epinephrine. There was no significant transpulmonary gradient for norepinephrine and epinephrine during rest and exercise at low altitude, and during rest at high altitude. Only during exercise at high altitude was a transpulmonary gain of plasma norepinephrine and epinephrine seen. There was no correlation between the transpulmonary plasma exchange of both norepinephrine and epinephrine with PASP during exercise, high altitude or during a combination of both.

Conclusion(s): These results suggest that sympathetic nervous, rather than adrenal medullary, activity increases in subjects acutely exposed to high altitude, and that high altitude pulmonary hypertension occurs largely independent of the SNS discharge to the pulmonary vasculature.

4AP3-5

Predicting fluid responsiveness with stroke volume variation (SVV) during cardiac arrhythmia

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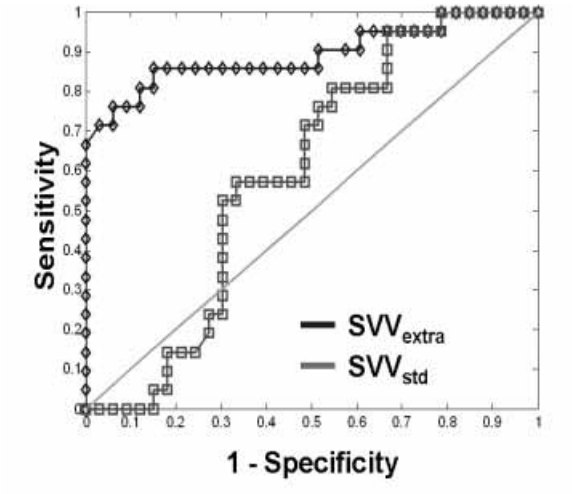
Background and Goal of Study: Stroke volume variation (SVV) induced by mechanical ventilation is a reliable predictor of fluid responsiveness. In patients with premature atrial or ventricular contractions (PVCs), the beat-to-beat variations in stroke volume reflect altered cardiac filling times rather than the effects of mechanical ventilation. Therefore a new algorithm has been developed to assess SVV (SVVextra) in cases of extrasystoles. This algorithm rejects PVCs using multi-parameter signal recognition and restores the respiratory variation of the signal using spline-based interpolation. Our hypothesis was that SVVextra is an accurate predictor of fluid responsiveness during cardiac arrhythmia.

Materials and Methods: Eight anesthetized and mechanically ventilated (tidal volume 10 ml/kg, RR = 13 per min) pigs (weight 80-100 kgs) were monitored with a radial arterial line and a pulmonary artery catheter. Multiple PVCs were induced by right ventricular pacing (25% of heart beats, i.e. 20 PVCs per minute if heart rate is 80 bpm). The arterial pressure waveforms were continuously recorded and intermittent cardiac output was measured by pulmonary thermodilution during period of arrhythmia. The arterial pressure data were run through SVVextra and through the standard algorithm (SVVstd). Measurements were done before and after 56 fluid boluses (7 mL/kg of 6% HES) performed at different volemic states (1 at baseline, then 6 fluid boluses after 21 ml/kg bleeding). Fluid responsiveness was defined as >15% increase in cardiac output following volume expansion.

Results and Discussion: Overall, fluid loading induced a decrease in SVVextra (14±5% vs 10±2%, p<0.01) and in SVVstd (27±10% vs 24±10%, p<0.05). Fluid responsiveness was observed in 21 out of 56 boluses. SVVextra was higher in responders than in non-responders (19±5% vs 12±3%, p<0.05) while SVVstd (29±7% vs 27±11%, p=0.4), was not different. ROC curve analysis showed that SVVextra is an accurate predictor of fluid responsiveness (sensitivity = 86%, specificity = 85%, best cut-off value = 14%, area under the curve=0.892±0.052) while SVVstd was not (area under the curve=0.596±0.077).



Conclusion(s): This new SVV algorithm predicts fluid responsiveness in subjects with extrasystoles.

4AP3-6

Pronostic value of the ankle brachial index to predict mortality and cardiovascular events in non-cardiovascular major surgery

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Background and Goal of Study: While the increased risk of peri-operative cardiovascular disease (CVD) events is well demonstrated in patients with coronary artery disease undergoing non-cardiovascular surgery, little is known about patients with peripheral arterial disease (PAD). Easily detected by the ankle-brachial index (ABI), patients with PAD are generally at high risk of CVD events. This study assessed the incremental prognostic value of the ABI to predict peri-operative events, compared to the conventional evaluation prior to major non-cardiovascular surgery.

Materials and Methods: In 423 consecutive patients (mean age 69 ± 10.7), we estimated also the revised cardiac risk index (rCRI) and measured pre-operative ABI. An ABI <0.90 or >1.40 was considered abnormal. The patients were divided into 3 groups: healthy subjects, those with a CVD history (including clinical PAD) and those without CVD history but with abnormal ABI (asymptomatic PAD). The primary outcome was composite combining death, non fatal acute coronary syndrome, stroke or transient ischemic attack and overt heart failure during the perioperative period. The secondary outcome included the same criteria within the first month. Multivariate regression analyses, adjusted for conventional risk factors evaluated the association between abnormal ABI and outcomes.

Results and Discussion: Eighty (19%) patients had a history CVD, while subclinical PAD was discovered in 53 additional (12.5%) cases. The primary outcome was recorded in 53 (12.5%) cases and the secondary outcome in 55 (13%) cases. Subclinical PAD was an independent risk factor for the primary (Odds Ratio [OR]: 3.28; 95% CI: 1.36-7.93; p= 0.008) and secondary outcomes (OR: 3.20; 95% CI: 1.33-7.69; p= 0.009). Abnormal ABI was independant of the rCRI for the primary (OR: 1.91; 95% CI: 1-3.64; p=0.0499) and secondary outcomes (OR: 1.99; 95% CI : 1.33-7.69; p=0.034).

Conclusion(s): This study demonstrates that asymptomatic abnormal ABI has a pronostic value to predict mortality and cardiovascular events in major non-cardiovascular surgery, incremental to risk factors included in conventional risk assessment.

4AP3-7

Age related changes in the microcirculation… does it really matter?

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Background and Goal of Study: Even though Europe's population is aging with a fast pace, yet microcirculatory changes in the elderly had not been to our current time studied.The goal of our study was to demonstrate the changes in the microcirculatory network during the physiological process of aging. We hypothesized that the basic microcirculatory parameters functional capillary density (FCD)and microcirculatory flow index (MFI) decrease in a linear fashion as age increases, when comparing young and old healthy subjects.

Materials and Methods: Data were collected from 3O healthy subjects regardless of their sex.Group A (n=10) included subjects between the age of 20-40, Group B(n=10) between 50-70 and Group C (n=10) between 80-95. All subjects were healthy and of good physical condition, with the elderly capable of performing daily activities on their own,were of good mental health, with no history of dementia, psychosis or behavioral disturbances. Further all the healthy subjects were non-smokers, did not suffer from any diseases or take any drugs that could have an effect on the microcirculatory network,and had normal values of hematocrit.The sub lingual microcirculation was visualized using side stream dark-field (SDF) imaging. The SDF images were recorded from 3 different areas per subject. MFI and FCD in small (<25 µm in diameter) and medium (25-50 µm) vessels were analyzed off-line.

Results and Discussion: Clear high contrast images were successfully obtained in all groups.There were statistically significant differences between the age groups. Statistically significant decrease both in FCD and MFI was observed in group C when compared to groups A and B.Results are summarized in Table 1. There was a decrease in FCD by 22% and in MFI by 17 % between the oldest subjects in group C and the youngest subjects in group A.

Microcirculatory parameters in age groups

	Group A 20-40 yr	Group B 50-70 yr	Group C 80-90 yr	A vs B	B vs C	C vs A
FCD	245±15	231±19	192±15	p<0.05	p<0.05	p<0.05
MFI	3(3-3)	3(2.7-3)	2.5(2.5-2.7)	p=0.1	p<0.05	p<0.05

FCD is given as mean ± SD; MFI is given as mean (95% CI of mean)

Conclusion(s): Our study confirmed that the basic microcirculatory parameters such as FCD and MFI decrease as age increases, with the higher percent of changes occurring after the age of 70 years.Age should be taken as an important factor in microcirculatory studies and clinical trails focusing on the human circulation.

Acknowledgements: Supported by Research project MZO 00179906.

4AP3-8

Goal directed heamodinamic therapy during major abdominal surgeries

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Background and Goal of Study: Goal Directed Therapy (GDT) is related to therapeutic strategies focused on achievement of predefined values of physiological parameters in order to improve the results and outcome for the patient. GDT is based on the following indicators: CI, DO2I and ScvO2. The current research studies the effectiveness of GDT on oxygen transport through optimization of the infusion therapy and inotropic support for maintenance of adequate oxygen transport and tissue oxygenation.

Materials and Methods: We included 66 patients scheduled for major abdominal, urological and gynecological surgeries. Patients were divided in two groups – control group and a group treated with Dopamine. The monitoring included the following measurements: ECG, HR, MAP, CVP, SPO2, body temperature, hourly urine output, serum lactate level, arterial gases, central venous saturation(ScvO2), hemoglobin (Hb), haematocrit (Hct), serum electrolytes, blood glucose level, Cardiac output index (CI), stroke volume index (SVI), stroke volume variation (SVV), systemic vascular resistance index (SVRI), oxygen delivery index (DO2I) and oxygen extraction (O2EX). In every study patient we recorded the initial (T0) values of all the parameters mentioned above, which were monitored continuously and recorded hourly during the surgery (T1-1….T1-6), and on the 6^{th} (T2-1), 12^{th} (T2-2) and 18^{th} (T2-3) hour after the surgery.

Results and Discussion: Our data indicate that the early administration of Dopamine as an inotropic agent in average dose 4,9 ± 1,4 mcg/kg/min, after correction of CVP to optimal values, provides stable oxygen transport resulting in statistically significant lower levels of serum lactate in comparison with the control group. The routine evaluation of the hemodynamic status based on physical examination and assessment of vital parameters such as CVP and urine output is not able to detect persisting global tissue hypoxia, which is supported by the calculated low correlation dependency. Our results indicate that the early administration of inotropic agents, especially when the CI decreases with more than 20% from the baseline, has a positive effect on tissue oxygenation.

Conclusion(s): The maintenance of optimal oxygen transport through early application of GDT has an important place and significance in contemporary management of high risk patients and those undergoing major surgeries. The perioperative monitoring including the mini-invasive method for cardiac output measurement is a valuable tool for assessment of the effectiveness of the therapeutic plan.

4AP3-9

Beta-adrenoceptor blockade prior to cardiac surgery improves impaired autonomic activity

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Background and Goal of Study: Perioperative beta-adrenoceptor blockade (BB) has been challenged (1,2) but chronic BB is known to improve autonomic activity (AA) (3). We hypothesise (I) acute BB improves depressed AA without adverse haemodynamic events, (II) BB will not improve unimpaired AA, but will increase the risk of adverse events.

Materials and Methods: In 105 patients AA was analysed by means of Total Power (TP) of heart rate variability at baseline and after BB for treatment of hypertension (systolic BP>160mmHg / diastolic BP>90mmHg) or tachycardia (heart rate>80bpm). Metoprolol-boli (2mg i.v.) were administered in stepwise manner until haemodynamic values decreased to normal (systolic BP<140mmHg,

diastolic BP<80mmHg, heart rate<70bpm). Incidence of hypotension (systolic BP<100mmHg), bradycardia (heart rate<50bpm), total need of vasopressors were recorded. Impaired AA was defined based on previous data as TP<500ms^3*Hz^{-1}(4). Statistic: t-test and Fisher's exact test, p<0.05.

Results and Discussion: 52 patients demonstrated hypertension/tachycardia and impaired AA (TP=429±222ms^3*Hz^{-1}). 53 patients demonstrated normal haemodynamics and unimpaired baseline AA (TP=745±1366ms^3*Hz^{-1}). Haemodynamic values were normal and rescue medication was comparable at incision (table 1). Impaired TP significantly increased due to intervention (2114±1536ms^3*Hz^{-1}, p<0.05 vs. baseline) whereas baseline values of Control did not change (888±1316ms^3*Hz^{-1}, p>0.05 incision vs. baseline). Hypotensive episode occured more often if BB was administered in patients with unimpaired baseline AA: 6 out of 7 vs. 17 out of 45, p<0.05). Short term BB improved impaired AA and adverse events were rare. If baseline AA was normal BB did not optimise AA. In these patients BB increased the risk of adverse haemodynamic events.

Conclusion(s): AA-analysis prior to BB may identify patients who might profit from this intervention. If only this group of patients is treated hypotension and bradycardia the major cause of mortality and stroke (1) may be prevented.

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4AP4-1

Effects of remifentanil on the cardiac electrophysiologic system under pharmacologic autonomic blockade. Study in an experimental porcine model

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Background and Goal of Study: Several clinical reports have implicated remifentanil as causing intraoperative severe bradyarrhythmias. In a previous study, developed in a closed-chest porcine model, remifentanil associated with propofol, depresses significantly sinus node function and AV nodal conduction (1). To exclude the influence of remifentanil on the autonomic system, we performed additional experiments under pharmacologic autonomic blockade.

Materials and Methods: Five large white pigs anesthetized with propofol (4.5 mg.kg-1 bolus followed by 13 mg.kg-1.h-1) and remifentanil (bolus of 1 µg.kg-1, followed by an infusion of 0.5µg.kg-1.min-1), underwent electrophysiologic evaluation before and after pharmacologic autonomic blockade (atropine 0.04 mg. kg-1 and propranolol 0.2 mg.kg-1). We evaluated sinus node function [sinus node recovery time (SNRT) and sino-atrial conduction time (SACT)], atrioventricular (AV) nodal function, Wenckebach cycle length (WCL) and effective refractory periods (ERP)]. atrial, His-Purkinje and ventricular conduction and refractoriness. Significant changes between protocols with and without autonomic blockade were evaluated.

Results and Discussion: Autonomic blockade produced a minor and non-significant decrease in SCL (833±103 vs 763±147 ms, 8%, p=NS), SACT (43±16 vs 44±14 ms, 0.5%, p=NS), cSNRT (366±273 vs 254±182 ms, 31%, p=NS), and a non-significant increase in WCL (307±22 vs 337±33 ms, 10%, p=NS) and VERP (300±39 vs 318±43 ms, 6%, p=NS). There were no significant effects on pacing thresholds, atrial refractory period, paced QRS duration or QTc interval. The main finding of this study is that autonomic blockade does not reverted remifentanil effects on sinus node and AV nodal function in a closed chest porcine model. This result are consistent with previous clinical observations, that found a decrease in heart rate, bradyarrhythmias and asystole, after application of remifentanil, in adult as well as in pediatric patients.

Conclusion(s): In our previous study, remifentanil produced important electrophysiologic effects in this closed-chest porcine model (1). The minor "reversion" observed by autonomic blockade suggests that remifentanil itself exerted direct electrophysiologic effects. If these results were confirmed in humans, they should be taken into consideration for the choice of anesthetic agents.

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4AP4-2

r-BNP (recombinant brain natriuretic peptide) and dihydralazine – but not nitroglycerine – increase microvascular gastric mucosal oxygenation in dogs

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Background and Goal of Study: Adequate gastrointestinal mucosal oxygenation is regarded crucial in prevention and therapy of critical illness [1]. r-BNP is a neuro-endocrine natriuretic peptid (NP) with promising potential as vasodilator in anaesthesia and critical care; however, data on splanchnic (micro-)circulatory effects of NP's are limited and contradictive [2]. We hypothesized that r-BNP as vasodilator increases gastric mucosal microvascular oxygenation (μHbO_2) and compared it to two current vasodilators, i.e. di-hydralazine (DIHYD, as 'arterio-dilator') and nitroglycerine (NITRO, as typical 'veno-dilator').

Materials and Methods: In a randomized, cross-over study, chronically instrumented dogs (18 experiments; ~30 kg) were repeatedly anaesthetized (propofol), mechanically ventilated (FiO_2=0.3; $etCO_2$=35mmHg) and randomly received equi-hypotensive doses of r-BNP, DIHYD or NITRO. We measured microvascular gastric mucosal haemoglobin oxygenation (μHbO_2, reflectance spectrophotometry [3]) and systemic DO_2, systemic haemodynamics, and electrolytes/metabolites. Statistics: Data presented as means±sem, ANOVA, Fisher PLSD, p<0.05.

Results and Discussion: Vasodilators were titrated to the same target MAP, which was decreased from ≅80 to ≅65 mmHg (p<0.05) in all groups; no intergroup difference. Both r-BNP (64±4 to 69±3%; p<0.05) and DIHYD (64±2 to 70±2%; p<0.05) significantly increased μHbO_2, whereas NITRO did not (63±2 vs. 61±3%). At the systemic level, DIHYD almost doubled DO_2 (15±1 to 26±2ml/kg/min; p<0.05), whereas r-BNP (17±1 vs. 18±2ml/kg/min) and NITRO (14±1 vs. 16±1ml/kg/min) did not significantly change DO_2.

Conclusion(s): r-BNP increased μHbO_2 selectively, i.e. without concomitant increase in DO_2, suggesting redistribution of perfusion towards gastric mucosa. The other drugs did not increase μHbO_2 at all (NITRO) or in adjunction with marked systemic effects, i.e. DO_2 (DIHYD). Our data suggest that r-BNP increases gastric mucosal microcirculatory oxygenation selectively, i.e. without increasing DO_2 in uncompromised subjects; further studies should address these findings in patients.

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4AP4-3

Third generation hydroxyethyl starch provides liver protection against inflammatory response after hepatic ischemia and reperfusion in a rat model

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Background and Goal of Study: Ischemia reperfusion injury (IRI) is associated with inflammatory events. A prior study1 showed early (2h of reperfusion) protective effect of hydroxyethyl starch (HES) 130/0.4, in liver IRI through its molecule. Goal: to study whether HES 130/0.4 has a late (24h of reperfusion) protective effect in rat liver IRI and if it is associated with anti-inflammatory properties.

Materials and Methods: 4 groups of 8 rats were used. Liver IRI was induced in 2 groups (1hour of segmental hepatic ischemia+24hours of reperfusion). At the onset of reperfusion, group IRI+HES had 13mL/Kg of HES and group IRI received no fluid. Normal controls (Sham and Sham+HES) were sham operated, but sham+HES rats received HES (same dose). Animals were killed after 24 hours of reperfusion and blood was drawn for alanine aminotransferase (ALT)

Abstract 4AP3-9 – Haemodynamic parameters at baseline and at incision

	Baseline			Incision			Norepinephrine (ug/kg)
Group	Sys BP (mmHg)	Dia BP (mmHg)	HR (bpm)	Sys BP (mmHg)	Dia BP (mmHg)	HR (bpm)	
Beta-Block	167+-17#	84+-12#	73+-12	141+-20	73+-13	47+-10	0.9+-0.9
Control	137+-13	74+-11	67+-15	138+-17	68+-11	48+-11	1.1+-0.9

Sys: systolic, dia: diastoli, HR: heart rate, #:p<0.05

quantification and ischemic liver samples were taken for histologic study (H&E and chloroacetate esterase (CE) activity, a neutrophil specific marker). A histologic score from 1 to 5 based on the extent of hepatocellular injury in H&E stained sections was used for IRI severity. Another score from 0 to 4 based on the intensity of CE staining was used to access anti-inflammatory activity.

Results and Discussion: HES before reperfusion markedly reduced biological and pathological markers of liver injury. ALT (Mean±SD) and histologic scores (Median) were greater in IRI group versus Sham group (ALT: 2974±3162 vs 67±23; P=0,021 and Histology:5 vs 1; P<0.001) showing the efficacy of this model. ALT and histologic scores were significantly greater in IRI group than in IRI+HES (ALT: 2974±3162 vs 170±151; P=0,025 and Histology: 5 vs 1; P<0,001), showing a protective effect of HES over liver IRI. ALT and histologic scores were comparable between Sham and Sham+HES (ALT: 67±23 vs 59±23; P>0,05 and Histology: 1 vs 1; P>0,05) showing absence of detrimental effects of HES over liver. Neutrophils were largely present in necrotic areas in IRI histologic samples. Staining intensity scores were greater in IRI group versus IRI+HES group (4 vs 1; P<0.05), suggesting an anti-inflammatory effect by HES.

Conclusion(s): Our study shows a late protective effect of HES against rat hepatic IRI through anti-inflammatory properties. Hence, HES perioperative treatment in major liver surgeries may provide a useful approach to mitigating hepatic IRI.

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4AP4-4

Sympathetic nervous system mediates hypercapnic effects on gastric mucosal oxygenation in anesthetised dogs

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Background and Goal of Study: Hypercapnia increases gastric mucosal microvascular oxygenation (µHbO2) [1]. The impact of the sympathetic nervous system on this effect, however, is unclear. On the one hand sympathetic activation might contribute to the increase in systemic oxygen delivery (DO2) and on the other hand it might exert local effects, e.g. redistribution of blood flow within the gastric wall and vasoconstriction. Therefore we studied the effects of hypercapnia in the absence of sympathetic activity (thoracic epidural anesthesia, TEA [2]).

Materials and Methods: Repetitive experiments were performed in randomised sequence on chronically instrumented dogs anesthetised with Sevoflurane. The effects of TEA (Lidocaine 1%) per se were examined under normocapnic conditions (i.e. 35mmHg end tidal carbon dioxide tension). The effects of hypercapnia (i.e. 70mmHg end tidal carbon dioxide tension, induced by reduction of minute ventilation and maintained for 2h) were studied following a normocapnic baseline with and without TEA. Systemic hemodynamics and regional oxygenation (µHbO2, reflectance spectrophotometry) were recorded continuously, arterial blood was sampled for blood gas analysis at 30min intervals. Linear correlation analysis was performed between systemic oxygenation (DO2) and µHbO2 during hypercapnia. Data are presented as means±SEM.

Results and Discussion: Hypercapnia increased DO2 from 12±1 to 16±1 ml•kg-1•min-1 and µHbO2 from 67±4 to 80±2%. Both variables, however, showed only a minor correlation with r2=0,53. In contrast, in the presence of TEA, hypercapnia decreased DO2 during the first minutes from 13±1 to 10±1 ml•kg-1•min-1, paralleled by a reduction in µHbO2 (74±2 vs 52±6%) but both variables recovered to baseline values during the study period (DO2 14±1ml•kg-1•min-1, µHbO2 71±4%; 2h hypercapnia) revealing a strong correlation (R2=0,92). TEA per se had no effect on DO2 or µHbO2.

Conclusion(s): Epidural anesthesia eliminates the hypercapnia induced increase in regional oxygenation and restores a linear correlation between systemic and regional oxygenation. Thus, sympathetic activation leads to the specific redistribution of blood to the gastrointestinal wall which is not just a consequence of the increased systemic blood flow, since both variables do not correlate in the presence of sympathetic activity.

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4AP4-6

Tolerance to acute normovolaemic anaemia in sepsis

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Background and Goal of Study: Septic shock is associated with a decrease in myocardial function and in tissue oxygen extraction capabilities, which may reduce tolerance to acute anaemia. This experimental study tested the hypothesis that critical haemoglobin concentration (Hbcrit), defined as the Hb value below which O2 consumption becomes delivery dependent, is significantly increased during sepsis.

Materials and Methods: Following institutional animal research committee approval, 16 sheep's were anaesthetized with sevoflurane (2%= 1MAC end-tidal) and mechanically ventilated (FiO2: 0.4). Animals were randomly allocated into a control group (group C; N=8) and a septic group (group S; N=8). Sepsis was achieved by caecal ligation and perforation. In both groups, animals were progressively haemodiluted using 6% hydroxyethyl starch 130/0.4 (ratio 1:1) as the substitution fluid. In each sheep, Hbcrit was determined from a plot of O2 consumption (VO2: indirect calorimetry) versus Hb (Co-oximeter measurement) using a last-sum-of-squares technique (1). Hbcrit and haemodynamic parameters obtained at the nearest experimental point were compared between the two groups using a Mann-Whitney U test. Data are presented as median [interquartiles]

Results and Discussion: Results are shown in table 1:

Table1

	Group C	Group S	p
Hbcrit (g/dl)	2,3 [1,9-2,6]	3,2 [2,5-4.0]	0.01
VO2crit (ml/min)	290 [272-308]	271[236-315]	0.46
MAP (mm Hg)	73 [65-77]	55 [52-59]	0.02
CO (l/min)	7.7 [7.1-8.9]	6.5 [5.2-8.1]	0.05
O2ER (%)	45 [43-54]	48 [36-55]	0.60

Conclusion(s): In this experimental model, sepsis was associated with a decreased tolerance to acute normovolaemic anaemia, reflected by an increase in Hbcrit. This decreased tolerance was related to a blunted cardiac output response.

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4AP4-7

A comparison between a selective and a non-selective adrenergic agonist in an experimental model of ventricular fibrillation

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Background and Goal of Study: Ventricular Fibrillation (VF) remains a leading cause of death and neurological disability. During cardiopulmonary resuscitation (CPR), the protection of the heart and the brain is a priority of experimental research and clinical practice. Several pharmacotherapies have been investigated, in order to improve survival and neurological outcome. The goal of this study was to determine whether a selective α-adrenergic agonist would improve neurological outcome or survival in a swine model of cardiac arrest.

Materials and Methods: Thirty healthy Landrace/Large White pigs 19 ±1.3kg, aged 16 weeks, were randomized into 2 groups (15 animals each). VF was induced to all animals and left untreated for 6 minutes. Animals in Group A received adrenaline (0.02mg/kg) and animals in Group B received phenylephrine 0.5mg/kg) during CPR. Electrical fibrillation was attempted after 8 minutes of cardiac arrest (6min of untreated VF and 2min of CPR). Animals with return of spontaneous circulation (ROSC) were placed back to their cages for 48 hours, in order to record survival and neurological alertness score (evaluation of posture, gait, response to stimuli, pupils and convulsions). Serum levels of Neuron Spesific Enolase (NSE) and Astoglial Protein S-100 were measured during baseline, resuscitation and post resuscitation phase.

Results and Discussion: Spontaneous circulation was restored in 11 animals in Group A and 12 animals in Group B ($p<0.05$). The serum levels of S-100 protein and NSE increased significantly in all resuscitated animals during the post-resuscitation period. However, the serum levels of S-100 protein and NSE in Group A were significantly lower than those measured in Groups B, during the entire post-resuscitation period ($p<0.05$). At the end of the experiment, there were 8 surviving animals in Group A and 7 survivors in Group B. Neurological alertness was significantly better ($p<0.05$) in Group A animals compared to those in Group B. Adrenaline's beta effects are deleterious for the myocardium. In contrast, $\alpha 1$ adrenoreceptors reduce the brain reperfusion and $\beta 2$- adrenergic stimulation improves the brain microcirculation. This study demonstrates that phenylephrine failed to improve post-resuscitation myocardial dysfunction and survival, and it was followed by a poorer neurological outcome.

Conclusion(s): The administration of phenylephrine, during CPR, comparing to adrenaline, did not improve 48-hour survival and additionally worsened Neurological Alertness Score in a pig model of cardiac arrest.

4AP4-8

Carbon monoxide inhalation prevents acute kidney injury after cardiopulmonary bypass in pigs

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Background and Goal of Study: Cardiopulmonary bypass (CPB) may be associated with acute kidney injury (AKI).[1] Carbon monoxide (CO) exerts organprotective effects via an induction of the heat shock protein (HSP) expression.[2,3] We hypothesized that preoperatively inhaled CO induces renal HSP expression during CPB and prevents AKI in pigs.

Materials and Methods: Pigs were randomised either into SHAM group [n=3], CPB [n=7], CPB with preoperative inhalation of 250 ppm CO [CO+CPB; n=7], Q+CO+CPB (Q=Quercetin, an inhibitor of the heat shock response [n=7]) or SnPP-IX+CO+CPB (SnPP-IX=tinprotoporphrine, an inhibitor of the the heme-oxygenase type 1 [n=7]). CPB was established for 2 hours, followed by 2 hours observation time post CPB. Kidney tissue was harvested at the end of the experiment. The parameters of kidney injury and protein expression of TNF-α, Il-6, HSP-70, and HSP-32 in kidney tissue were analysed, as well as serum parameters of AKI. Apoptosis was determined using the caspase-3-activity assay. Statistial significance was assumed at a p-value <0.05.

Results and Discussion: Haemodynamic parameters were largely unaffected by CPB or carbon monoxide inhalation in all groups. Compared to CPB, parameters of AKI revealed lower levels of cystatin C (CPB vs. CO+CPB: 64±14 vs. 28±9 ng/ml, P < 0.001) and neutrophil gelatinase-associated lipocalin (CPB vs CO+CPB: 391±65 vs. 183±56 ng/ml, P < 0.001) in CO treated animals. Renal expression of TNF-α (450±73 vs. 179±110 pg/ml, P < 0.001) and IL-6 (483±102 vs. 125±67 pg/ml, P < 0.001) were lower after CO inhalation. HSP-70 and HSP-32 expression (196±64 vs. 554±149 ng/ml, P < 0.001) were induced after CO inhalation, while caspase-3 activity (550±66 vs. 259±52 RFU, P < 0.001) was inhibited. Q and SnPP-IX partially inhibited the CO mediated effects.

Conclusion(s): As Q and SnPP-IX reversed carbon monoxide-mediated effects, we conclude that protective effects of preconditioning by inhaled CO during CPB are mediated by an activation of the heat shock response.

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4AP4-9

Effects of helium on H_2O_2 induced damage in HUVEC

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Background and Goal of Study: We recently demonstrated that helium induces preconditioning in human endothelium in vivo. Human umbilical vein endothelial cells (HUVEC) are widely used to investigate the endothelium in vitro. Recent research showed that the noble gas xenon can protect HUVEC against TNF-a induced cell damage[1]. Additionally, propofol is able to decrease H_2O_2 induced endothelial damage by suppressing Caspase 3 activity[2]. We hypothesised that pretreatment with the noble gas helium might protect the endothelium against H_2O_2 induced apoptosis.

Materials and Methods: HUVEC were isolated from fresh umbilical cords and grown upon confluency at passage 4 in 6 well plates. Three independent experiments were performed. 10 hours before start of the experiment cells were put in resting medium (M199, 10%FCS, Pen/Strep, Amfo, L-glutamine) without addition of growth factors. Cells were treated for 3 x 5 min with either Helium (5% CO_2, 25% O_2, 70% Helium) or control gas (5% CO_2, 25% O_2, 70% N_2) at 37ºC in a specialised gas chamber. The periods were interspersed by refreshing of the medium to assure complete washout of the stimulus. After completion of the treatment cells were either stimulated with H_2O_2 (100µM, 1.5 hours) or left untreated. Either adherent or detached cells were harvested for FACS analysis of Annexin V (AnV) and Propidium Iodide (PI).

Results and Discussion: Stimulation with H_2O_2 induced cellular damage demonstrated by an increase of detached cells in both, control gas- (32.1%±23.1) and helium pre-treated cells (25.9%±22.2),without statistical difference between groups. Pretreatment with helium alone did not alter the amount of detached cells (1.0%±1.2) compared to controls (0.9%±0.5). AnV staining showed H_2O_2 induced apoptosis in both control and helium pretreated cells (50.8%±34.0 vs. 48.1%±37.1.p=0.93). PI staining revealed that 94.4%±5.7 of the H_2O_2 stimulated cells and 97.5%±0.5 of the Helium pretreated cells were positive for PI, indicating either late apoptosis or direct necrosis.

Conclusion(s): Helium pretreatment alone does not induce apoptosis or necrosis. Stimulation with H_2O_2 100 µM induces detachment of endothelial cells, and cell death of adherent cells either by apoptosis (50%) or necrosis. Helium pretreatment had no effect on H2O2 induced cell damage.

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4AP4-11

Attenuation of monocrotaline-induced pulmonary hypertension by heme oxygenase-1 involves toll-like receptor 4 signaling

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Background and Goal of Study: Heme oxygenase-1 (HO-1) is known to have protective role against many vascular diseases such as pulmonary hypertension (PH) in human and experimental models. Although inflammatory processes including Toll-like receptors (TLRs) signalings are involved in the disorders, the underling mechanism of HO-1 to attenuate them is not fully understood. It is reported that HO-1 and TLR4 pathways may have crosstalk via caveolin-1 which regulates multiple proteins in plasma membrane. We hypothesized that the protective role of HO-1 against vascular diseases may involve TLRs signalings. In this study, we investigated whether induction of HO-1 improves monocrotaline(MCT)-induced PH through interaction of caveolin-1 with TLR4 signaling.

Materials and Methods: Sprague Dawley rats were divided into four groups: Group M was given 60mg/kg of MCT 4 weeks before following measurement. Group MH was given 60mg/kg of MCT and hemin, HO-1 inducer 30 mg/kg twice a week for 4 weeks. Group H was given hemin 30mg/kg twice a week for 4 weeks. Group C was control. Systemic and right ventricular pressure (RVP) was measured. The amount of HO-1, caveolin-1, 3 and TLR4 in lung tissue were measured by western blot analysis. Coimmunoprecipitation and immunoblot using lung were performed to analyse the interaction among caveolin-1, TLR4 and HO-1. Immunofluorescence analysis of lung was done against HO-1, caveolin-1 and TLR4. The sections were observed under confocal microscope.

Results and Discussion: RVP was significantly higher in group M than group C, while the increase was attenuated by adding hemin in group MH. Likewise, increased TLR4 expression in lung in group M compared to in group C also reduced in group MH. HO-1 was significantly higher in group M than in group C and further increased in group MH. Caveolin-1 did not differ in group M and MH, and localized in only plasma membrane of alveolar epithelium. Coimmunoprecipitation showed that the both HO-1 and TLR4 biding to caveolin-1 were increased in group MH than in group M. Attenuation of RVP with enhanced HO-1 by hemin was associated with decreased TLR4 expression and increased interaction between caveolin-1 and TLR4. These suggest that HO-1 expression with hemin may not only decrease TLR4 expression but affect TLR4 signaling because caveolin-1 negatively regulates membrane protein activity mostly by binding them.

Conclusion(s): Inhibitory effect of HO-1 with hemin on MCT-induced PH was associated with decreased TLR4 expression and increased interaction between TLR4 and caveolin-1.

4AP5-1

Effects of ischemic preconditioning on oxidative stress markers during pneumoperitoneum: A rabbit model

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Background and Goal of Study: Experimental study indicates that oxidative stress during and after laparoscopic surgery may cause liver ischemia reperfusion (I/R) injury. [1,2] The aim of this study was to investigate the effectiveness of ischemic preconditioning (IP) in preventing liver I/R injury caused by free oxygen radicals generated during CO_2 pneumoperitoneum.

Materials and Methods: Twenty one New Zealand rabbits were divided into three groups consisting of seven in each. Control group rabbits were subjected to anaesthesia for 60 min. The pneumoperitoneum group (Group PNP) was subjected to 15 mmHg intraabdominal pressure with CO_2 for 60 min. The preconditioning group (Group IP) was subjected to 15 min of insufflation and 10

min of desuflation followed by 60 min of PNP. Serum alanine aminotransferase, aspartate aminotransferase, lactate dehydrogenase, lipid hydroperoxide, glutathione reductase and total antioxidant status were measured. Results were analyzed statistically with Kruskal-Wallis and Mann-Whitney tests; statistical significance was set at p<0.05.

Results and Discussion: Increased intraabdominal pressure produced significant increase in LPO at the end of PNP and 30 min after desuflation compared with that before insufflation, and compared with the control and IP group at the some time points. TAS levels were decreased significantly in PNP group 24 h after desuflation. Also, 24 h after desuflation AST, ALT and LDH were significantly increased in PNP group compared with that before induction of anesthesia, control and IP group. There were no significant differences in the studied parameters between control and IP group.

Conclusion(s): This result provides evidence that IP prevented hepatocyte injury and oxidative stress during CO_2 pneumoperitoneum.

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4AP5-2

The effects of propofol and sevoflurane on modulation of inflammation and oxidative stress in the kidney following experimental aortic surgery

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Background and Goal of Study: Propofol has been reported to provide protection against ischaemia-reperfusion (IR) injury. Nuclear transcription factor kappa B (NFκB) plays a key role in oxidative stress and the inflammatory response during IR. The aim of this study was to compare the effect of propofol with sevoflurane on kidney NFκB expression and systemic inflammatory responses induced by aortic clamping.

Materials and Methods: Twenty piglets were divided into four groups: sham surgery group with propofol (group SP, n=5) or with sevoflurane (group SS, n=5); and suprarenal clamping for 30 min with aorta-aortic bypass under propofol (group CP, n=5) or sevoflurane (group CS, n=5) anaesthesia. Propofol was administered at 4 $mg \cdot kg^{-1} \cdot h^{-1}$ IV and sevoflurane given at 1.5% inspiratory concentration. Peripheral blood and kidney biopsies were taken before the start of surgery, 15 min after unclamping the aorta, 24, 48, 72 hours, and 7 days after surgery. Plasma creatinine, myeloperoxidase (MPO), tumour necrosis factor-alpha (TNF-a), interleukin 1-beta (IL-1b); kidney superoxide anion (SOA) and superoxidase dismutase (SOD) were measured. The expression of inducible nitric oxide synthase (iNOS) and renal tissue NFκB were measured using Western blotting. Data were analyzed using the Fisher exact test and analysis of variance (Student-Newman-Keuls or Scheffe test for normally distributed data and the Kruskall-Wallis Z test for data not normally distributed). Statistical significance was for values of $P < 0.05$.

Results and Discussion: Compared with CS group, animals in the CP group had lower concentrations of MPO, TNF-a, IL-1b, SOA, SOD (P<0.05) from 24 to 72 hours after surgery and diminished NFκB expression and iNOS activity (P<0.05) at 48 and 72 hours after surgery, respectively.

Conclusion(s): Compared with sevoflurane, propofol administration during supra-renal aortic clamping and unclamping led to modulation of markers of inflammation and decreased NFκB expression.

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4AP5-3

Protective effect of amiodarone on *ex vivo* perfused rat liver after cold ischemia

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Background and Goal of Study: The potassium channel inhibitor, amiodarone (AM), has shown to improve survival of liver cells exposed to oxidant stress (1). This study investigated whether AM could protect the liver after cold ischemia injury in food deprived rats.

Materials and Methods: After University Animal Care Committee approval, female Wistar rats were fasted for 16 hours. After they were anaesthetised, the portal vein was cannulated, the liver removed and perfused at a flow rate of 5 ml/min (± 12 cm H_2O) in a closed *ex vivo* system with HBSS supplemented with glucose 1 g/l, insulin, HEPES. Solutions were saturated with 100% O_2. The experiment consisted of 3 phases: perfusion for 15 min at 4°C, cold ischemia (4°C) for 24 hours, and reperfusion during 60 min at 37°C. Animals were randomly divided into 2 groups (n=5): control and AM-treaded group (8 mg/ml added to perfusate during the first phase). Glucose, lactate, potassium, ALT, AST, and LDH were analyzed in perfusate samples at different time-points. The glutathione (GSSG/GSH) was measured in tissue biopsies. Mean ± SD. Student *t* test.

Results and Discussion: [table1]AM minimizes potassium and enzymes release at the time of reperfusion. This further supports the view that AM can inhibit reoxygenation-induced lipid peroxidation of cell membranes, as reported by others (2). Nevertheless, no significant difference was observed in tissular oxidized glutathione.

Biological variables at the end of experiment

Variable	Control (n=5)	Amiodarone (n=5)
Glucose (mg/dl)	66 ± 10	112 ± 8 *
Potassium (mEq/l)	8.2 ± 0.7	4.5 ± 0.4 *
Lactate (mg/dl)	3.4 ± 1.1	2.7 ± 0.5
AST (mU/ml)	1,029 ± 174	176 ± 105 *
ALT (mU/ml)	801 ± 101	137 ± 73 *
LDH (mU/ml)	7,514 ± 2,508	3,474 ± 2,771 *
GSH/GSSG (%)	13.5 ± 4.3	9.7 ± 3.3

* $p < 0.05$

Conclusion(s): In clinical setting, the pretreatment of organ donor by AM may be indicated to compensate the deleterious effect of cold ischemia.

References:

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4AP5-4

Aseptic inflammation and sepsis modify the clonidine effect on the post-hypoxic vasomotricity

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Background and Goal of Study: In a previous study[1], we showed that clonidine (CL), an a2-adrenoreceptor agonist, improves post-hypoxic vasoconstriction (PC) and endothelium-dependent vasodilatation (PVD) in young healthy rats. Our experimentation intends to evaluate the CL effect on post-hypoxic vasomotricity in inflammatory and septic young rats.

Materials and Methods: After animal ethic committee approval, 144 rings aorta from 36 young rats were studied according to a validated methodology[2]. Twelve rats constituted the control group (CG), 12 rats the Inflammatory Group (IG) and 12 others the Septic Group (SG). In IG, an aseptic inflammation was generated by surgical implantation 7 days before experimentation of a bead of alginate coated with human serum in the para-vertebral subcutaneous space. In SG, a sepsis was induced by the technique of caecal ligation and puncture 24 hours before experimentation. After aorta sampling and stabilization, CL (10^{-5}M) was added in two randomized baths. Two were used as control. After fifteen minutes, all baths were washed and 25 minutes of hypoxia (PpO_2 <10mmHg) was applied. After 40 minutes re-oxygenation (PpO_2>400 mmHg), PC was evaluated by cumulative phenylephrine concentrations (10^{-10}-10^{-4}M) and PVD by cumulative acetylcholine concentrations (10^{-10}-10^{-4}M) on pre-contracted aorta. The statistical analysis used GEE regression, p<0.05 significant.

Results and Discussion: In comparison with control baths, CL improves PVD in CG and SG respectively, -23.79% ± 8.42 versus -32.95% ± 8.33, p<0.001 and -21.46% ± 7.70 versus -26.10%±9.90, p=0.005.Concerning PVD in IG, no difference was found (p= 0.40). CL improves PVC in CG: 64.69% ± 25.00 (CL baths) versus 41.56% ± 8.40 (control baths), p<0.001). This effect was not observed in IG (p=0.72) an SG (p=0.89).

Conclusion(s): CL improves PVD in healthy and septic young rats but no in inflammatory rats. When considering PVC, CL improves it in healthy young rat but this effect is not observed in inflammatory and septic rats.

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4AP5-5

IL-1β regulates cell proliferation and activity of extracellular matrix remodelling enzymes in cultured pig heart cells

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Background and Goal of Study: After myocardial infarction and successful resuscitation, elevated levels of cytokines (e.g. IL-1β, IL-6) are found within the myocardial tissue (1) and interleukins, especially IL-1β, are considered to play a major role in tissue remodelling events throughout the body (2). The present study was performed to establish a cell culture model of primary pig heart cells and to evaluate the effects of IL-1β on cell proliferation, expression and activity of enzymes typically involved in tissue remodelling.
Materials and Methods: Cultures of pig heart cells were established by mechanical/enzymatical tissue preparation and subconfluent cell layers were stimulated with pig recombinant IL-1β (1, 10 and 100 ng/ml). RNA expression was detected by semi- quantitative RT-PCR, protein levels were evaluated by Western blotting and enzymatic activities of MMPs were quantified by gelatine zymography. Moreover, cell proliferation was measured by employing colorimetric MTS assays.
Results and Discussion: Pig heart cells express receptors for IL-1β and application of 1-100ng/ml IL-1β resulted in a dose-dependent increase of cell proliferation (P<0.05 vs. control at 24h and 100ng/ml IL-1β). MMP-2 gene expression and MMP-2 enzymatic activity were increased by 10 and 100ng/ml IL-1β. Statistically significant differences were however only observed with concentrations of 100ng/ml IL-1β (P<0.05 vs. control; 3h stimulation for PCR, 24h stimulation for zymography). No significant effects of IL-1β were detected on the expression of MMP-9. RT-PCR studies showed that stimulation with 100ng/ml IL-1β caused an enhanced expression of the tissue inhibitor of MMPs (TIMP-2; P<0.05 vs. control, 100ng/ml IL-1β, 3h stimulation), an observation that might be interpreted as a protective mechanism to avoid excessive matrix remodelling by MMPs.

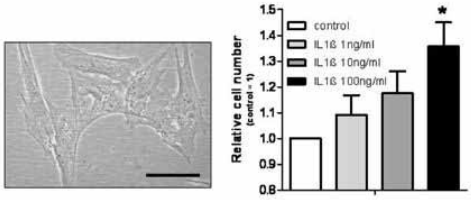

Figure 1: Typical morphology of primary pig heart cells cultured in-vitro (left). Effects of IL-1β. On cell proliferation (right). Bar, * P<0.05 vs. control.

Conclusion(s): Our data obtained with primary pig heart cells suggest that IL-1β plays a role in the events of cell proliferation and extracellular matrix remodelling. IL-1β might be an important factor regulating tissue recovery and scarring after myocardial infarction.

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4AP5-6

The frequency force reserve is reduced during therapeutic hypothermia in an experimental model

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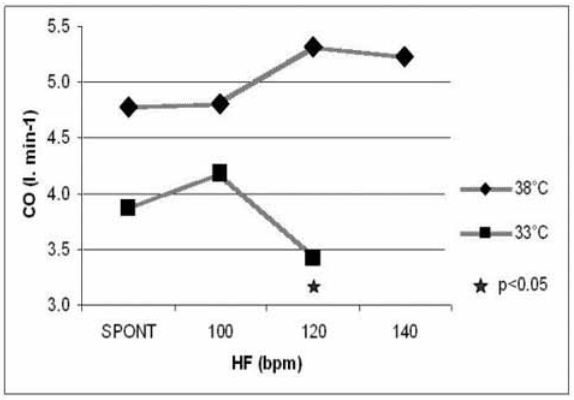
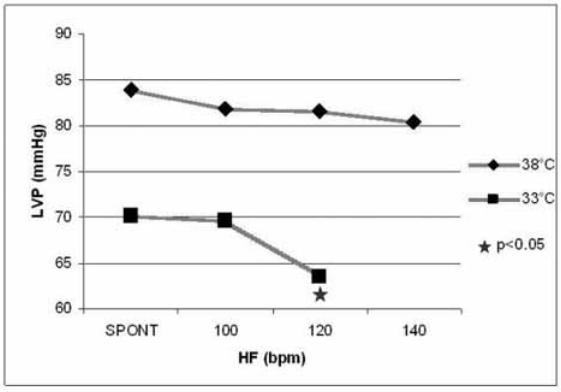
Background and Goal of Study: Hypothermia, used as neuroprotective treatment after cardiac arrest, also reduces myocardial performance. The knowledge of the functional reserve of myocardium during hypothermia is limited. We therefore wanted to investigate the ability to maintain ventricular work during increasing of the heart rate.
Materials and Methods: Eight anesthetized pigs were studied in an open chest model. Peak left ventricular pressure (LVP) was measured using a micromanometer-tipped catheter in the LV. Stroke volume (SV) and cardiac output (CO) was measured by thermodilution technique from a catheter in the pulmonary artery. Moderate hypothermia was performed by intravascular cooling. Heart rate was increased by right atrial pacing at frequencies of 100, 120 and 140 beats per minute during normothermia (38°C) and at 100 and 120 beats per minute during hypothermia (33°C). At each step, pacing was performed for five minutes prior to hemodynamic measurements. Values are given as mean±SD. Statistical analyses were performed with non-parametric tests.
Results and Discussion: Hypothermia reduced spontaneous heart rate in all pigs from 92±10 to 77±11 min-1 (p<0.05) with a fall in CO from 4.8±0.7 to 3.9±0.8 l. min-1 (p<0.05). During normothermia there was no significant change in CO when heart rate was increased. In the hypothermic animals, however, there was a significant reduction in CO when heart rate was increased from 100 bpm to 120 bpm (4.2±1.1 vs 3.4±1.4 l. min-1, p<0.05). Concomitant changes were also seen in the LVP from 70±11 to 64±14 mmHg (p<0.05).
Conclusion(s): The frequency force reserve is reduced during mild hypothermia. The ability of the heart to maintain performance with increasing heart rate is substantially reduced, and indicates that increased heart rate should be avoided during therapeutic hypothermia.





4AP5-7

Intermittent insuflattion/desufflation during natural orifice transluminal endoscopic surgery (NOTES) can reduce wide variability on intraabdominal pressure, hemodynamics and respiratory function

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Background and Goal of Study: On-demand insufflation with a standard endoscopic light source/insufflator has been associated with a marked median increase and wide variation in intraabdominal pressure (IAP) and, consequently, hemodynamic and respiratory changes during transgastric peritoneoscopy suggesting a need for stricter control of IAP during NOTES. Our aim was to asses respiratory and hemodynamic changes in a porcine model during the transgastric peritoneoscopy using feedback pressure regulation.
Materials and Methods: Twelve swine were randomized to transgastric (TG, n=8) or laparoscopic (LP, n=4) 30 min peritoneoscopy under general anesthesia. In TG group, the peritoneal cavity was insufflated with CO_2 from an endoscopic light source/insufflator. IAP was measured by through a 16-gauge Veress needle inserted into the peritoneal cavity. Anesthesiologist adverted only when IAP was >15mmHg, then aspiration through the endoscope was done. Invasive systemic and pulmonary arterial pressures, cardiac output by thermodilution, airway pressures and blood gas analysis were recorded before, during and 20 min after desufflation.
Results and Discussion: All experiments were successfully completed. In TG animals desufflation was required 1,38±1,2 times per procedure/per animal. IAP using an endoscopic insufflator demonstrated wide fluctuation (range, 2 to 16 mmHg; median: 8 mmHg) whereas remains constant at 14 mmHg in LP animals. There were neither significant variations of hemodynamic parameters in any group respect baseline. However, at 15 min of peritoneoscopy LP group showed higher pulmonary pressures than TG group (mPAP 23±4 vs 18±3 mmHg, *p*<0.05 respectively). Whereas changes in airway pressures

were observed at 30 min of peritoneoscopy in LP animals, those parameters remained unchanged in TG animals. Neither group showed significant gas exchange disturbances. All cardiopulmonary parameters returned to baseline at 20 min post-desufflation.

	Baseline		30 min peritoneoscopy	
	Transgastric	Laparoscopy	Transgastric	Laparoscopy
Plateau airway pressure (cmH2O)	18±5	18±2	18±3	29±3 *,τ
Peak airway pressure (cmH2O)	22±5	22±1	22±4	33±4 *,τ

*: p<0,05 different to baseline, ττ: p<0,05 different between groups

Conclusion(s): Use of an on-demand endoscopic light source/insufflator for translumenal surgery with feedback pressure regulation can minimize the risk of hemodynamic and respiratory compromise due to those punctual and acute changes in IAP previously showed in NOTES surgery, leading to even less risk of deleterious effects than laparoscopic surgery.

4AP5-8

Hypercapnia-induced effects on microvascular oxygenation of the gastric mucosa are preserved during angiotensin converting enzyme inhibition independent of blood pressure

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Background and Goal of Study: Hypercapnia improves systemic oxygen delivery (DO2) and microvascular oxygenation of the gastric mucosa (μHbO2) [1]. Simultaneously hypercapnia stimulates the renin-angiotensin-aldosterone-system (RAAS) [2]. As angiotensin II is considered a potent vasoconstrictor particularly in the splanchnic region [3] the impact of RAAS-activation during hypercapnia is unclear.

Materials and Methods: The effects of moderate hypercapnia (i.e. 70mmHg end tidal carbon dioxide tension, etCO2) on DO2 and μHbO2 were studied in repetitive experiments on five chronically instrumented dogs anesthetised with sevoflurane. Subsequent angiotensin converting enzyme (ACE) inhibition (captopril) was used to suppress RAAS-influence during hypercapnia. In an additional series the hypotension induced by captopril was compensated titrating phenylephrine to maintain mean arterial blood pressure (MAP) stable on the level before captopril infusion. The effects of captopril per se were studied under normocapnia (i.e. 35mmHg etCO2). Systemic hemodynamics and gastric mucosal microvascular oxygenation (reflectance spectrophotometry) were recorded continuously. Arterial blood was sampled intermittently for blood gas analysis and calculation of systemic oxygen delivery (DO2). Data are presented as means±SEM. t-test, p<0.05

Results and Discussion: Hypercapnia increased DO2 from 12±1 to 16±1ml•kg-1•min-1 and μHbO2 from 70±4 to 80±2%. These effects were preserved even in the presence of captopril (DO2 14±2 vs 20±4ml•kg-1•min-1; μHbO2 70±4 vs 78±3%) although MAP decreased from 64±1 to 44±3mmHg. Likewise during restoration of MAP with phenylephrine hypercapnia increased μHbO2 from 68±3 to 79±2% to the same amount despite a doubling in DO2 from 13±1 to 26±2ml•kg-1•min-1. ACE-inhibition alone had no effect on DO2, but decreased μHbO2 from 72±2 to 65±2% and MAP from 64±2 to 48±4.

Conclusion(s): ACE-inhibition during hypercapnia does not alter the increase in μHbO2 with or without normalization of blood pressure. Thus, in contrast to physiological conditions, the effects of angiotensin are overweighed during hypercapnia, probably by an activation of the sympathetic nervous system and direct vasodilatory effects of hypercapnia in the splanchic circulation.

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4AP5-9

Simvastatin restores the clonidine effects on post-hypoxic vasomotriciry in olds rats

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Background and Goal of Study: In a previous study1, we showed that, in contrast with young rats, clonidine (CL), an alpha-2 adrenoceptor agonist, enhances the posthypoxic endothelial dysfunction in olds rats. During ischemia-reperfusion, reduction of nitric oxide available is a proposed explanation. Several studies show that HMGCoA reductase inhibitors, statins, increase endothelial NO production and improve posthypoxic endothelial function. In this study, we investigated the effects of the clonidine on the posthypoxic vasomotricity on olds rats pre-treated with simvastatin.

Materials and Methods: After animal ethic committee approval, 96 rings aorta (4x24) from 24 old rats (11-12 months old) were studied according to a validated methodology2. Twelve constitute the control groups and 12 others the Simvastatin Group (SG). In SG, all rats were pre-treated with simvastatin (10 mg kg-1.day-1) in 1 ml water for 3 days. This was administered via an orogastric tube and the last dose was given 1h before the experiment. After aorta sampling, CL (10-5M) was added in two randomized baths. Two were used as control. After 15 minutes, all baths were washed, 25 minutes of hypoxia (PpO2<10mmHg) was applied. After 40 minutes re-oxygenation, posthypoxic contraction was evaluated by cumulative phenylephrine concentrations (10-10-10-4M) and compared with pre-hypoxic maximal contraction. Posthypoxic endothelium-dependent dilatation was evaluated by cumulative acetylcholine concentrations (10-10-10-4M) on pre-contracted aorta. The statistical analysis used GEE regression, p<0.05 significant.

Results and Discussion: Pleiotropics effects of simvastatin as NO production could explain the improvement of the endothelial function. However, more NO contribute to a bigger production of reactive nitrogen species and could induce damage on the posthypoxic vasoconstriction.

Posthypoxic contraction

	Control baths	Clonidine baths	p
Control	77,95±16,23	88,04±23,06	0,339
Simvastatin	71,45±11.57	65,85±18,50	0,034

Posthypoxic endothelium-dependent dilatation

	Control baths	Clonidine baths	p
Control	-35,60±5.32	-31,81±3,24	0,038
Simvastatin	-25,03±3,81	-31,32±4,41	<0,001

Conclusion(s): In our study, simvastatin restores the endothelium function in clonidine group. Surprisingly, posthypoxic contraction is altered in clonidine group while the rats were pre-treated with simvastatin.

References:

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4AP5-10

The impact of inspired oxygen concentration on tissue oxygenation during progressive hemodilutional anemia

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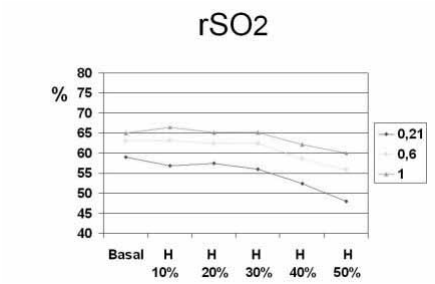
Background and Goal of Study: To investigate the impact of hyperoxic ventilation with FiO2 0,6 and 1.0 in cerebral saturation (rSO2) on the acute normovolemic anemia.

Materials and Methods: Design: Prospective and controlled experimental study. Setting: Experimental animal laboratory of a university hospital. Interventions: rSO_2 (the balance between local O2 supply and demand in brain) was measured through near infrared spectroscopy. A Somanetics INVOS 4100 oximeter was used to measure regional hemoglobin oxygen saturation in the cerebral cortex (frontal area), with concurrent assessment of cardiorespiratory function and cardiac output (measured with PICCO® system) in a mechanical ventilation, anaesthetised pig model (n = 6). 10% aliquots of circulating blood volume were removed and replaced 1:1 with Voluven® (6% hydroxyethyl starch 130/0.4 in 0.9% sodium chloride injection) until 50% of the total blood volume (25ml/kg). Different oxygen fraction in the gas mixture (0,21-0,6-1.0) were administered following each 10% blood replacement.

Results and Discussion: We found a statistically significant decrease of rSO_2 (p<0,05) during the acute normovolemic anemia with FiO_2 0,21 (p = 0,01) and FiO_2 0,6 (p = 0,032), however, with FiO2 1.0 the rSO2 drop wasn't significant (p = 0,119). Hemoglobin decreased by a mean of 4,4 gr/dl (CI 95%: 0,8 to 8 gr/dl) (p=0,023), cardiac output increased by a mean of 1,5 L/min (IC 95%: 0,4 a 2,5) (p=0,016).

Conclusion(s): rSO2 decreases during the acute normovolemic anemia with FiO2 0,21 and FiO2 0,6. Nevertheless, hyperoxic ventilation with FiO2 1.0 decreases this fall and can hide a normovolemic anemia.



Effect of varying the fraction of inspired oxygen (FiO2) during progressive haemorrhage. H: hemodilution.

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4AP6-1

Changes of cerebral blood flow velocity by intravenous anesthetics

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Background and Goal of Study: Changes of cerebral blood flow by anesthetics have been experimentally investigated. However, comparison of the cerebral blood flow at anesthesia induction by various anesthetics have not been studied. The present study investigated the changes of cerebral blood flow velocity at anesthesia induction by thiopental, propofol, midazolam, and ketamine.

Materials and Methods: Thirty-six patients aged 40 to 60 years without any pre-operative complications were divided into four equal groups after the approval of the institutional review board and informed consents from the patients. Without any premedication, the probe (2MHz) of the Transcranial Doppler (TCD, LEGEND TC22, RIKO, Tokyo, Japan) was fixed to show the best signals at the depth of 50 to 55 mm. Under 100% oxygen inhalation by a mask, anesthesia was induced with thiopental 5 mg/kg, propofol 2 mg/kg, midazolam 0.1 mg/kg, or ketamine 2 mg/kg. Mean cerebral blood flow velocity (CBFV) and pulsatility index (PI) were measured before anesthesia induction and when patients lost verbal response. After measurement, fentanyl and vecuronium were administered and tracheal intubation was performed.

Results and Discussion: CBFV significantly decreased in the thiopental and propofol groups, increased in the ketamine group, and did not change in the midazolam group. PI did not change significantly in all groups, while variations were big. Blood pressure decreased in the thiopental and propofol groups, increased in the ketamine group, and did not change in the midazolam group. Heart rate increased in the thiopental and ketamine groups, decreased in the propofol group, and did not change in the midazolam group. These results suggest that cerebral blood flow of middle cerebral artery decreased by thiopental and propofol, increased by ketamine without changes of the diameter of middle cerebral artery, and did not change by midazolam. These changes might be linked with the changes of blood pressure.

Conclusion(s): Cerebral blood flow might decrease by thiopental and propofol, increases by ketamine, but might not change by midazolam.

4AP6-2

Use of near-infrared spectroscopy (NIRS) during a vascular occlusion test to assess the microcirculatory response during fluid responsiveness

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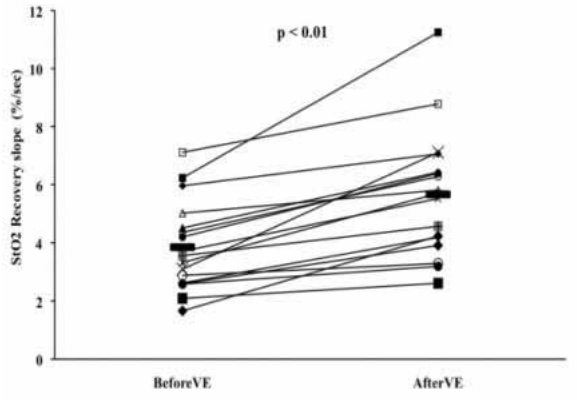
Background and Goal of Study: Adequate volume expansion should improve cardiac preload and stroke volume leading to improved microvascular blood flow, tissue perfusion and oxygenation. The dynamic recovery slope of StO2 (tissue O2 saturation) during a standardized vascular occlusion test (VOT) is proposed to reflect microvascular reactivity. We aimed at evaluating the dynamic StO2 variations during fluid challenge in high-risk surgical patients.

Materials and Methods: Thirteen adult Caucasian patients, ASA II-III, undergoing major abdominal surgery, were studied. In all, cardiac output (CO), stroke volume (SV), pulse pressure variation (PPV), and standard hemodynamic parameters were continuously recorded. Fluid responsiveness was defined as an increase in SV >15%, after a 500ml colloid (HEA 130/0.4) infusion over 10 min. StO2 measurements and VOT (sphygmomanometer inflated until >50 mmHg above systolic pressure and kept inflated until StO2 decreased to 40%) were performed after anaesthesia induction (baseline), before and after fluid challenge.

Results and Discussion: At baseline, no patient was preload-dependant (meanPPV 7.9±2%), and none required vasopressors during the procedure. Baseline mean StO2 was 85±6%, while CO and SV were 4.9±0.9L/min and 68±21mL respectively. During hypovolemia, compared to baseline, there was no difference in both StO2 (85±6 to 84±9%, p=0.76) and StO2 desaturation rate (-9.6±1.6 to -11 ±2.7%/min, p=0.10), while StO2 recovery slope was lowered (5.1±1.6 to 3.8±1.5%/sec, p=0.04). Patients were all responders to fluid challenge. After volume expansion, SV (84±20 vs. 62±12ml, p<0.01) and CO (6.5±2 vs. 4.8±1.2L/min, p<0.01) were higher, with no significant changes in both StO2 and StO2 desaturation rate. Fluid challenge induced a 46% increase in StO2 recovery slope (p<0.01, figure 1), which was comparable to baseline.



Conclusion(s): Whilst redistribution of blood flow may occur during circulatory failure (vasoconstriction of lesser vital organs), impairement of microcirculation and tissue hypoperfusion indicators are of particular importance. Both hypovolemia and intravascular volume expansion are associated with significant modifications in the dynamic recovery slope of StO2.

4AP6-3

ScvO2 and Pcv-aCO2 as complementary tools for goal-directed therapy (GDT) during high-risk surgery

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Background and Goal of Study: Central venous oxygen saturation (ScvO2) has been shown to be a useful therapeutic target in septic shock or high-risk surgery. Central venous-to-arterial carbon dioxide difference (Pcv-aCO2) has been proposed as a complementary tool for GDT in septic shock. We tested the hypothesis that both ScvO2 and (Pcv-aCO2) could be used as complementary tools for GDT during high-risk surgery.

Materials and Methods: Seventy adult patients, ASA I-III, undergoing major abdominal surgery, were randomly assigned to 6 ml kg-1 h-1 (R-GDT group, n = 36) or 12 ml kg-1 h-1 (C-GDT group, n = 34) of crystalloids. Additional boluses of HES (130/0.4) were given to maintain respiratory variation in peak

Abstract 4AP5-10 Variation of hemoglobin and CO during the hemodilution

	BASAL	10% HEMODILUTION	20% HEMODILUTION	30% HEMODILUTION	40% HEMODILUTION	50% HEMODILUTION
Hemoglobin (g/dl)	9,5±1,7	8,3±1,0	7,6±1,1	7,3±1,2	6,4±1,2	5,6±0,8
CO l/min	2,6±0,6	3,3±1,2	3,8±1,5	3,8±1,1	3,9±1,3	3,9±0,6

Table 1. CO: cardiac output. Data expressed as mean ± standard desviation.

aortic flow velocity (deltaPV) below 13%. In both groups, ScvO2, cardiac output (CO), oxygen delivery (DO2i), Pcv-aCO2 and postoperative complications were blindly recorded.
Results and Discussion: At baseline, there were no differences in hemodynamic variables, ScvO2 (79 ± 7 vs. 80 ± 6, p = 0.37) and Pcv-aCO2 (6 ± 3 vs. 6 ± 2, p = 0.95). The total volume of fluid perfused was larger in the C-GDT group than in the R-GDT group (p <0.01). The two groups showed no differences in intraoperative blood loss, blood transfusion, mean CO and mean DO2i values. Overall, postoperative complications were increased in the R-GDT group (p < 0.01), especially postoperative sepsis occurred more often (p = 0.0064). Minimal ScvO2 (minScvO2) was higher in the C-GDT group (72 ± 6 vs. 69 ± 6%, p = 0.04). In patients with complications, minScvO2 was significantly reduced (72 ± 6 vs. 67 ± 6%, p = 0.0017). MinScvO2 <70% was independently associated with sepsis (OR 4.2 [95%CI 1.1-14.4], p = 0.025). Intraoperative mean Pcv-aCO2 was higher in the R-GDT group (7 ± 3 vs. 5 ± 2mmHg, p < 0.01). In patients who develop sepsis, Pcv-aCO2 was higher than in patients who did not (8 ± 2 vs. 5 ± 2mmHg, p <0.01). In patients with ScvO2 >70% and who develop sepsis, Pcv-aCO2 was also significantly higher (p <0.01). The area under the ROC curve was 0.758 [95%CI 0.71-0.81] for discrimination of patients with ScvO2 >70% who did and did not develop sepsis, with 5mmHg as the best threshold value.
Conclusion(s): ScvO2 reflects important changes in O2 delivery in relation to O2 needs during the perioperative period and might help guiding GDT better than deltaPV alone. Pcv-aCO2 appears a useful tool to identify persistent hypoperfusion when GDT is associated with an ScvO2 >70%.

4AP6-4

The influence of equipotent doses of sevoflurane and propofol, guided by bispectral index, on outcomes in off-pump coronary artery bypass grafting surgery

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Background and Goal of Study: The cardioprotective effects of were associated with lesser damaged heart and shorter intensive care unit (ICU) care after coronary artery bypass grafting surgery. Volatile anesthetic agents have showed better outcomes comparing with intravenous anesthetic agents after coronary artery bypass grafting surgery. The present study was designed to compare outcomes of equipotent dose of sevoflurane versus equipotent dose of propofol anesthesia in patients undergoing Off-pump coronary artery bypass grafting surgery (OPCAB).
Materials and Methods: In S group, sevoflurane 1.0% (end expiratory concentration) was administered. End expiratory concentration of sevoflurane was titrated to maintain bispectral index (BIS) values between 40 and 50. In P group, propofol 1 μg/ml (target concentration) was administered using target-controlled infusion Target concentration of propofol was titrated to maintain BIS values between 40 and 50. The concentrations of creatinine kinase MB concentration (CK-MB) and troponin I (TnI) were measured before start of surgery (T0), arrival in ICU (T1), 12 hours (T2) and 24 hours after ICU admission. Intubation time was defined as time from arrival at ICU to extubation. Intubation time and ICU stay was measured.
Results and Discussion: 94 patients (S group: 47, P group: 47) were studied. Preoperative patients characteristics were similar in groups. Minimal and maximal end tidal concentration of sevoflurane was 0.85 ± 0.31 and 1.15 ± 0.42%, respectively. Minimal and maximal target concentration of propofol was 0.78 ± 0.17 and 1.43 ± 0.22 μg/ml, respectively. Postoperative values of CK-MB and TnI (T1, T2 and T3) were significantly higher than preoperative values (T0) in groups, whereas there were no significant differences between S group and P group. There were no significant differences of anesthetic time, operation time, intubation time and ICU stay between S group and P group.
Conclusion(s): Sevoflurane and propofol at equipotent dose, guided by BIS with remifentanil 20 ng/ml did not show the difference of releases of CK-MB and TnI, intubation time and ICU stay.

4AP6-5

Postoperative myocardial injury after major head and neck cancer surgery

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Background and Goal of Study: Head and neck cancer is often caused by long-term tobacco abuse, a major risk factor for coronary artery disease. Yet, little is known about the risk for postoperative myocardial injury after major head and neck cancer surgery and its clinical relevance.
Materials and Methods: Retrospective cohort study of all patients who underwent major head and neck cancer surgery (n=378) at a single major academic centre from April 2003 to July 2008. Peak postoperative troponin I (TnI) concentration was the primary outcome. The study was approved by the IRB with a waiver of informed consent.
Results and Discussion: Findings: Of 378 patients, who underwent major head and neck cancer surgery, 57 patients (15%) developed an elevated TnI; 90% of which occurred within the first 24 hours after surgery. Pre-existing renal insufficiency (unadjusted OR [OR]: 4.60, 95% CI 1.53-13.82), coronary artery disease (OR: 2.33, 95% CI 1.21-4.50), peripheral vascular disease (OR: 2.83, 95%CI 1.31-6.14), hypertension (OR: 2.22, 95% CI 1.20-4.12), and previous combined chemotherapy and radiation (OR: 2.68, 95% CI 1.04-6.91) were associated with elevated postoperative TnI. Patients with elevated TnI had a significantly longer length of stay in the hospital (8.5 vs. 10.1 days; p= 0.014) and ICU (3 vs. 4.5 days; p= 0.001) and an 8-fold increased risk of death at 60 days after surgery (OR 7.62; 95% CI 1.98 – 29.31). At one year, patients with an abnormal postoperative TnI were twice as likely to die (OR 1.93; 95% CI 1.02 – 3.63).

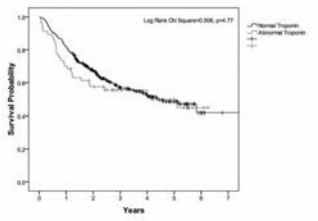

Figure2. Kaplan-Meier Survival Analysis of Patients with normal and elevated Postoperative Troponin I.

Conclusion(s): Patients who undergo major head and neck cancer surgery are at significant risk for postoperative myocardial injury which is a strong predictor of 60-day mortality after surgery. Monitoring of myocardial injury during the first postoperative days as well as optimizing preventive cardiac care may be helpful to reduce postoperative mortality.
Acknowledgements: This study was funded - in parts - by grants from the American Heart Association, Foundation for Anesthesia Education and Research (FAER), Washington University School of Medicine to PN.

4AP6-6

Impact of Trendelenburg position and positive end-expiratory pressure on the internal jugular cross-sectional area

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Background and Goal of Study: Increasing the cross-sectional area of the right internal jugular vein facilitates cannulation and decreases complications. Maneuvers such as the Trendelenburg tilt position and ventilation with a positive end-expiratory pressure (PEEP) may increase the cross-sectional area of the right internal jugular vein. This study determined the changes in the cross-sectional area in response to different maneuvers.
Materials and Methods: The cross-sectional area (cm2) of the right internal jugular vein was assessed in 50 anesthetized adult cardiothoracic surgery patients using two-dimensional ultrasound. First, the crosssectional area was measured in response to supine position with no PEEP (control condition, S0) and compared with 5 different randomly ordered maneuvers: 1) PEEP ventilation with 5 cm H2O (S5), 2) PEEP with 10 cm H2O (S10), 3) a 20° Trendelenburg tilt position with a PEEP of 0 cm H2O (T0), 4) a 20° Trendelenburg tilt position combined with a PEEP of 5 cm H2O (T5), and 5) a 20° Trendelenburg tilt position combined with a PEEP of 10 cm H2O (T10).
Results and Discussion: All maneuvers increased the cross-sectional area of right internal jugular vein with respect to control condition S0 (all p<0.05). S5 increased the cross-sectional area on average by 15.9%, S10 by 22.3%, T0 by 39.4%, T5 by 38.7%, and T10 by 49.7%.
Conclusion(s): When comparing the effectiveness of applying different PEEP levels and/or the Trendelenburg tilt position on the cross-sectional area of the right internal jugular vein, the Trendelenburg tilt position is most effective.

4AP6-7

Perioperative measurements of beat-to-beat blood pressure changes during autonomic function testing in spontaneously breathing patients

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Background and Goal of Study: Variations in blood pressure are extensively used to monitor the hemodynamic status of patients throughout the perioperative period. We recently found that controlled breathing and autonomic function testing in spontaneously breathing subjects are related to reproducible blood pressure variations as measured by a non-invasive continuous blood pressure measurement device. We here investigated whether our approach additionally enables the detection of changes in blood pressure variation after anesthesia and surgery in spontaneously breathing patients. We hypothesized that anesthesia and surgery influence blood pressure variation as reflected in hemodynamic alterations during autonomic function testing in the postoperative period.
Materials and Methods: Blood pressure variation was determined in surgical patients using a non-invasive continuous finger blood pressure measurement device (Nexfin HD®; BMEYE, Amsterdam). Exclusion criteria were an age < 18 or > 75 years, a BMI < 15 or > 35 kg/m2, diabetes mellitus, or use of beta blockers. Measurements were performed before surgery and on three subsequent days postoperatively. After baseline measurements during supine steady state, patients executed controlled breathing (10 breaths/minute) and a Valsalva maneuver to determine blood pressure variation using a formula for pulse pressure variation calculation. Data were analyzed using a t-test for paired observations.
Results and Discussion: The variation in blood pressure during controlled breathing as measured in 23 patients (6 males/17 females; 43 ± 9 years; BMI 26 ± 4 m^2/kg) changed significantly over 4 consecutive days in the perioperative period. The variation in blood pressure on day 1 postoperatively dropped from 10.4 ± 4.5% to 7.4 ± 2.6% (P=0.025; n = 19) and returned to baseline on day 2 and 3 postoperatively. A similar pattern was found in the blood pressure variation calculated from the Valsalva maneuver.
Conclusion(s): Our data demonstrate the ability to determine changes in blood pressure during controlled breathing and the Valsalva maneuver in the non-ventilated surgical population using a non-invasive continuous blood pressure measurement device. Our results support further development and validation of this method as clinical measure for perioperative hemodynamic changes in spontaneously breathing patients.

4AP6-8

The prognostic role of left and right ventricular function in patients who underwent the cardiac surgery

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Background and Goal of Study: The aim of this study was to evaluate the prognostic role of right and left ventricular functions in patients who underwent the cardiac surgery.
Materials and Methods: From February 2004 to August 2004, preoperative left and right ventricular functions were assessed by bidimension (left ventricular ejection fraction) and M-MODE (tricuspid anular plan systolic excursion, TAPSE) echocardiography on 250 consecutive patients who underwent cardiac surgery. Median euroscore was 12.0%. The procedures were: 145 isolated myocardial revascularizations, 81 valve surgeries and myocardial revascularizations, 24 aortic surgeries. In the next two years, fifteen patients were excluded due to non cardiac death.
Results and Discussion: At least one episode of cardiac failure occurred in 20 patients, 5 of them died from pulmonary oedema or cardiac arrest. The patients' survival rate over the period of two years has been 91.5%. Logistic regression adjusted for EuroSCORE identify EF (OR=0.91, p<0.001) and TAPSE (OR=0.56, p<0.001) as independent risk factors for occurrence of cardiac failure over the period of two years. ROC curves showed as cut off value to predict occurrence of cardiac failure EF≤35% (sensitivity 90%, specificity 88%), and TAPSE≤14mm (sensitivity 88%, specificity 82%).
Conclusion(s): Left ventricular EF and TAPSE are ecocardiographic parameters which are easy to evaluate. This provides strong prognostic value for occurrence of cardiac failure following the cardiac surgery.
References:

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2 F. Guarracino, R. Baldassarri. Transesophageal echocardiography in the OR. Minerva Anestesiologica 2009. Sep;75(9):518-29.

4AP7-1

Hemodynamic effects of endothelial function testing in healthy volunteers

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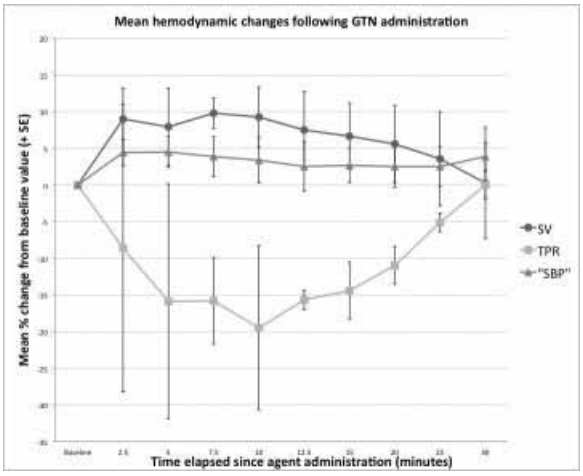
Background and Goal of Study: Previous studies have validated endothelial function testing using pulse plethysmography (PPG)[1], which compares endothelium dependent vasodilatation after salbutamol challenge with endothelium independent vasodilatation after glyceryl trinitrate (GTN). There is a paucity of data characterising the hemodynamic effects of this technique, which are required prior to use in clinical practise. Our goal was to characterise the duration and extent of hemodynamic changes seen in healthy volunteers during endothelial testing.
Materials and Methods: The study was approved by ethics committee. 20 male volunteers were studied; mean age 20.7 yrs. Study agents (Salbutamol 400mg via spacer device and GTN 400mg sublingual spray) were administered sequentially after a 30 minute rest period in 10 volunteers, the order was reversed for the remaining 10. Hemodynamic changes were measured non-invasively using a finometer, which uses a finger cuff to trace pulse waveform from which blood pressure (BP), stroke volume (SV) and total peripheral resistance (TPR) are derived. Monitoring was continued until variables returned to baseline.
Results and Discussion: There was minimal change in BP, but a significant fall in TPR (p = <0.001 repeated values ANOVA), which was compensated for by an increase in SV (p=<0.001). There was considerable interpersonal variation in the response to salbutamol both in terms of magnitude of effect and duration of action. The vascular stiffness parameters measured by the pulse plethysmograph were poorly correlated with these changes.



Conclusion(s): There were significant hemodynamic changes associated with this technique of endothelial function testing which would not have been evident using either routine BP measurement or PPG. Whilst these changes are well tolerated in healthy volunteers, the impact of up to a 20% fall in TPR must be considered if endothelial testing is to be used clinically. Further studies to characterise the hemodynamic effects of endothelial testing in patient populations are warranted.
References:

1 Wilkinson IB et al. Pulse-wave analysis: clinical evaluation of a noninvasive, widely applicable method for assessing endothelial function. Arterioscler Thromb Vasc Biol 2002; 22:147–52.

4AP7-2

Haemodynamic response to haemodialysis

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Background and Goal of Study: During haemodialysis, conventional non-invasive haemodynamic BP monitors (NIBP), which provide intermittent measurements, may miss some haemodynamic events. Additionally, the presence of fistulae in patients with renal failure may render intra-arterial monitoring difficult or not feasible. The Finometer, a continuous beat-by-beat, non-invasive haemodynamic monitor, may provide a feasible alternative. Using Finometry we observed the gross haemodynamic changes occurring during routine haemodialysis as part of a service evaluation.
Materials and Methods: 25 patients were continuously monitored throughout their haemodialysis sessions, which lasted between 3.5 and 4.5 hours. Their mean age was 61.3 (18.6), 13 male and 12 female.
Results and Discussion: An interpatient variability in the magnitude and timing of haemodynamic changes throughout the haemodialysis period was encountered. Of the 25patients, there was a significant decrease (more than 30% decrease from baseline value, for more than 20 min) in SBP, MBP, stroke volume (SV) and total peripheral resistance (TPR) in 7, 6, 10 and 6 patients respectively during their haemodialysis sessions. Furthermore, the mean (SD) of time periods where there were more than 30% decreases from baseline values

in SBP, MBP, SV and TPR, were 20.9 (39.2), 17.8 (36.5), 40.2 (60.1), 39.4 (73.3) min respectively. Highest blood pressure (BP) values during the course of haemodialysis were associated with significant decreases in SV and significant Increases in TPR while heart rate (HR) remained stable. On the other hand, when BP reached its lowest values, only SV decreased significantly.

Mean (SD) of maximum changes in SBP and the corresponding SV and TPR values

	Baseline	Highest	p Value	Lowest	p Value
SBP (mmHg)	141(24)	180 (32)	p <0.001	86 (27)	P <0.001
SV (ml)	91 (37)	64 (37)	p <0.001	72 (35)	P = 0.0063
TPR (MU)	1.3 (1.06)	3.08 (2.81)	P = 0.0043	1.01 (0.69)	P = 0.2365

Conclusion(s): Interpatient variability in haemodynamic responses to haemodialysis, along with significant haemodynamic changes that occur during the course of routine haemodialysis, may urge the need for conducting further studies to justify the regular use of Finometry in the haemodialysis setting, which might provide safer haemodynamic practice, through early diagnosis and treatment of haemodynamic mishaps.

4AP7-3

Characterisation of endothelial-dependent and endothelial-independent vasodilatation in healthy volunteers using pulse plethsymography

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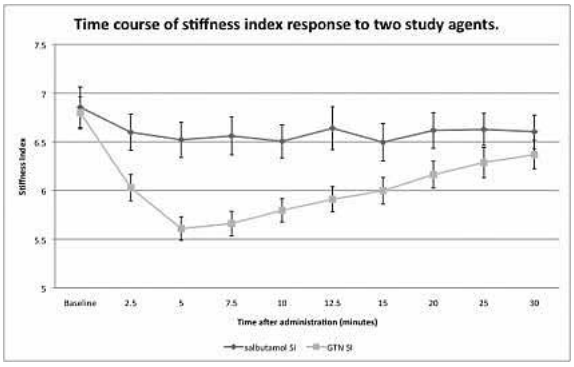
Background and Goal of Study: Pulse plethysmography (PPG) is a relatively new technology and has been used to assess endothelial function by comparing the vasodilatory response to salbutamol (endothelial dependent) and glyceryl trinitrate (endothelial independent)[1]. PPG calculates indices of vascular stiffness (stiffness index (SI) and reflection index (RI)) based on the pulse volume trace. The goal of this study was to address the paucity of data detailing the duration and extent of changes to these variables, and whether the sequencing of the agents alters response. This data is important to inform clinical use of the test.
Materials and Methods: The study had ethical approval. 20 healthy male volunteers took part in the study; mean (SD) age 20.7 (0.66) years. Salbutamol 400mg (via spacer device) and GTN 400mg (sublingual spray) were administered sequentially after a 30 minute rest period in 10 volunteers before reversing the order for the remaining 10. SI and RI were measured using PPG, and the subsequent agent was administered only after variables returned to baseline.
Results and Discussion: Maximal vasodilatory response to salbutamol (endothelial dependent) was of the order of 60% of GTN (endothelial independent) response. There was considerable inter individual variation in response to salbutamol. When individual responses are monitored and subsequent agents are not applied before return to baseline, sequencing of agents does not effect responses (p values > 0.05).

Mean maximal change in vascular stiffness indices with study agents.

	Mean (SE) maximal % change from baseline - salbutamol	Mean (SE) maximal % change from baseline - GTN	Mean o (SE) Rati
Stiffness Index	9.82 (7.18)	19.5 (6.1)	0.62 (0.67)
Reflective Index	17.5 (12.2)	34.2 (14.5)	0.64 (0.56)



Conclusion(s): This study gives the baseline characteristics and time course of the change in the values of SI and RI in healthy volunteers. The data will serve as a benchmark for sample size calculations in future patient based studies.
References:

1 Wilkinson IB, Hall IR, MacCallum H, et al. Pulse-wave analysis: clinical evaluation of a noninvasive, widely applicable method for assessing endothelial function. Arterioscler Thromb Vasc Biol 2002; 22:147–52.

4AP7-4

Global enddiastolic volume and variation of left ventricular outflow tract velocity reliably predict fluid responsiveness in cardiac surgery

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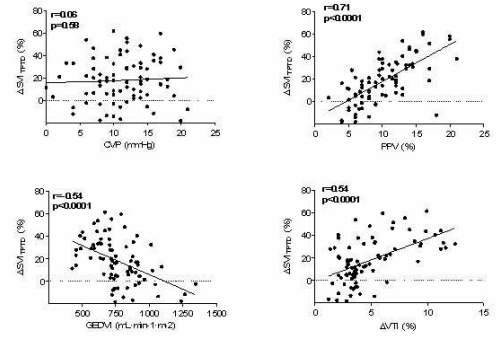
Background and Goal of Study: Several studies have shown that goal–directed perioperative optimization of fluid administration may reduce morbidity after major surgery and the length of stay on the intensive care unit [1]. In this context, global enddiastolic volume index (GEDVI) and changes in the velocity time integral obtained in the left ventricular outflow tract (ΔVTI_{LVOT}) as a dynamic variable of fluid responsiveness have gained increasing interest. However, the ability of GEDVI and ΔVTI_{LVOT} to predict fluid responsiveness is still under debate. The aim of the present study was to challenge the predictive power of these variables concerning fluid responsiveness in a large patient population.
Materials and Methods: After institutional ethics committee approval and informed consent 82 patients scheduled for cardiac surgery were studied after induction of anesthesia and both during and after after passive leg raising (PLR). Each patient was monitored with central venous pressure, the PiCCO system and transesophageal echocardiography. Responders were defined to increase their SVI_{TPTD} >15% during PLR. To assess the ability of a variable to identify responders and non-responders receiver operator characteristic (ROC) curves were generated.
Results and Discussion: We observed 53 responders (increase in SVI_{TPTD} >15%) after PLR and 39 non-responders (increase in SVI_{TPTD}<15%). CVP showed no significant correlation with ΔSVI_{TPTD} (r=-0.06, p=0.58), in contrast to PPV (r=0.71, p<0.0001), GEDVI (r=-0.54, p<0.0001) and ΔVTI_{LVOT} (r=0.54, p<0.0001). The best area under the ROC curve was found for PPV (AUC: 0.82, p<0.0001), followed by ΔVTI_{LVOT} [/sub](AUC: 0.74, p<0.0001) and GEDVI (AUC: 0.71, p=0.0006), whereas CVP was not able to reliably predict fluid responsiveness (AUC: 0.58, p=0.18). ROC analysis yielded threshold values of PPV >11%, GEDVI <725 ml•min^{-1}•m^{-2} and ΔVTI_{LVOT} >4.5% to discriminate between responders and non-responders.



Conclusion(s): ΔVTI_{LVOT} and GEDVI reliably predicted fluid responsiveness under closed chest conditions.
References:

1 Grocott MP, Mythen MG, Gan TJ: Perioperative fluid management and clinical outcomes in adults. Anesthesia and analgesia 2005; 100:1093-1106.

4AP7-5

Effects of single dose of esmolol on BIS and catecholamine response to tracheal intubation during desflurane anesthesia

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Background and Goal of Study: Esmolol produces a dose-dependent attenuation of the adrenergic response and prevents arousal reactions to noxious stimuli. Desflurane increases sympathetic activation by elevating plasma norepinephrine (NE) relative to other inhaled anesthetics. In a previous study, [1] a single dose of esmolol (0.5 mg/kg) blunted the increase in BIS to tracheal intubation during sevoflurane but not desflurane anesthesia. Therefore, we investigated whether esmolol (1 mg/kg) might blunt the BIS and catecholamine response to endotracheal intubation during desflurane anesthesia.
Materials and Methods: Forty-eight patients (ASA I or II) without cardiovascular disease were enrolled in this prospective, randomized study. After induction of anesthesia, patients were mask-ventilated with desflurane (end-tidal 1 MAC) for 5 minutes and then received normal saline, esmolol 0.5 mg/kg, or esmolol 1 mg/kg 1 minute before intubation (control, esmolol-0.5 and esmolol-1 groups, respectively).

BIS, mean arterial pressure (MAP), and heart rate (HR) were measured before the induction of anesthesia (awake), before esmolol injection (time point -1), immediately before intubation (time point 0), and every minute for 5 minutes after tracheal intubation (time point 1 to 5). At time point 0, 1 and 5, 5 mL of arterial blood was drawn for the measurement of NE and epinephrine (E) concentration in plasma.

Results and Discussion: The patients' demographic data were not significantly different among the three groups. Compared with preintubation, 1 mg/kg of esmolol could not attenuate the increase in BIS at 1 minute after intubation (37 ± 5.4 to 40.7 ± 4.9; $P < 0.001$) but the changes were smaller than in the control (34 ± 6.6 to 48.9 ± 12.2) and esmolol-0.5 groups (36 ± 5.1 to 49.5 ± 9.4). MAP and HR increased after intubation in all groups but the change in HR was greater in the control group than esmolol groups. The increase in plasma NE concentration was significantly greater at 1 minute after intubation in the esmolol-1 group (346 ± 120.2 to 503.3 ± 125.7; $P = 0.016$), whereas the plasma E concentration remained unchanged after intubation in all groups.

Conclusion(s): A single dose of esmolol (1 mg/kg) could not attenuate the BIS and catecholamine increase to tracheal intubation during desflurane anesthesia.

References:

1 Choi SH, Kim CS, Kim JH, et al. J Neurosurg Anesthesiol. 2009; 21: 214-217.

4AP7-6

Gray zone approach: A new statistical tool to assess the ability of pulse pressure variations to predict fluid responsiveness in mechanically ventilated patients under general anesthesia

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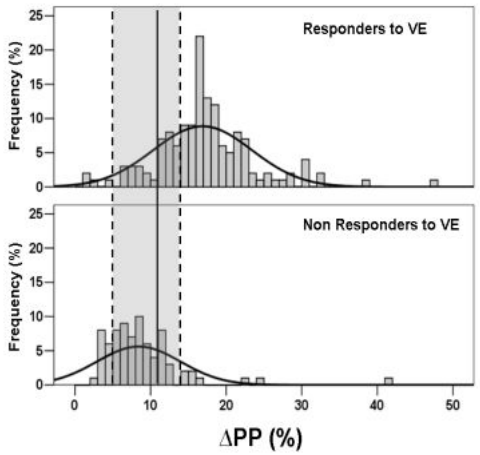
Background and Goal of Study: Pulse pressure variation (PPV) is the best predictor of fluid responsiveness in mechanically ventilated patients. Studies focusing on this parameter tested its predictive value using ROC curve analysis and reported a threshold of 13% allowing for sensitivity and specificity of 85%[1]. However, most quantitative tests do not perfectly discriminate between subjects with and without a given status (fluid responder or not). The Gray Zone approach has been proposed to avoid the binary constraint of a "black or white" decision that often does not fit the reality of clinical practice. This partition includes a gray zone between positive and negative conclusions. In this study we used this analysis to express the predictive value of PPV.

Materials and Methods: We studied 223 patients under mechanical ventilation. The ability of PPV to predict fluid responsiveness (>15% increase in cardiac ouput after 500mL of colloids) was expressed using ROC curve and Gray Zone approach described by *Coste et al*.[2]. The cut-off points delimiting the gray zone were defined as g_{up} and g_{low} where g_{up} was the lowest value associated with a positive likelihood ratio=10 ensuring a post-test probability>0.90 and g_{low} was the highest value associated with a negative likelihood ratio equal=0.1 ensuring a post-test probability<0.05. Percentage of values included inside the gray zone was calculated in order to reflect the clinical applicability of the test.

Results and Discussion: Overall, 145 (65 %) patients were responders. A PPV value>11% was able to predict fluid responsiveness with a sensitivity of 85% and a specificity of 84%. Area under the ROC curve was 0.88±0.02. However, the gray zone thresholds for PPV were 5% (g_{low}) and 15% (g_{up}) and 91 patients (41%) were inside the gray zone (Figure).



Conclusion(s): Despite the good predictive value of PPV using the ROC curve analysis, more recent statistical tools suggest that about 40 % of PPV values are within the gray or inconclusive zone, between 5% and 15%. This new statistical method may have potential clinical implications for implementations of PPV in goal directed fluid terapy protocols.

References:

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4AP7-7

Carotid stenting: Incidence of intraoperative and postoperative complications. Our experience

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Background and Goal of Study: The goal of the study was to assess the incidence of postoperative complications after carotid stenting in patients with carotid artery stenosis.

Materials and Methods: We have conducted a retrospective study among postoperative complications in 86 patients with carotid stenting treatment developed from May 2005 to September 2009. These patients were diagnosed from symptomatic carotid artery stenosis. The Anesthesic technique was local anesthesia and sedation. The cumulative incidence of adverse events were structured as follows: 1. First 24 hours; 2. First 7 days; 3. First 30 days. The statistical analysis was made using SPSS 15.

Results and Discussion: The characteristics of patients were: the average age was 72.77 years; 80.5% of total patients were male and 19.5% female; 55.8% patients were ASA III. History of dyslipemia was 69.9% patients; history of hypertension was 81.6%. 72.1% patients suffered symptomatic stenosis and 77% and had symptoms. The cumulative incidence of adverse events was: 1. Death: 1.1% at 24 hours; 2.3% at 7 days; 1.1% at 30 days. 2. Postoperative Ictus: non ictus:87.4%; intraoperative ictus: 6.9%; postoperative ictus at 24 hours: 3.4%; postoperative ictus at 7 days: 1.1%; postoperative ictus at 30 days 1.1%. 3. Postoperative Myocardial Infarction: non myocardial infarction: 97.7%; postoperative myocardial infarction at 24 hours: 1.1%; postoperative myocardial infarction at 30 days: 1.1%. 4. Cumulative Postoperative Mortality: 4.6%. 5. Cumulative postoperative Morbility: 17.2%.

Conclusion(s): The incidence of postoperative complications after carotid stenting in our patients was similar to data obtained in the SAPPHIRE trial (Stenting and Angioplasty with Protection in Patients at High Risk for Endarterectomy). Furthermore, we have found a significant statistical relationship (p=0.018) between High Risk patients with more than 2 risk factors and the incidence of postoperative complications.

References:

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3 ESVS Guidelines. Invasive Treatment for Carotid Stenosis: Indications, Techniques. European Journal of Endovascular Surgery. 2009. Vol. 37, S1-S19.

4AP7-8

The effects of perioperative use of dexmedetomidine on hemodynamic parameters and surgical stress response in chronic hypertensive patients

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Background and Goal of Study: The aim of this study was to observe the effects of perioperative use of dexmedetomidine on hemodynamic changes and endocrine parameters which can be affected by surgical stress.

Materials and Methods: Forty two chronic hypertensive patients undergoing abdominal or pelvic surgery, were allocated randomly into two groups. Anesthesia was applied with thiopental, vecuronium and fentanyl, and was maintained with sevoflurane (1.5%-2,5%) within N_2O/O_2 (65%/35%) in both groups. In group D (n=21) loading dose of dexmedetomidine (1 µg/kg within 10 min) was given to the patients 10 min before induction, and infusion with the dose of 0,5 µg/kg/hour was started until the end of the operation. In control group (group K, n=21) saline was given with similar protocol. Additional fentanyl was given to patients when mean arterial blood pressure (MAP) has been increased more than 20% of baseline, and nitroglycerine was infused if hypertension can not be controlled with fentanyl alone. Hemodynamic parameters [systolic arterial blood pressure (SAP), diastolic arterial blood pressure (DAP), MAP, end-tidal carbon dioxide (ETCO2), heart rate (HR), pulse oxymetry (SpO2)], and additionally used fentanyl and nitroglycerine were recorded. Venous blood samples were obtained from all patients for the measurement of serum glucose, insulin, Growth Hormone, ACTH, prolactin, cortisol levels

at eight o'clock on the day of operation (t_0, baseline), 10 minutes after surgical incision (t_1), postoperative 24th (t_2) and 48th hours (t_3), and groups were compared.
Results and Discussion: SAP, DAP, MAP, and HR values were significantly lower in group D than in group K (p<0,05) during the operation. Additional fentanyl was given to 14 patients in group K, and to 7 patients in group D (p<0.05). The mean dose of additionally used fentanyl was 73,80 + 68,22 µg in group K while it was 35,71 + 61,52 µg in group D (p<0.05). All stress hormone values were found to be increased in both groups compared to their baseline values. There was no statistically significant difference in serum glucose, insulin, growth hormone, ACTH and prolactin levels between two groups while serum cortisol levels were significantly lower in group D than in group K in the measurements of t_1, t_2 and t_3 (p<0.05).
Conclusion(s): We conclude that perioperative infusion of dexmedetomidine may supress the response to surgical trauma, and may stabilize the hemodynamic changes in chronic hypertensive patients.

4AP7-9

The effect of PEEP on cardiac output in a setting of increased intra-abdominal pressure

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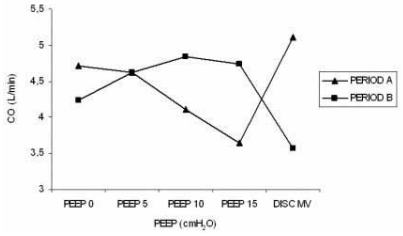
Background and Goal of Study: Application of PEEP in mechanically ventilated patients prevents intraoperative hypoxemia, which is caused by closing of alveoli and V/Q mismatch. However, PEEP is associated with negative hemodynamic effects and reduction in cardiac output (CO).The increase of intra-abdominal pressure (IAP) also affects both cardiac and lung function. The aim of this study was to record the effect of PEEP in CO before and after pneumoperitoneum application.
Materials and Methods: 52 patients [age: 49.5±14.4 yrs;BMI:27.3±3.8 and ASA-PS classification: 1-3] undergoing laparoscopic cholecystectomy, were evaluated during two different time periods. CO was measured noninvasively with an Oesophageal Doppler Monitor-ODM before and after pneumoperitoneum was obtained to 12mmHg during time period A and B respectively under 5 conditions: at 0, 5, 10, 15cm H_2O of PEEP and when the ventilator was disconnected. The standard monitoring applied consisted of EEG, IBP, $ETCO_2$, BIS and pulmonary parameters. To compare the five protocol phases, ANOVA was utilized for repeated measurements and paired t-test between the two groups.
Results and Discussion: The CO alterations during time period A and B are shown in Figure 1 and Table 1. The effects of different PEEP levels during time period A are similar as described in the literature. During time period B, incremental increase of PEEP enhanced CO, which was tremendously reduced after the ventilator disconnection.



Alterations of CO

	PERIOD A (mean±SD)	PERIOD B (mean±SD)	p
PEEP 0	4.7±1.7	4.2±1.5	0.2
PEEP 5	4.6±1.6	4.6±1.4**	0.7
PEEP 10	4.1±1.6**	4.9±1.5**	0.007
PEEP 15	3.6±1.7**	4.7±1.5**	0.0004
DISC MV	5.1±1.9**	3.5±1.2**	0.0003

Comparison with basic measurment **p<0.001

Conclusion(s): According to the results of this study the application of PEEP during laparoscopic surgery could protect the cardiac function, improve CO and serve as a very useful tool in cases of increased IAP. Further evaluation of this suggestion and of its potential clinical implications merit more detailed study.

4AP8-2

The late preoperative (abdominal and/or pelvic surgery) B-type natriuretic peptide predicts severe postoperative cardiac events in patients with high cardiovascular risk

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Background and Goal of Study: B-type natriuretic peptide (BNP) predicts cardiac mortality and morbidity after major surgery in non selected patients. Nevertheless, it would be interesting to predict complications in a selected high cardiovascular risk population, notably because clinical cardiac risk indices have only a limited predictive value. We postulate that preoperative BNP may detect stable patients with a cardiovascular medical history, who will experience cardiac complications during abdominal and/or pelvic surgeries.
Materials and Methods: Thirty-eight patients (pts; 63% males, 68±11 years) undergoing a scheduled abdominal and/or pelvic surgery were prospectively included. All were at high cardiovascular risk, including a history of a stable cardiac disease (76% of total; hypertensive n=14, ischemic n=13 and valvular n=2), a stroke (18% of total), a chronic renal failure (7.8% of total) or a diabetes (52% of total). The Lee score was 1.89±0.83. BNP plasma concentration was measured the day before surgery. Screening for cardiac events during the surgery and the postoperative period (acute coronary syndrome-ACS, worsened cardiac insufficiency and death from cardiac causes) was performed using clinical criteria, cardiac troponin I and BNP levels and serial electrocardiograms.
Results and Discussion: Nine pts (23.6%) had postoperative cardiac events: 5 pts had an ACS and 4 pts a worsening heart failure. Preoperative BNP levels were higher in pts who had postoperative complications (221±121 ng/ml) than in pts without complications (63±42 ng/ml, p=0.0002). Any other clinical criteria failed to differentiate these 2 groups, but Lee score was higher in pts with complications (2.66±0.86 *vs* 1.65±0.66, p=0.002). Using receiver-operator curve analysis, the level of BNP associated with such severe cardiac events was 140 ng/ml with a sensitivity of 77.8% and a specificity of 96.6%. This cut-off had very high positive predictive (87.5%) and negative predictive (93.3%) values.
Conclusion(s): The late assessment of the preoperative BNP (in the 24 hours before surgery), at the level of >140 ng/ml, detects previously stable patients with a medical history of cardiovascular disease or at high cardiovascular risk, who will experience cardiac complications after abdominal and/or pelvic surgeries. Therefore BNP should be used for the risk stratification preoperatively for the screening of patients at cardiac risk, indicating the need for preventative measures.

4AP8-3

Liberal versus central venous pressure guided administration of fluids and ventricular function

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Background and Goal of Study: Fluid administration is a issue for most anesthesiologists as the amount of fluids administered may influence postoperative outcome[1]. No consensus there is about the goal volume that should be infused intra-operatively to ensure an optimal outcome. Both, hypovolemia and liberal administration of fluids may contribute to postoperative complications and prolonged recovery[2]. The aim of this prospective randomized double-blind study was to evaluate if central venous pressure (CVP) guided administration of fluids leads to a restriction of volumes infused compared to a liberal fluid regimen; therefore, we evaluated if postoperative ventricular function assessed by trans-thoracic echocardiography and postoperative hospital stay differ in patients treated with CVP guided and liberal fluid therapy.
Materials and Methods: After obtaining informed consent 30 patients, aged 30-70 years, each with American Society of Anaesthesiologists (ASA) physical status I-III, scheduled to undergo major abdominal surgery with preserved cardiac function, were enrolled in the study. The day before surgery patients were randomly assigned to two groups according to intra-operative fluid regimen, liberal (L) and CVP guided (R) fluid therapy; afterwards, cardiac filling and output was assessed by trans-thoracic echocardiography in patients of both groups. The day of surgery during the anaesthesia, group L received 10 mL/Kg/h of crystalloids; group R was provided with crystalloids administered according to have CVP between 3-5 mmHg. In both groups induction and maintenance of anaesthesia was standardized. At the end of surgery trans-thoracic echocardiography was performed in all the patients to assess cardiac filling and output. Total amount of fluids administered and hospital stay was registered. Data were analyzed using analysis of variance with a $p < 0.05$ considered statistically significant.
Results and Discussion: The two groups were similar regarding patients number and characteristics, amount of fluids administered, pre and postoperative echocardiography parameters, and postoperative hospital stay. No differences were found between pre and post-operative cardiac filling and output in patients treated with liberal and CVP guided fluid regimen.
Conclusion(s): Liberal administration of fluids does not lead to a fluid overload and does not delay hospital discharge.
References:
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4AP8-4

Patient temperature management with Koala underbody convective air in port-access cardiac surgery

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Background and Goal of Study: Postoperative hypothermia adversely affects hemodynamics and recovery after cardiac surgery with and without cardiopulmonary bypass (CPB). Forced air warming is effective in preventing the redistribution hypothermia that occurs after induction of anesthesia. We evaluated the effect of a new Mistral Koala full underbody forced air warming blanket (TSCI. The Netherlands) on perioperative patient (pt) temperature during cardiac surgery.
Materials and Methods: 19 pt undergoing Port-Access (Heart-Port) heart valve surgery (HP) were selected, 4 pt were excluded due to severely depressed cardiac function. On arrival to the operating room, pt were placed on the operating table over a Koala blanket that was taped to the patient sides,the blower was set at 43°[/deg]C. Pt were covered from the trunk to the legs, except the arms, for ECG, arterial and CVP monitoring. Nasopharyngeal and bladder temperatures were registered just after anesthesia induction, and at 30 min intervals during surgery, and at the ICU until tracheal extubation. An infrared camera was used to document heat distribution around the pt.
Results and Discussion: Patient data (data are shown as mean±SD, % and range) Age (years):66±12.5 (34-82) Weight (kg): 67.86±13.15 (50-93) Height (cm): 162.46±9.63 (147-180) Ejection fraction (%): 62± 7 (45-75) Bypass time (min): 150± 41 (75-226) Nasopharyngeal Temperature data (degrees Celsius) (data are shown as mean±SD and range) Anesthesia Induction: 36.04± 0.37 (35.4-36.6) Start CPB: 36.37± 0.39 (35.5-37.1) CPB lowest temp: 33.7± 1.04 (31.1-34.6) End CPB: 36.78 ± 0.16 (36.5-37.1) Afterdrop: 0.30± 0.21 (0-0,7) Departure from OR: 36.55± 0.29 (36-36,9) ICU arrival: 36.5± 0.46 (35.8-37.2) Extubation: 36.4± 0.39 (36.2-37.6) Patient warming with convective air was effective for patient temperature management.
Conclusion(s): Prewarming with full underbody convective air system in HP surgery: 1- Prevents body core temperature redistribution after anesthesia induction, increases pre-CPB temperature, allows adequate rewarming and limits its temperature afterdrop after CPB, helping to achieve early extubation criteria. 2-The thermoflect material used in the underbody Koala blankets allows the heat to stay safely around the patient. not disturbing the surgical team.
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4AP8-5

Influences of circulatory volume conditions on PEEP-induced hemodynamic changes in anaesthetized patients

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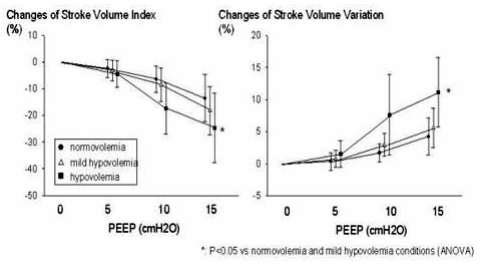
Background and Goal of Study: Interaction between PEEP and hemodynamics may impair optimal fluid management during anaesthesia and surgery. However, no study has examined dose-dependent effects of PEEP on hemodynamic stability in anaesthetized persons with various circulatory volume conditions. We tested the hypothesis that PEEP-induced hemodynamic changes during anaesthesia are influenced by both PEEP levels and the circulatory volume conditions.
Materials and Methods: With approval of the IRB, we recruited 40 ASA I-II adult patients undergoing major surgeries. All patients were mechanically ventilated under general anaesthesia and paralysis. Hemodynamic variables such as stroke volume index (SVI) and stroke volume variation (SVV) were measured by the FloTrac ™ connected to radial artery catheter in addition to systolic blood pressure (SBP) and heart rate. Circulatory fluid volume conditions were determined by the SVV value at ZEEP; normovolemia (N) = SVV < 10 %, mild-hypovolemia (MH) = 10 % < SVV < 13 %, hypovolemia (H) = SVV > 13 %. At various volume conditions, PEEP was increased by 5 cmH_2O in a stepwise fashion from ZEEP to 15 cmH_2O. Statistical analyses were performed by ANOVA and $P < 0.05$ was considered significant.



Results and Discussion: We successfully measured PEEP-induced hemodynamic changes at various volume conditions (73 trials). Figure presents PEEP-induced hemodynamic changes for different volume conditions (means ± SD). In response to progressive increases of PEEP, the SVI and SBP dose-dependently and more significantly decreased during hypovolemic conditions than during normovolemic condition. Notably, the SVV increase was more prominent in hypovolemic conditions.
Conclusion(s): Both PEEP levels and circulatory volume conditions influenced PEEP-induced reduction of the stroke volume and augmentation of the stroke volume variation during mechanical ventilation in anaesthetized adults. Hemodynamic parameters for optimal fluid management in patients treated with high PEEP should be carefully interpreted.
References:
1 Matthieu B, et al. Anesthesiology 2009;111:855-62.

4AP8-6

Could Pro-BNP detect the patients at risk of atrial fibrillation after lung resection?

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Background and Goal of Study: Cardiac arrithmias are very frequent in the postoperative period after thoracic surgery. Several risk factors have been proposed to detect the patients at the highest risk to suffer these complications. ProBNP is a very useful biomarker in the context of cardiac failure to monitor the stage of disease and the response to the treatment. It has demonstrated to play a very important role in the context of cardiac and vascular surgery. Our primary goal was to find relation between the levels of the biomarker Pro-BNP and incidence of Atrial Fibrillation after lung resection.
Materials and Methods: A single-center prospective, observational study was performed in 25 patients undergoing elective thoracic surgery from September 2009 to December 2010. Detailed perioperative demographics were collected. Exclusion criteria were: Chronic Atrial Fibrillation, history of chronic heart failure and antiarrhythmic drug treatment. Venous blood samples were obtained preoperatively and 24 hours after the lung resection. Results are presented as mean and standard deviation for quantitative variables and proportion for qualitative variables. Data were evaluated using SPSS (version 15).
Results and Discussion: 3 patients developed atrial fibrillation in the postoperative period (13%). The Pro BNP value in this patients was significantly higher than in the AF free patients (165,60 pg/mL). These patients also experienced a significant elevation 24h after the lung resection. (Pro BNP value: 662,63 pg/mL). Pneumonectomy was performed in 4 patients (18%). 47% patients underwent left sided surgery. There were no statistical relations between side, extent of resection and Pro BNP. The mean age of our population was 61 years (± 8,66 y). We found no relation between age and Pro BNP elevation. Global AF in our population was much lower than in other studies published (in some series 40%). Our population was also younger than others.
Conclusion(s): Our study shows the promising role that the biomarkers can play in the thoracic surgery context. Large studies are needed to demostrate the ability of this biomarker to detect the patients at risk.

4AP8-7

Is tranexamic acid related to postoperative cardiac surgery seizures?

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Background and Goal of Study: Tranexamic acid is an antifibrinolitic agent that has been proved to reduce postoperative bleeding and inflamatory response in cardiac surgery. Since the FDA warning about Aprotinin, the use of Tranexamic acid is increasing in patients undergoing cardiac surgery. This drug is suspected to increase the incidence of postoperative cardiac surgery seizures. The aim of this study was to analyze if the incidence of postoperative seizures is related to the use of Tranexamic acid.
Materials and Methods: Between January 2008 and June 2009 all patients undergoing coronary or valve surgery were selected (Group Tr, n=52). Exclusion criteria were: redo surgery, aorta surgery, combined procedures, urgent surgery, previous epileptic status, high risk patients (logistic Euroscore > 10%) and patients at high risk of bleeding. In this group all patients received tranexamic acid (1gr IV before CPB, IV infusion 1mg/Kg h, 2 gr during CPB). This group was compared with those patients with similar characteristics in which tranexamic acid was not used (Group Co, n=66). The same anaesthesia protocol was used in both groups. Baseline clinical characteristics of patients, intraoperative hemodynamic data and flow pump were recorded. These variables were

also analyzed with the incidence of postoperative seizures in order to study any confounding factor.

Results and Discussion: Baseline clinical characteristics were similar in both groups with no differences regarding age, sex, cardiovascular risk factors. There was no surgical mortality and no adverse event related to the use of tranexamic acid. Preoperative hematocrit level was higher in group Co (37% vs. 26,7%; p=0,01). There were no differences regarding intraoperative sodium levels, glucose levels, maximal and minimal flow in pump, gasometric levels (including pO2, pCO2 and pH) between both groups. Crossclamp and cardiopulmonary bypass time were similar in both groups. However a lower mean artery pressure was found in Group Tr (84 vs. 67 mmHg; p<0.001). Postoperative seizures happened in 2 patients (3,9%) in Group Tr and in 3 patients (4.5%) in Group C0 (p= 0.95). Hemodynamic parameters, pump flows, mannitol use and gasometric values were not related with postoperative seizures.

Conclusion(s): In our study Tranexamic acid was not related with postoperative seizures. Patients receiving Tranexamic acid had a lower preoperative hematocrit level and their mean pressure was lower during cardiac pump. We did not find any preoperative or intraoperative data related with postoperative seizures.

4AP8-8

Haemodynamic monitoring and cardiovascular disease in carotid endarterectomy complications

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Background and Goal of Study: To assess the influence of previous cardiovascular disease(PCVD) and intraoperative haemodynamic during carotid clamping on the carotid endarterectomy(CE) perioperative complications(PC).

Materials and Methods: 79 consecutive patients ASAI-IV scheduled for CE under regional anaesthesia was studied. PCVD were:peripheral arteriopathy,acute myocardial infarction(AMI),ischaemic heart disease(IHD) and,hypertension(HBP).Patients were divided into two cohorts:with PCVD and without PCVD. PC included:clamping neurological deficit,perioperative stroke and death within thirty days of operation. We compared clamping blood pressure between the two cohorts and between patients with PC. Data are mean(M)±standard deviation(sd) and percentages. Differences were analyzed using ANOVA and $\chi 2$ test.P-value<0.05 was considered significative. Relative risk(RR) of PC in both cohorts was analyzed.

Results and Discussion: PC were:neurological deficit during clamping in 11 patients(13,9%),perioperative stroke in 2 patients(2,5%),death in other 2 patients(2,5%).Prevalence of arteriopaty was 44,3%,of AMI 15,2%,of IHD 21,5% and HBP 70,1%(p<0,001).Perioperative stroke prevalence in PCVD was:in arteriopaty 5,7%,in AMI 8,3%,in IHD 5,9%,in HBP 3,7%(p=0,69).RR in cohorts of developping perioperative complications were:0,67(0,1-5,9)for clamping neurological deficit, 0,26(0,2-3,2) for perioperative stroke and 0,26(0,2-3,2) for death(p>0.05).Table 1 shows sistolic blood pressure(SBP),diastolic blood pressure(DBP) and medium blood pressure(MBP) during carotid clamping in the patients with perioperative complications and in the cohorts.

Conclusion(s): Neither PCVD nor clamping blood pressure have been associated with PC, which could warn about possible complications. PCVD and clamping blood pressure have not been associated either. Perioperative neuromonitoring to prevent PC in CE is necessary as previous studies describe.

4AP8-9

Effect of endoscopic transthoracic sympathectomy for severe intractable angina: Experience in our hospital

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Background and Goal of Study: Endoscopic transthoracic sympathectomy (ETS) is a well documented, safe and successful treatment for primary palmar and axillary crippling hyperhidrosis. In addition, ETS has been shown to improve symptoms and reduce ischemia in patients with advanced coronary disease unsuitable for coronary revascularization or angioplasty. The aim of this study is to present our experience on ETS for patients with refractory angina.

Materials and Methods: A total of 6 patients (3 male and 3 female) aged 61 to 83 years old with refractory angina were included in the study. Diagnosis of atherosclerotic heart disease was confirmed by coronary angiography in all patients. The patients were on maximal pharmacological antianginal treatment and were judged to be unsuitable for coronary artery bypass grafting or angioplasty. Bilateral ETS of Th1 to Th4 was carried out to guarantee cardiac denervation under total intravenous general anaesthesia in five patients and inhalational in one patient. ETS was carried out alternating single lung ventilation with a double lumen tube with the patient in lateral position, beginning for the left side in order to avoid intraoperative arrhytmia. In addition to standard monitoring (two leads-ECG, pulseoximetry and BIS) invasive arterial pressure was monitored. Sympathectomy was performed using diathermy to avoid Horner's Syndrome for calorific effect. We have used skin temperature control in both hands in order to assess ETS effectiveness.

Results and Discussion: There were no surgical complications, hemodynamic or ECG changes and one-lung ventilation was well tolerated in all patients. Hands temperature increased at least 0.5 degrees after the procedure. In one patient simpathectomy was unilateral (right side) due to fibrous adhesions. During the follow-up period (from 2 month to 2 years) two patients died before ten days after the procedure due to myocardial infarction, one patient suffered one episode of angina and cardiac insufficiency (class IV) after one week, and the remainder 3 patients had marked improvement of symptoms with a reduction of both angina frequency and intensity.

Conclusion(s): Although our experience with refractory angina pectoris and ETS is still limited, ETS is a safe, simple and low invasive procedure and it can be offered as an alternative treatment to symptomatic patient who are refractory to medical and not suitable for angioplasty/ revascularization. The clinical role of ETS should be defined in larger controlled randomised trials.

4AP9-2

Radial artery cannulation decreases the distal arterial blood flow measured by power doppler ultrasound

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Background and Goal of Study: Radial arterial cannulation is a popular technique for continuous hemodynamic monitoring in the area of anesthesia and intensive care. For preventing ischemic complications, some diagnostic tests, including Allen's test and ultrasound assessment, were applied to confirm sufficient blood flow at the distal site. However, there is scarce new information about the change in distal blood flow of cannulated vessel after the arterial catheterization. In the current investigation, we conducted two studies. The first is measurements of the intact radial arterial blood flow in volunteers and the second is assessment of the cannulated arterial blood flow in patients.

Materials and Methods: Six volunteers (study 1) and 8 post-surgical patients (study 2) were enrolled into the studies. In the study 1, the both side of diameter of radial artery (RA) and blood flow, first dorsal metacarpal arterial (DMA) blood flow of participants were measured with or without 20-N proximal oppression using 2-D sonography and power Doppler ultrasound (PDU). In the study 2, the diameter of radial, ulnar and artery of the both intact and cannulated side detected by PDU were compared.

Results and Discussion: Study 1: The age of volunteers was 37.1 ± 7.1 yr (mean ± SD), body height was 172 ± 7.1 cm and weight was 61.5 ± 5.6 kg. The diameter of RA was 3.4 ± 0.52 mm and the proximal oppression significantly decreased the PDU diameter to 1.8 ± 0.59 mm without a noticeable change of anatomical diameter assessed by 2-D sonography. The diameter of DMA measured by PDU also decreased 2.0 ± 0.60 to 1.3 ± 0.59 mm. Study 2: The age of patients was 71.6 ± 12.3 yr, body height was 156.1 ± 1.1 cm and body weight was 54.8 ± 8.4 kg. There was no difference between the diameters of right and left radial arteries, however, the ulnar artery was larger (3.4 ± 0.60 vs. 2.8 ± 0.83 mm) and the DMA was narrower (1.4 ± 0.43 vs. 2.0 ± 0.47 mm) in the cannulated side. As results of volunteers, arterial blood flow could be assessed using PDU and the measured flow diameter was independent of anatomical arterial diameter. Even though, vessel like image was obtained with conventional 2-D sonography, the confirmation of functional blood flow of the distal site might be required.

Abstract 4AP8 – Relationship between clamping blood pressure in patients with PC and in patients with PCVD.

	SBP M±sd	p-value	DBP M±sd	p-value	MBP M±sd	p-value
Clamping neurological deficit/No clamping neurological deficit	175,6(41,8)/166,2(31,3)	0,37	88,3(24,7)/79,5(16,6)	0,12	122,1(30,4)/113,1(19,4)	0,18
Death/No death	188(5,7)/166,9(33,2)		89(15,6)/80,6(18,2)		183(14,2)/113,5(21,8)	
Perioperative stroke/No perioperative stroke	170,5(16,3)/167,4(33,2)		81,5(10,6)/80,8(18,3)		114(0)/113,9(21,9)	
PCVD/No PCVD	166,5(33,9)/176,7(21,1)	0,38	79,8(18,3)/89(14,5)	0,15	112,6(21,8)/124,8(16,9)	0,11

Conclusion(s): The diameters of DMA were different between the intact and cannulated side in the patients. There is no information of severe complication induced by RA cannulation, however, significant reduction of blood flow should be concerned.

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4AP9-3

Comparison of effects of two different esmolol regimens on the cardiovascular changes and parathormone level responses to tracheal intubation: Single bolus dose or infusion

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Background and Goal of Study: The aim of the study was to compare the effects of the single intravenous bolus dose and bolus dose followed by infusion of esmolol before the anesthesia induction on the haemodynamic and serum parathormone level changes that is the result of LTI.

Materials and Methods: In this prospective double blind study, 60 ASA I-II patients were randomly divided into three groups of 20 patients each. The first group (Group B) patients received esmolol 1.5 mg kg^{-1} as a bolus within 20 seconds. Second group (Group I) patiens received a loading dose of 0.5 mg kg^{-1} of esmolol within 20 seconds followed by esmolol was infused at a rate of 100 μ kg^{-1} for ten minutes. Third group served as the control group (Group C) and isotonic saline was given. Injections of esmolol and isotonic saline were completed two minutes before LTI. Immediately after, induction of anesthesia was performed with thiopental sodium 5-7 mg kg^{-1} and rocuronium 0.6 mg kg^{-1}. Arterial pressure and heart rates were measured non-invasively when each patient was taken to the operating room (basaline value), after the administration of study drug and induction of anesthesia and 1, 3, 5 min after the intubation. Also, three different blood samples were taken from the patients before the operation, 5 min and 1 hour after the intubation, and the changes in the parathormone and calcium levels were compared.

Results and Discussion: No difference was found in the demographic data among the three groups. There was no significant difference between the groups in none of the periods that SAP, DAP, and MAP values were measured. Compared with baseline values, arterial pressure values 1 min after intubation and heart rate values 1, 3, 5 min later were significantly high in all groups ($p < 0.05$). Highly statistically significant increases were observed in the serum parathormone levels of each three groups 5 minutes after the intubation and 1 hour after the intubation in respect to basaline values ($p < 0.01$). The decreases were statistically highly significant which occurred in the serum calcium levels of Group B 5 min after the intubation and 1 hour after the intubation Group I and 1 hour after the intubation of Group I and Group P in respect to basaline values ($p < 0.01$).

Conclusion(s): The dose of esmolol that we administered was insufficient to prevent hemodynamic responses caused by LTI. We observe that after the endotracheal intubation there were 1.5- 2 times increase in the serum parathormone levels, and simultaneously significant but negligible decreases in calcium levels.

4AP9-4

Serum interleukin 6 increase correlates with S100B protein in elective abdominal aortic aneurysm repair

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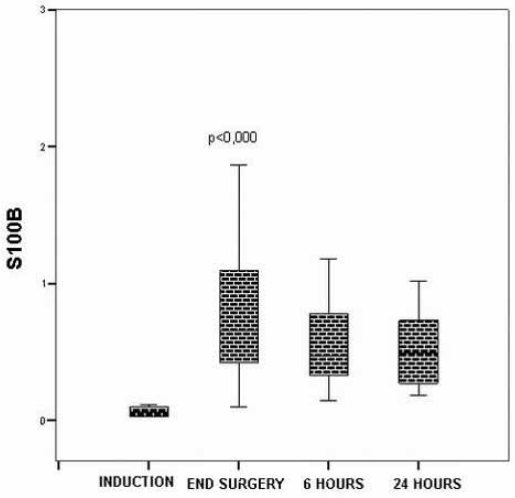
Background and Goal of Study: Surgical procedure, trauma and hemorrhage trigger cytokine production as part of systemic inflammatory response. Cytokine interleukin (IL) 6 correlates with severity of trauma, complications and survival. Serum S100B protein, a sensitive marker in brain injury increases in hemorrhage1[1], stress[2], abdominal surgery, and critical ICU patients; also in sepsis[3] where it yields prognostic value. We investigate the profile of Il-6 and serum S100B protein in elective abdominal aneurysm (AAA) repair.

Materials and Methods: Twenty males, 70±3 years undergoing elective AAA repair were studied. All received autotransfusion and 0 -2 blood units. Aortic cross clamping time was 62±21 min and duration of repair135-240 min. Hemoglobin was kept above 8 gr %. Blood samples were taken after induction of anaesthesia, at the end of surgery, 6 and 24 hours later. We measured IL-6, serum S100B, arterial blood gases (pH,HCO3) and lactate. Blood pressure was maintained in safe limits. ANOVA, bivariate correlation and linear regression analysis was used for statistics.

Results and Discussion: IL-6 and S100B increased at the end of surgery, P<0.002, p<0,000. For all measurments IL-6 p<0,000 and S100B p<0,02. The main finding was the correlation of S100B with IL-6 (r=0.451, P<0.01). IL-6 correlated with clamping time(r=0,38, p<0,05) and S100B with lactate (r=0,4 p<0,05).Two patients died the 4th day. Age and IL-6 were independent predictors of outcome. Our findings regarding IL-6 profile and prognostic role for outcome agree with literature. Potential causes of S100B increase are stress, blood loss, systemic hypoperfusion. The correlation of IL-6 with S100B supports growing evidence that S100B secretion is part of stress response, physical and psycological, as no obvious brain or systemic hypoperfusion occured or neurological sequelae followed.



Conclusion(s): We postulate that S100B is a component of stress response and interacts with systemic inflammatory response. This aspect goes along many reports where S100B increases in conditions other than brain injury.

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4AP9-5

Study of serum myeloperoxidase kinetics during coronary surgery under cardiopulmonary bypass

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Background and Goal of Study: Myeloperoxidase (MPO) is an oxidative stress biomarker resulting from leukocytes activation. High MPO serum levels predict risk for early cardiac events in patients with acute coronary syndrome (1), correlate with the severity of heart failure (2), and seem to be implicated in the inflammatory response after percutaneous coronary intervention (3). The aim of this prospective study is to investigate whether MPO is produced during on-pump coronary surgery and to determine the kinetics of its serum levels.

Materials and Methods: Forty patients undergoing coronary revascularization under cardiopulmonary bypass (CPB) were enrolled in this study. MPO serum levels were obtained from arterial blood samples before the induction of general anaesthesia (TO), 5 min after systemic heparinization (T1), 15 min after aortic declamping (T2), and 15 min (T3), 1 h (T4), 5 h (T5), and 19 h (T6) after the end of CPB. Results expressed as mean±SEM were analyzed using the repeated-measured ANOVA technique ($p < 0,05$, significant).

Results and Discussion: Demographics, preoperative status, and number of grafts, were similar. MPO levels increase significantly from 25.48 ± 9.20 (T0) to 218.50 ± 10.16 (T1) (p<0.001) and from T1 to 281.7 ± 16.04 (T2) (p<0.001) ng/mL. MPO levels decrease starting from T3 (101.8 ± 9.19), until T6 24.89 ± 1.1 ng/mL (p<0.001).

Conclusion(s): MPO is secreted during on-pump coronary surgery. Pic values are observed just after aortic declamping and significantly decrease after the end of CPB.

References:

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4AP9-7

A randomized clinical trial of propofol or etomidate for elective electrical cardioversion for atrial fibrillation

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Background and Goal of Study: Elective electrical cardioversion is a therapeutic option for the management of atrial fibrillation (AF). It is a brief but very painful procedure that requires deep sedation and early recovery. We compared propofol (P) versus etomidate (E) for procedure sedation for electrical cardioversion for atrial fibrillation (CVAF) in terms of efficacy, adverse events, recovery times, bispectral analysis (BIS) and satisfaction of the patient.

Materials and Methods: 114 patients (aged 65±12 years, 58% males, 48% ASA 2, 46% ASA 3), who underwent CVAF were randomized to either sedation with P (0,5-1 mg/kg) or with E (0,1-0,15 mg/kg). All patients were premedicated with fentanyl (0,025-0,05 mg). Heart rate (HR), blood pressure (BP), oxygen saturation, induction times, recovery times, and BIS values were recorded as well as major and minor adverse events. After the procedure, a questionnaire was completed inmediately and repeated in a 15-30 days period to evaluate satisfaction, perceived pain or recall of the procedure.

Results and Discussion: Non statistically significant differences were found in demographic data, patient characteristics or efficacy of the procedure (91% with P and 87% with E). Induction and recovery times were similar in both groups. Pain during injection (33% vs 2%, p<0,001), myoclonus (41% vs 0%, p<0,001), nausea and vomiting (28% vs 2%, p<0,0001) were more frequent in E group. Apnea (52% vs 9%, p<0,0001) and bag-valve-mask ventilation (54% vs 13%, p<0,0001) were more frequently observed in P group. BIS values at CV were higher in E group (63±18 vs 54±15, p<0,008). Analysis of hemodynamic variables is shown in table 1. No serious adverse events were noted in any patient. Unpleasant sensation after the procedure was significant in E group (11% vs 1%, p<0,0008). No patient referred recall of the procedure.

Conclusion(s): Propofol and Etomidate may be used safely for elective CVAF. Propofol induces more respiratory events and a trend to hypotension, however without clinical relevance in our patients. Propofol is better tolerated than etomidate and could be the drug of choice for CVAF, keeping etomidate for hemodinamically unstable patients.

4AP9-9

Anaesthetic techniques for thoracic endovascular aortic aneurysm repair (TEVAR): Experience of a large single centre

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Background and Goal of Study: There are no randomised studies comparing TEVAR & open repair of thoracic aortic aneurysms. Non-randomised studies suggest a reduction in mortality, paraplegia & days in hospital with TEVAR. (1) The optimum anaesthetic technique for TEVAR is unknown. We present our experience on outcomes of TEVAR.

Materials and Methods: This is a retrospective analysis of our TEVAR database between July 1997 & September 2009. Analysis was done using the $\chi 2$ Test for nominal data and the Mann-Whitney U Test for ordinal data.

Results and Discussion: Three hundred and four patients underwent TEVAR, 216 (71%) under regional anaesthesia (RA), 74 (24%) under general anaesthesia (GA), 12 (4%) under LA, with 1 missing data. The results comparing RA & GA are shown in Table 1. There were 24 cases of spinal cord ischaemia leading to paraplegia (8.3%). The paraplegia was early onset (periop) in 20 patients & late onset (>4 hours postop) in 4 patients. All 24 patients with paraplegia received lumbar CSF drains, resolving the paraplegia in 15 cases. Twelve patients (4.1%) developed stroke (all infarcts): 6 patients recovered fully; 6 had incomplete recovery, of which 4 died. Twenty-one patients died (7.2%); the main causes were stroke, myocardial infarction & massive haemorhage.

Conclusion(s): This is one of the largest single centre studies reporting outcomes after TEVAR. The 30–day mortality was significantly less in the RA group. There was a trend towards reduction in stroke & days in hospital in the RA group. The incidence of spinal cord ischaemia & permanent paraplegia were however higher (statistically non-significant) in the RA group.

Table 1

	Total	RA	GA	p value
n	290	216 (Epidural 211, Spinal 3, CSE 2)	74	
Elective, n	197 (68%)	163 (75%)	34 (46%)	0.0001
Male, n	192 (66%)	143 (66%)	49 (66%)	1
Age, median years (IQR)	72 (62-78)	73 (64-79)	68 (53-75)	0.0001
30-day Mortality, n	21 (7.2%)	11 (5.1%)	10 (13.5%)	0.03
30-day Mortality, n - Elective	7 (3.6%)	6 (3.7%)	1 (2.9%)	0.82
30-day Mortality, n - Urgent	14 (15.1%)	5 (9.4%)	9 (22.5%)	0.07
Spinal Cord Ischaemia, n	24 (8.3%)	19 (8.8%)	5 (6.8%)	0.6
Permanent Paraplegia, n	9 (3.1%)	9 (4.2%)	0	0.4
Stroke, n	12 (4.1%)	8 (3.7%)	4 (5.4%)	0.6
Chest Infection, n	7 (2.4%)	5 (2.3%)	2 (2.7%)	0.9
Hospital LOS, median days (IQR)	4 (3-9.5)	4 (3-9)	5.5 (3-10)	0.3

References:

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Abstract 4AP9-7 – Table 1

	N	Basal SBP (M±SD mm Hg	SBP 5' (M±SD mm Hg	SBP 10' (M±SD mm Hg	Basal HR (bpm)	HR 5' (bpm)	HR 10' (bpm)
propofol	57	132±21	-21±19	-18±20	94±24	-24±25	-25±27
etomidate	57	132±20	9±14	8±15	91±20	-18±21	-16±21
p		NSS*	<0,001	<0,001	NSS*	NSS*	NSS*

NSS* non statistical significant, SBP systolic blood pressure

Respiration

5AP1-1

Capsaicin reduced lung ischemia-reperfusion injury via diminishing pulmonary inflammation in rabbits

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Background and Goal of Study: Ischemia-reperfusion (IR) in the lung produces chemotactic cytokines and neutrophil infiltration, contributing to ischemia-reperfusion lung injury (IRLI). Capsaicin, a transient receptor potential vanilloid type1 (TRPV1) agonist, has been found to inhibit the release of inflammatory mediators in vitro, and reduce inflammation in septic rats in vivo. This study was carried out to investigate the role of capsaicin in IRLI in vivo.

Materials and Methods: Male New Zealand rabbits were anesthetized with pentobarbital and ventilated with 50% oxygen. The ischemia injury was induced by clamping the left pulmonary hilus for 1h and reperfusing for up to 3h (IR group). Sham rabbits underwent hilum dissection but not lung ischemia (sham group). Treated rabbits received either capsaicin (CAP group) or TRPV1 antagonist, capsazepine (CPZ group) 5 min before ischemia. Arterial blood gas analyses, histological changes, Bronchoalveolar lavage fluid (BALF), and lung tissue myeloperoxidase (MPO) activities were assessed. Data were represented as means ±SD. Statistical analysis was performed by one-way ANOVA, a p-value <0.05 was regarded as significant.

Results and Discussion: Compared with sham group, rabbits in the I/R group had poorer gas exchange (lower PaO_2, higherA-aDO_2), more severe histological injury, and greater increase of neutrophils in BALF. Capsaicin treatment decreased the inflammatory response indicated by lowering MPO activities in lung tissue and protein level, percent of polymorphonuclear leukocyte (PMN%), and total cell number in BALF, and reduced IRLI both histologically and functionally. In contrast, pretreatment with capsazepine increased pulmonary inflammatory response and exacerbated IRLI.

Conclusion(s): The present data suggest that the activation of TRPV1 with capsaicin protects against IRLI probably via attenuating pulmonary inflammatory response in the rabbit.

Table 1. Comparison of lung tissue MPO activities and protein levels, PMN%, and cell numbers in BALF between groups

Group	MPO (activity U/g tissue)	Protein in BALF (mg/ml)	PMN% in BALF(%)	Total cell number in BALF(10^3/ml)
Sham	2.05±0.11*	1.04±0.18*	11±3.8*	110±23*
IR	7.12±0.67	6.12±0.17	31±7.1	348±84
CAP	4.96±0.96*	3.70±0.27*	16±3.5*	223±38*
CPZ	7.67±0.51*	6.49±0.41*	37±4.9*	427±53*

N=10, * P<0.05 compared with IR group

Acknowledgements: This study was supported by the grant of National Natural Science Foundation of China (30672260).

5AP1-2

Immunomodulatory effect of desflurane and sevoflurane in endotoxin-injured alveolar epithelial cells

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Background and Goal of Study: Numerous studies have shown that volatile anaesthetics like sevoflurane or isoflurane are able to attenuate inflammatory processes. This was demonstrated in lung injury in vivo and in vitro, leading to the hypothesis that this might be a general effect of volatile anaesthetics. Although desflurane has become one of the most commonly used volatile anaesthetics, only limited data regarding this issue exist so far. In this study, we investigated possible immunomodulatory effects of desflurane in an in vitro model of acute lung injury with sevoflurane as reference gas.
Materials and Methods: Monolayers of a cell line of alveolar epithelial cells (AEC, L2 cells) were stimulated for 2 hours with 20 µg/ml lipopolysaccharide (LPS), followed by a 2h or 4h co-exposure to a CO2/air-mixture with or without 1 MAC of desflurane or sevoflurane, respectively. The intracellular expression of the phosphorylated MAP-Kinase ERK, which plays a key role in the inflammatory signalling cascade, was measured by flow cytometry at 2h. mRNA levels of monocyte chemoattractant protein-1 (MCP-1) and cytokine induced neutrophil chemoattractant protein-1 (CINC-1) were assessed at 4h via qRT-PCR. Chemotactic activity of supernatants regarding neutrophil recruitment was assessed. Student's t-test was performed. For all analyses, we considered p<0.05 to be statistically significant.
Results and Discussion: pERK expression was significantly decreased in both desflurane- and sevoflurane /LPS groups compared to air/LPS. When treated with volatiles, less mRNA for MCP-1 and CINC-1 was expressed in the desflurane/LPS and sevoflurane/LPS group compared to air/LPS. Chemotactic response was attenuated in the desflurane/LPS group as compared to LPS.
Conclusion(s): Desflurane seems to have a similar anti-inflammatory potential as previously shown with sevoflurane[1]. Both volatile anaesthetics influence the inflammatory cascade by interfering with the same molecular pathway. This is a crucial step in acute lung injury for subsequent upregulation of inflammatory mediators. These data underline the hypothesis that the anti-inflammatory action of volatile agents is due to a group effect.
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5AP1-4

Nitric oxide and endothelin-1 release after one-lung ventilation during thoracoabdominal oesophagectomy

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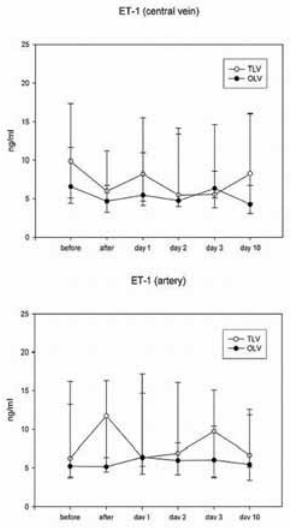
Background and Goal of Study: Thoracoabdominal oesophagectomy is associated with a substantial risk of postoperative pulmonary complications. One-lung ventilation (OLV) is standard during the thoracic part of the operation. OLV may induce shunting of blood from the deflated lung and thus a subsequent ischemia-reperfusion injury and dysfunction of the pulmonary endothelium via the vasodilator nitric oxide (NO) and the vasoconstrictor endothelin-1.
Materials and Methods: Patients with oesophageal cancer were randomised to ventilation with one lung (OLV, n=16) or two lungs (TLV n=14) during the thoracic part of the operation. Pulmonary biopsies for analysis of inducible NO-synthetase (iNOS) by immunofluorescence were collected before and after one-lung ventilation in the OLV group and at corresponding time points in the TLV group. Plasma for analysis of nitrit (a metabolite of NO) and endothelin-1 was taken from central vein (superior caval) and artery (radial).
Results and Discussion: Immunofluorescence for iNOS in lung biopsies was not affected by either OLV or TLV. Nitrite (Table1) and endothelin-1 (Figure1) in central vein and artery were similar after OLV or TLV and did not change significantly over time. The frequency of postoperative complications was similar in the two groups.
Figure1 Discussion OLV during thoracoabdominal oesophagectomy had no physiological influence on factors regulating pulmonary vascular tone.

Table 1

Nitrite (µM)	Before	After	p
Central vein			
OLV	1.06 (0.57-2.7)	1.01 (0.85-1.7)	0.74
TLV	1.04 (0.21-2.51)	0.92 (0.32-2.18)	0.09
Artery			
OLV	1.14 (0.68-2.89)	1.26 (0.93-2.81)	0.27
TLV	1.10 (0.33-2.45)	1.14 (0.36-1.91)	0.42

Nitrite in plasma from central vein and radial artery after OLV or TLV in patients undergoing thoracoabdominal oesophagectomy (Rank Sum Test).



Conclusion(s): As OLV does not affect pulmonary vascular tone more than TLV it should remain standard of care during oesophagectomy since it improves surgical exposure.

5AP1-5

Propofol attenuates lung injury following intestinal ischemia-reperfusion in rats

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Background and Goal of Study: Propofol has been reported to ameliorate systemic oxidative stress and intestinal damage after ischemia/reperfusion injury (IIR). Our study aims at exploring the role of propofol in lung injury induced by IIR.
Materials and Methods: Thirty adult male Wistar rats (200-350gr) were randomly allocated in 3 groups (*n*=10). Animals in group SHAM were anaesthetized with ketamine and xylazine and then a laparotomy was performed, followed by sham IIR. Animals in group IIR received ketamine and xylazine and were then subjected to clamping of the superior mesenteric artery for 45 min and reperfusion for 4h. Group IIR+P received anaesthesia with propofol and then IIR was induced, as in group IIR. At the end of the experiment the rats were re-anaesthetized and arterial blood was obtained for arterial gases and biochemical measurements. Systemic lipid oxidation was determined by measurement of malondialdehyde levels. In addition, Bronchoalveolar Lavage Fluid (BALF) was collected to measure cell counts, total protein and phospholipids levels. The left lung was used for histological assessment. Data were evaluated by one-way ANOVA.
Results and Discussion: Induction of IIR resulted in deteriorated oxygenation and acidemia. Treatment with propofol significantly improved systemic oxygenation (group IIR; PaO_2 = 83 ± 5 mmHg vs. 94 ± 4 mmHg in group IIR+P, p <0.05) and inhibited systemic lipid oxidation. In addition, the increase in BALF neutrophils and alveolar macrophages was successfully inhibited in group IIR+P. Treatment with propofol also reduced BALF protein content. Interestingly, total BALF phospholipids and lipid phosphorus concentrations increased in IIR group, but were restored in IIR+P group. Moreover, group IIR+P showed a significant improvement in intestinal and lung histology and lung wet/dry ratio compared to group IIR. Systemic antioxidant protection, improvement of intestinal injury, inhibition of the inflammatory response and preservation of the alveolar-capillary permeability seem to be crucial mediating mechanisms underlying this simple and clinically relevant intervention.
Conclusion(s): Anaesthesia with propofol during IIR efficiently prevents most histological, cytological, and biochemical aspects of lung injury, restoring

gas-exchange. Clinical studies should examine the potential of anaesthesia with propofol to prevent IIR-induced lung injury.

5AP1-6

Effects of volatile and intravenous anaesthetics on ventilator-induced lung injury

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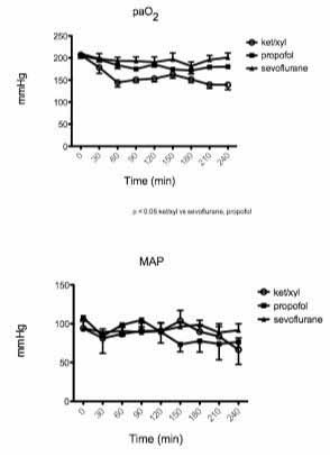
Background and Goal of Study: Recent studies have shown that volatile anesthetics exert a protective role in different organ systems, but the effects of volatile anesthetics on ventilator-induced lung injury (VILI) remain to be elucidated. Therefore, we compared three commonly used sedation regimens. We hypothesized that Sevoflurane could exert protective effects and improved oxygenation as compared to intravenous (IV) anesthetic regimens.
Materials and Methods: Male Sprague-Dawley rats (n=15), 250-350g, were randomized to receive either 1) ketamine/xylazine (KET/XYL 20/5 mg/kg/h); 2) Sevoflurane (SEVO: 2.6%); 3) Propofol (PRO: 30 mg/kg/h). Animals were tracheostomized and mechanically ventilated in volume controlled mode (Vt = 6 ml/kg, PEEP = 5 cm H2O, FiO2 = 0.4). After stabilization 5 mg/kg lipopolysaccharide (LPS) (E. coli 055:B5) was administered intratracheally. Thirty min after LPS administration, ventilator settings were switched to injurious ventilation (Vt = 15 ml/kg, ZEEP, FiO2 = 0.4) for 3.5 h.



Results and Discussion: Oxygenation was significantly lower in the KET/XYL than in the SEVO and PRO groups. A trend to improved Oxygenation was found in SEVO as compared to PRO groups. Wet/Dry (W/D) ratio did not differ significantly among groups. MPO was lower in PRO and SEVO groups, although the difference did not reach statistical significance.
Conclusion(s): Sevoflurane and Propofol improved gas exchange in the context of VILI as compared to ketamine/xylazine. Sevoflurane was associated with improved oxygenation as compared to Propofol, although this difference was not significant. Preliminary data from in vitro experiments suggested a potential role of GABA receptors activation in the protective effects seen with Sevoflurane and Propofol. Further in vivo experiments will be necessary to explore the role of GABA receptor activation in this context.

5AP1-7

Expression of aquaporin channels 1 and 5 during mechanical ventilation

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Background and Goal of Study: The death rate for Acute Respiratory Distress Syndrome (ARDS) has been kept raised. The lung damage induced by the mechanical ventilation (MV) plays a key role in the development and evolution of this syndrome. Membrane channel proteins called aquaporins (AQPs) allow selective and rapid bi-directional movement of water(1). We know at least 13 types in mammals(2) of which the lung expresses four(3). Our objectives are: 1) determine if prolonged MV causes lung edema in rats and 2) verify if MV generates changes in the expression of AQPs 1 and 5 on lung tissues.
Materials and Methods: 17 male Wistar rats were subjected to MV; 8 specimens for 2 hours and 9 specimens for 4 hours. In both groups, a tidal volume of 10 ml/kg was used. Hemodynamic, gasometric and mechanical ventilatory parameters were recorded. The degree of edema was calculated by the lung wet/dry weight ratio and compared with a group of non-ventilated animals (control group). The expression of AQPs 1 and 5 was measured in 3 specimens of each of the groups (control, MV 2 hours and MV 4 hours) by performing Western immunoblotting using specific antibodies against these channel proteins. It was also carried out immunohistochemical staining of AQPs 1 and 5 in tissue samples from all groups.
Results and Discussion: No significant differences in the degree of edema between groups was found, although there was a progressive decrease in the ratio pO2/FiO2 at 2 hours and 4 hours. In parallel there was a decrease of lung compliance [Table 1]. The AQP-1 suffered no significant differences in their expression in relation to the time of MV. The AQP-5 (cytosolic and membrane) had statistically significan increased expression (p = 0.001) measured by densitometry. These findings were also corroborated in immunohistochemical samples.

Table 1

	n	Lung WET/DRY weight ratio	pO2/FiO2	Compliance
Control Group	4	4,68 ± 0,08	452,12 ± 77,5	
Group MV 2h	8	4,90 ± 0,33	426,86 ± 79,2	0,6 ± 0,1
Group MV 4h	9	5,23 ± 0,79	395,22 ± 115,3	0,5 ± 0,1

Values are expressed as mean ± S.D.

Conclusion(s): Tidal volumes of 10 ml/kg doesn´t cause acute lung injury and edema in rats subjected to VM. There is impairment of oxygenation and mechanical lung conditions. The expression of AQP 5 increases gradually with time of MV, possibly as an adaptive mechanism of the lung to the aggression produced by the MV.
References:
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5AP1-9

Receptors and ion channels of the human carotid body – Oxygen sensing and signaling on a molecular level

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Background and Goal of Study: General anesthetics and non-depolarizing neuromuscular blocking agents reduce the acute hypoxic ventilatory response in humans (1, 2) by mechanisms that are not fully understood. This ventilatory response arises from stimulation of chemosensitive type 1-cells in the carotid body (CB), leading to hyperventilation and sympathetic activation. Animal studies show that nicotinic, purinergic and dopaminergic receptors and K^+-channels are involved in CB oxygen signaling (*3*), while hemeoxygenase 2 (HO-2) has been suggested as a critical oxygen sensor (*4*). General anesthetics and non-depolarizing NMBAs target both nicotinic receptors and potassium channels (*5, 6*) and many drugs in anesthesia and intensive care have, thus, the potential to interact with important oxygen sensing and signaling mechanisms in the CB at a molecular level. However, the presence of these receptors and ion-channels has not been investigated in the *human* CB. The aim was to demonstrate relevant receptors and ion-channels in the human CB with specific focus on nicotinic, purinergic and dopaminergic receptors, K^+-channels and HO-2.
Materials and Methods: CBs were removed unilaterally from 5 non-radiated patients with head-and-neck-cancer scheduled for radical neck-dissection. The CBs were divided and freshly frozen or fixated and target proteins visualized by immunohistochemistry. PCR and Western blot were conducted to determine the levels of mRNA and proteins.
Results and Discussion: The human CB type 1 cells contain the α3, α4, α7 and β2 nAChR subunits, the ATP-receptors $P2X_2$ and $P2X_3$, the adenosine receptor A_{2A}, the dopamine D_2-receptor, HO-2 and the K^+-channels TASK-1 and Maxi-K, determined with immunohistochemistry. The α3, α7 and β2 nAChR subunits, the $P2X_2$- and D_2-receptors and the K^+-channels TASK-1 and Maxi-K are also demonstrated on the mRNA level by PCR and $P2X_2$ and D_2 as proteins by Western blot.
Conclusion(s): For the first time, signaling pathways of the human CB oxygen sensing have been described. Nicotinic, purinergic and dopaminergic receptor subtypes and K+-channels were demonstrated and we confirm the presence of HO-2 in humans as a proposed oxygen sensor. The human CB hosts an orchestra of receptor proteins and K+ channels that serve as targets for commonly used drugs in anesthesia and intensive care.
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5AP2-1

The effects of three ventilatory differents strategies on pulmonary gas exchange in laparoscopic cholecystectomy

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Background and Goal of Study: Respiratory function and pulmonary gas exchange are affected in laparoscopic cholecystectomy. The aim of this ramdomized double blind study was to compare the effects of three different ventilatory strategies on pulmonary gas exchange in laparoscopic cholecystectomy.
Materials and Methods: 90 patients scheduled for laparoscopyc cholecystectomy were randomly allocated into three groups(30 patients each) 5 min before CO_2 insuflation: (1) PEEP of 10 cm H_2O, (2) a recruitment maneuver with 55 cmH_2O for 10 s followed by zero end-expiratory pressure, (3) a recruitment maneuver followed by PEEP. In every patient we used midazolam 2 mg (premedication), propofol 2 mg/kg with cisatracurium 0.15 mg/kg (induction); a continuous infusion of 1-2 µg/kg/min of cisatracurium and of remifentanyl 0.1-0.2 µg/kg/min. Patient were ventilated using a Primus (Dräger Corp., Germany): O_2/air 50%, V_{Tidal} 10 ml/kg and respiratory rate 12/min. Blood gas analysis were recorded: awake, 5 min after induction of anesthesia at zero end-expiratory pressure, and 5, 20 and 40 min after CO_2 insufflation. We analized PaO_2, $PaCO_2$ (both mmHg), hemodynamic data (SBP,DBP, HR) and pulmonary compliance (ml/cmH_2O) using ANOVA repeated measures and Fisher exact test as required for statistical analysis ($p<0.05$ as significant).
Results and Discussion: Patient´s characteristics in 3 groups were comparable. There were no significant differences among groups in PaO_2, PCO_2 or compliance when patients were awake or at 5 min after induction of anesthesia. We didn´t found significant statistical differences in $PaCO_2$ at 5 min of CO_2 insuflation but PCO_2 levels were higher in patients of groups 2 at 20 and 40 min than in patients of groups 1 and 3($p<0.05$). Compliance levels were higher in patients of groups 1(42.8 ml/cmH_2O) and 3 (48.9ml/cmH_2O) than in group 2 (35.7 ml/cmH_2O),($p<0.05$) but there were no differences in PaO_2 levels after CO_2 insufflation. Hypoxemia didn´t appear at any time in the study.

$PaCO_2$ levels(*$p<0.05$)

	Preinsuflation		Postinsuflation		
	Awake	5 min postinduction	5 min	20 min	40 min
Group 1	37.3	38.3	39.4	40.2	41.4
Group 2	36.4	37.5	38.9	44.7*	44.5*
Group 3	37.1	37.4	39.2	42.2	41.9

Table 1($PaCO_2$ in mmHg)

Conclusion(s): In our study,the differences in $PaCO_2$ are probably explained by a shorter effects on alveolar ventilation of recruitment maneuver than those produced by PEEP or PEEP and recruitment maneuver since $PaCO_2$ levels were higher in group 2 than in other patients.

5AP2-2

Comparison between volume-controlled ventilation versus pressure-controlled ventilation during one-lung ventilation in thoracic surgery in patients with impaired preoperative lung function

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Background and Goal of Study: Recent studies have suggested that Volume-controlled Ventilation(VCV) and Pressure-controlled Ventilation (PCV) are similar to maintain arterial oxygenation during one-lung ventilation(OLV).However, it has been suggested that patients with impaired lung function may benefit from PCV, because of its decelerating inspiratory flow. It reduces the Ppeaks and might improve recruitment and the distribution of inspired gas. This aspect has not been studied in patients undergoing OLV. The aim of this study was to investigate prospectively if PCV results in improved arterial oxygenation comparing with VCV during OLV in patients undergoing thoracic surgery with a FEV_1/FVC<70%.
Materials and Methods: In a previous study, we compared intra and postoperative oxygenation between PCV and VCV in 150 patients undergoing thoracic surgery. In this study, we have focused on the patient subgroup with preoperative FEV_1/FVC<70%.We analyzed 62 patients with at least 1 hour of OLV. Patients were distributed into 2 groups depending on the ventilatory mode used during OLV. In VCV group(n=36), it was used a tidal volume(Tv) of 8 mL/kg and in the PCV group(n=26), an inspiratory pressure to provide a Tv of 8 mL/kg. We measured ventilatory data(Tv, airway pressures and compliance) and arterial blood gases at 20,40 minutes after OLV,and at 4(PO1) and 24 hours postoperatively(PO2).Differences in qualitative and quantitative variables between groups were analyzed by using the X^2 and t Student tests, respectively. Values of $p<0.05$ were considered as statistically significant.
Results and Discussion: There were no significant differences in preoperative lung function. In VCV group FEV_1/FCV was 60,4% and in PCV group 62,8%. During OLV, there were no significant differences in arterial oxygenation, compliance, airway Pplateau and Pmean, although Ppeak was higher in the VCV group ($p<0.001$): There were no significant differences in postoperative arterial oxygenation:

Intraoperative Data

		OLV+20	OLV+40
PaO_2(mmHg)	VCV	114,6(82,3)	123,1(82,2)
	PCV	109,3(55,9)	143(78,02)
		p=0.8	p=0.4
Pplateau(cmH_2O)	VCV	23,1(5,3)	22,3(5,3)
	PCV	20,7(3,6)	21,4(3,9)
		p=0.052	p=0.4

Values expressed as mean(SD)

Postoperative oxygenation

		PO1	PO2
PaO_2/FiO_2	VCV	287(99,2)	366(143,8)
	PCV	273,2(74,7)	345,8(87,3)

Values expressed as mean(SD)

Conclusion(s): In patients undergoing thoracic surgery with a FEV_1/FVC<70%, the use of PCV compared with VCV during OLV appears to be equal in terms of intra and early postoperative oxygenation.

5AP2-3

Pressure control ventilation vs. volume control ventilation in patients undergoing major abdominal surgery

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Background and Goal of Study: Volume- control ventilation (VCV) is considered to be the conventional ventilation in patients undergoing surgery. Pressure-control ventilation (PCV) is another option but with not guaranteed tidal volumes with possibility for minute ventilation reduction and hypoxia. We wondered if PCV has any advantages in patient oxygenation and pulmonary protection in patients undergoing abdominal surgery with laparatomy because of shifting tidal volumes (TV) due to surgical retractors.
Materials and Methods: We studied 33 patients randomly assigned into two groups: VC for volume control patients and PC for pressure control, without any known lung disease, ASA status 1-3, mean age 67±9, male 23, female 10, predicted body weight (PBW) mean 67.9±9.6 and body mass index (BMI) mean 26.4±3.7. Ventilator parameters and tidal volumes were set at 7 ml/kg PBW and for PC the PEEP was adjusted at +6 cmH_2O. The PBW was calculated. The first blood sample for pCO_2, pO_2, pH and SaO_2 were obtained before pre-oxygenation. Each patient was pre-oxygenated for 3 min. prior to induction. Next arterial blood sample was collected after 30 and 90 minutes and 10 and 60 min after extubation. During surgery the ventilator parameters were obtained from Zeus-Draeger anesthesia machine: plateau pressure, compliance and $etCO_2$.

Patient characteristics and comparison of PC and VC with constant flow settings during surgery

	PC	VC
Number of patients	17	16
Male/Female	14/3	10/6
BMI	26±4	27±3
PBW	69±7	67±12
TV	487±45	470±85

Results

	After Intubation	30 min	90 min
Plateau pressure			
PC/VC	14±2/13±2	15±2/15±2	16±2/16±2
Compliance			
PC/VC	83±21/72±16*	72±17/57±15*	70±18/65±22

Data are presented as whole numbers or means±standard deviation, * indicates statistically significant differences between groups ($p<0.05$)

Results and Discussion: In both groups TV was well maintained during surgery. There was no difference in pCO_2, pO_2, SaO_2, pH, $etCO_2$ and plateau pressure among groups at any time. The patients in PC group had higher lung compliance than VC patients, p<0.05.
Conclusion(s): Pressure control ventilation with better lung compliance might have advantages over VC even in abdominal surgery where surgical retractors cause TV shifting thus ensuring maintained minute ventilation.

5AP2-4

Does PEP compensate the reduction of tidal volume during one-lung ventilation?

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Background and Goal of Study: During one-lung ventilation (OLV), large tidal volume (V_T) has been proposed to limit atelectasis and hypoxemia [1]. However, such ventilatory strategy may provoke hyperinflation and ventilator-induced lung injury [2]. Use of low V_T could reduce this risk [3] but may lead consistent alveolar derecruitment and thus atelectasis. This harmful effect may be counteracted by application of positive end-expiratory pressure (PEEP) to the dependent lung. We evaluated the impact on oxygenation of increasing PEEP during OLV when protective ventilation is used.
Materials and Methods: This prospective, randomized, two-period cross over and noninferiority study was approved by our ethical committee (Clinical trial registry: NCT 00534690). All included patients received two successive ventilatory strategies in a random order : high tidal volume (8 $ml.kg^{-1}$ of ideal body weight) with low PEEP (5 cmH_2O) and low tidal volume (5 $ml.kg^{-1}$) with high PEEP. Respiratory rate and PEEP were respectively adjusted to keep minute ventilation and plateau pressure constant. Each period lasted for 15 min and was followed by blood gas analysis. Exclusion criteria included severe obstructive disease. Primary outcome was the change in PaO_2/FiO_2 ratio between both strategies.
Results and Discussion:]V_T = tidal volume, RR = respiratory rate, Pplateau = end inspiratory plateau pressure, PEEP = positive end expiratory pressure, Pmean = mean alveolar pressure, Pe_TCO_2 = end tidal CO_2, $PaCO_2$ = arterial carbon dioxide tension, PaO_2 = arterial oxygen tension, SAP=Systolic arterial pressure. HR = Hear Rate. The PaO_2/FiO_2 ratio significantly decreased during low Vt ventilation (mean difference = -18.8; 95% IC [-34.0 to -3.5], P=0.02). Any significant increase of intrinsic PEEP has been observed between both groups.

Respiratory parameters during both periods (n=82)

	Baseline values	High Vt ventilation	Low VT ventilation
VT (ml)	509±69	511 ± 68	321 ± 47*
RR (cycle/min)	11±2	11±2	20 ± 3
Pplateau (cmH2O)	20±3	20±3	20±3
PEEP (cmH2O)	5±0	5±0	9 ± 1*
PaO2/FiO2	163±87	166 ± 86	156 ± 81*
PaCO2 (mmHg)	40±5	40 ± 5	43 ± 6*

Conclusion(s): During OLV, PEP does not maintain oxygenation when V_T is reduced. Lowering Vt might be efficient in reducing lung injury but the use of such protocol may require the acceptance of possibly lower PaO_2 and alveolar ventilation.
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5AP2-5

Variable ventilation versus conventional ventilation: A stereological analysis

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Background and Goal of Study: Ventilator induced lung injury may occur in 24% of ventilated patients without pre-existing lung injury (Gajic, Crit Care Med, 2004). How new modes of ventilation affect healthy lungs remains to be investigated. We aimed at analyzing morphological alterations in lungs applying stereology in animals receiving either variable ventilation (VV) or conventional ventilation (CV).
Materials and Methods: 10 pigs (32±1.8 kg) were anesthetized, intubated and randomly assigned to one ventilation mode. VV was delivered by a DIVAN ventilator (Dräger Medical, Lübeck, Germany) using randomized tidal volumes from 5 to 11 ml/kg. In the CV group 8ml/kg tidal volume were applied. Hemodynamics and spirometry were recorded from a Datex S5 Monitor (Ohmeda, GE, USA) and blood gas analysis performed hourly. After 6 hours the left lung was fixed by internal perfusion and a systematic random sampling was performed for lightmicroscopic morphometrical analysis.
Results and Discussion: Mean airway pressure (7.5±0.5 vs. 8±0.4 cmH20) and mean peak pressure (14±1.4 vs. 17±1.4 cmH20) were lower during VV. Blood gas analysis and hemodynamics were similar between groups. Stereological parameters as volume fractions of parenchyma and non-parenchyma showed no differences. Alveolar surface density was 322±76 1/cm in the VV group and 303±71 1/cm in the CV group. Mean thickness of alveolar septa was slightly lower in the VV group (15±7 vs. 17±5 µm).
Conclusion(s): Airway pressures were significantly lower during VV than during CV. Electron microscopy will be indispensable to quantify subtle morphological damage of the blood-air barrier, since no significant morphometrical signs were observed with light microscopy.

5AP2-6

Effects of spontaneous triggering of respiratory cycles during mechanical ventilation (MV) on respiratory sinus arrhythmia (RSA)

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Background and Goal of Study: In MV, ventilation modes exist that differ in the inspiration being triggered by the subject (e.g. pressure support ventilation, PSV) or by the ventilator (e.g. pressure control ventilation, PCV), without considerable differences in the other parameters of the ventilatory cycle. We compared the pattern of RSA during PCV and PSV, to clarify the relative importance of central and reflex mechanisms of RSA modulation during MV, and to elucidate if the pattern of RSA along the respiratory cycle during MV is independent of the ventilation mode.
Materials and Methods: 6 pigs (32–42 kg) were anesthetized (Propofol 2-6 mg/kg/h, Sufentanil 0.5-2 µg/kg/h, Atracurium 1mg/kg for PCV only), intubated and mechanically ventilated using PCV and PSV for 30 minutes (order randomized). Ventilation parameters were set to obtain a tidal volume of 12 ml/kg, a respiratory rate of 12-18 bpm and an inspiration length of 1s. Airflow, airway pressure, ECG and arterial blood pressure were acquired synchronously with Fs=2000 Hz. Blood gas analysis and cardiac output estimation were done at the end of each task. The average difference between the longest and shortest heart period within each respiratory cycle was taken as an estimate of RSA amplitude. Also, the average slope (SL) of the line fitted to the time series of heart periods belonging to each inspiration was calculated. Differences between modes were assessed using paired t-tests (α=0.05).
Results and Discussion: For PSV, SL was negative (mean=-17.5 ms/s) and significantly different from PCV (mean=2.3 ms/s, p<0.001), while RSA was larger (mean RSAPSV= 45 ms, mean RSAPCV= 12 ms, p<0.01). No significant differences were found for anaesthesia level, tidal volume, respiratory rate, length of inspiration, cardiac output, arterial and venous pO2, heart rate and mean arterial pressure. Body temperature and arterial pCO2 were higher for PSV (average increase of 0.8 °C and 8 mmHg, respectively, p<0.05), reflecting an increase in metabolism due to active inspiratory effort.
Conclusion(s): In these mechanically ventilated pigs, when the central drive triggers the respiratory cycles, the RSA reverses the pattern along the respiratory cycle and considerably increases in amplitude, compared to when only reflex mechanisms of RSA modulation are present. This suggests that, in MV, the presence of central modulation of RSA overpowers reflex modulation, and establishes a pattern of RSA compatible to what found in spontaneously breathing healthy subjects (inspiratory tachycardia, expiratory bradycardia).

5AP2-7

Effect of mode of ventilation during anaesthesia on postoperative respiratory function

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Background and Goal of Study: Surgical procedures and anaesthesia have been shown to affect respiratory function and respiratory muscles by various mechanisms.[1,2] The present study investigated the effect of the intraoperative mode of ventilation on postoperative respiratory function and respiratory muscle strength in women undergoing general anaesthesia for lower abdominal surgery.
Materials and Methods: Women ASA I-II undergoing elective lower abdominal surgery under combined general-epidural anaesthesia and post-operative epidural analgesia were randomized to receive intraoperatively, group A: controlled

mechanical ventilation with muscle relaxation, group B: controlled mechanical ventilation without muscle relaxation and group C: pressure support of spontaneous breathing. Spirometric dynamic (FEV_1, FVC, FEV_1 / FVC) and static (RV, TLC, RV / TLC) lung volumes and arterial blood gases were measured in all patients 24 hours pre- and 48h post-operatively. Respiratory muscle strength was assessed by maximum inspiratory (PImax), expiratory (PEmax) and sniff inspiratory pressures at the same times. Postoperative changes between groups were compared using the SPSS 10.0. A p value of < 0.05 was considered statistically significant.

Results and Discussion: Group A included 13 women (mean age 49±6 years and BMI 31.51±4), group B 10 women (mean age 51±7 years and BMI 29.04±4) and group C 12 women (mean age 52±6 years and BMI 29.79±4.8). All patients exhibited postoperatively a reduction of all spirometric parameters and arterial oxygen tension. However this decrease was less in group C compared to groups A and B (only for TLC and RV $p<0.005$). Postoperative decrease of PImax, PEmax and Sniff pressure was also statistically less in group C ($p<0.005$).

Conclusion(s): Maintenance of spontaneous breathing with pressure support during anaesthesia for lower abdominal surgery had postoperatively a significantly smaller effect on respiratory function and muscle strength compared to controlled ventilation.

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5AP2-8

Comparison of superimposed high frequency jet ventilation with conventional jet ventilation before laryngeal surgery. Effects on ventilation studied by opto-electronic plethysmography

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Background and Goal of Study: New ventilator developments have simplified the use of supraglottic superimposed high frequency jet ventilation (SHFJV) but the technique has not been fully evaluated in relation to other modes of jet ventilation in humans. Our hypothesis was that SHFJV would increase lung volume and improve gas exchange compared with other, monofrequency jet ventilation techniques.

Materials and Methods: 16 patients (ASA 1-2, BMI<35 kg/m^2) scheduled for minor laryngeal surgery under general anaesthesia were included. Before surgery, four different jet ventilation techniques were applied in random order for periods of 10 minutes each: supraglottic superimposed high frequency (SHFJV – 12 and 600 min^{-1}), supraglottic low frequency ($LFJV_{SG}$ – 12 min^{-1}), supraglottic high frequency ($HFJV_{SG}$ – 150 min^{-1}) and infraglottic high frequency jet ventilation ($HFJV_{IG}$ – 150 min^{-1}). Arterial blood gases were obtained every five minutes. Chest wall volume variations were continuously measured with Opto-Electronic Plethysmography (OEP) and pressures in the lower trachea, in the distal esophagus and in the laryngoscope were recorded. $LFJV_{SG}$ end-expiratory chest wall volume (EEVCW) was taken as the reference condition for volume changes.

Results and Discussion: All four modes of jet ventilation resulted in adequate oxygenation and CO_2 elimination. Compared to $LFJV_{SG}$, EEVCW increased by 254±185 ml during SHFJV ($p<0.05$), 151±138 ml during $HFJV_{SG}$ ($p<0.05$) and by 45±110 ml during $HFJV_{IG}$ ($p>0.05$). Tidal volume was 230±159 ml, 263±148ml, 142±50 ml and 110±31 ml, respectively during $LFJV_{SG}$, $SHFJV_{SG}$, $HFJV_{SG}$ and $HFJV_{IG}$. All end-expiratory and tidal chest wall volumes were accompanied by corresponding intratracheal pressure variations.

Conclusion(s): In this study in patients with healthy lungs and minor airway obstruction SHFJV efficiently increased end-expiratory and tidal chest wall volumes. However, adequate gas exchange and oxygenation was achieved with all four investigated ventilatory modes. Further studies are needed to investigate whether patients with pre-existing pulmonary disease or severe airway obstruction will benefit from SHFJV.

5AP2-9

Influence of palliative endobronchial treatment on blood gases in general anaesthesia with high frequency jet ventilation

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Background and Goal of Study: Palliative endobronchial treatment is a standard part of palliative care worldwide. Main goal of these procedures is to relief patient's symptomas. The aim of this study was to compare differences in results of blood gases and spirometry parameters before and after palliative procedure.

Materials and Methods: An observational retrospective study was made in university hospital in the period of 1/2003 – 12/2007. Study consists of 91 patients and 172 procedures. Most frequent procedure was Nd: Yag laser coagulation (65.7%) and second one was electrocautery (34.3%). Information about blood gases and spirometry was compiled from patient's medical report. To exclude influence of premedication, anaesthetics agents and postoperative bronchospasms was measuring of blood gases and spirometry performed one day before procedure at the latest and not earlier than one day after procedure (not longer than 1 month). For blood gas and respiratory parameters analysis was applied standard parametric descriptive statistics (mean, confidence interval and standard deviation). After the validation of normal distribution of parameters differences their statistical significance was analyzed by means of paired samples t-test. Statistical analysis was performed using SPSS 17.0.

Results and Discussion: No exitus letalis was recorded during study period. Most frequent complication was tachycardia. Blood gases and respiratory parameters were compared before and after procedure. There was statistically significant difference just in p_aO_2 but it was not clinically significant difference. Details are in the table 1.

Comparison of biochemical and respiratory parameters before and after procedure

	N	Mean	95% Confidence Interval	Standard Deviation	p [1]
p_aO_2	105	-0.35	(-0.63; -0.06)	0.15	0.018*
p_aCO_2	104	-0.04	(-0.13; 0.05)	0.05	0.367
S_aO_2	56	-0.51	(-1.61; 0.59)	0.56	0.372
FEV_1	94	0.01	(-0.06; 0.07)	0.03	0.832
FVC	89	0.01	(-0.06; 0.09)	0.04	0.741
FEV_1/FVC	90	-0.68	(-2.22; 0.86)	0.79	0.391

[1] analyzed by means of paired samples t-test. Statistically significant results are given in bold and denoted *

Conclusion(s): Endobronchial treatment in general anaesthesia using high frequency jet ventilator has practically no effect on blood gases and respiratory perioperative parameters and is standard and safe part of palliative care.

5AP2-10

Superimposed high frequency jet ventilation increases end-expiratory volume in relation to frequency

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Background and Goal of Study: During the last years, superimposed high frequency jet ventilation (SHFJV) has proved to be safe and effective in clinical practice. We hypothesised that, since the lung time constants may be too long for the lung to empty at high frequencies, lung volume might increase. This has not been investigated previously since there are difficulties in measuring volume changes during any form of jet ventilation. The aim of this study was to assess chest wall volume variations and oxygenation in relation to frequency during SHFJV and, as a reference modality, high frequency jet ventilation (HFJV).

Materials and Methods: Ten anaesthetised piglets (21-25 kg) were ventilated with a TWINSTREAM® ventilator either with SHFJV or HFJV. In both modes, frequencies ranging from 100 min^{-1} to 1000 min^{-1} were applied during 5 minutes in a randomised order. FiO_2 was set to 0,5 throughout the experiment. Chest wall volume variations were obtained using Opto-Electronic Plethysmography and LFJV end-expiratory volume was taken as the reference condition for volume changes. Airway pressures and arterial blood gases were measured repeatedly.

Results and Discussion: At any frequency, both SHFJV and HFJV increased end-expiratory chest wall volume (EEVCW) compared with LFJV. The increase ranged between 146±42 ml and 179±37 ml during SHFJV and between 78±31 ml and 116±31 ml during HFJV, at 100 min^{-1} and 300 min^{-1}, respectively. For frequencies above 300 min^{-1}, EEVCW tended to plateau in both modes. Chest wall tidal volume (V_t) was always higher than 250 ml during SHFJV; conversely, during HFJV, it was only 93 and 35 ml at 100 and 200 min^{-1} and negligible at higher frequencies. During SHFJV, pO_2 was 33.9±7.1 kPa and pCO_2 was 5.0±0.8 kPa with no significant differences between the frequencies studied. Conversely, during HFJV, frequencies above 300 min^{-1} reduced PaO_2 from 22.3±8.4 kPa to 5.3±1.3 kPa and increased $PaCO_2$ from 7.8±1.5 kPa to 9.2±1.3 kPa, at 200 min^{-1}and 1000 min^{-1}, respectively.

Conclusion(s): In anaesthetised piglets SHFJV is more effective than HFJV in increasing end-expiratory volume. SHFJV provides adequate V_t and gas exchange at all studied frequencies between 100 and 1000 min^{-1}. Conversely, although HFJV increases end-expiratory volume, at rates above 300 min^{-1} it is not able to provide an adequate V_t and consequently it induces severe hypoxia and hypercapnia.

5AP3-2

Predicting partial pressure of oxygen in arterial blood in mechanically ventilated patients

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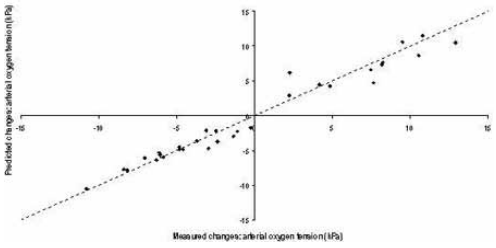
Background and Goal of Study: There is evidence that the magnitude of changes in arterial oxygen partial pressure (PaO_2) is greatly underestimated following change of fraction of inspired oxygen (F_IO_2) on mechanically ventilated patients [1]. We aimed to develop a simple formula that would predict the PaO_2 after a change in F_IO_2 with sufficient accuracy to be used in clinical settings.
Materials and Methods: Ten virtual subjects were configured using the Nottingham Physiology Simulator [2] to resemble the various pathologies commonly found in patients on Intensive Care Units. The behaviour of PaO_2/F_IO_2 through F_IO_2 0.3 – 1.0 was studied and a formula to predict PaO_2 after a change in F_IO_2 was derived. Subsequently, 31 data sets were collected from 16 randomly selected, mechanically ventilated patients before and 10 min after changes of F_IO_2, which formed part of routine patient management. Each data set consisted of ventilator settings, core temperature, haemoglobin, PaO_2, $PaCO_2$ and arterial pH. We compared data derived from our formula (see below) with the measured values.
Results and Discussion: The mean (SD) change in F_IO_2 was 0.2 (0.04) in those which increased and -0.13 (0.04) in those which decreased. We derived a formula that combined ease of use and acceptable accuracy: ${}_{new}PaO_2 = k \times {}_{new}F_IO_2 \times {}_{old}PaO_2 / {}_{old}F_IO_2$ *where* $k = 1 - ({}_{old}F_IO_2 - {}_{new}F_IO_2) / 2$ Limits of agreement ($LA_{95\%}$) between predicted and measured size of change for PaO_2 were -2.86 -2.46 (bias: -0.2) kPa. Predicted vs. measured magnitude of change in PaO_2 are shown in the figure. The new formula is acceptably accurate and consistent in predicting the change in PaO_2 in response to F_IO_2 adjustment in mechanically ventilated patients. Its simplicity may allow its regular use in the critical care setting.



Conclusion(s): The present data validate our formula with sufficient accuracy to be used in critical care settings. Future work will assess the usefulness of the formula.

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1 Bedforth NM, Hardman JG. Intensive Care Med. 1999; 25: 839-42.
2 Hardman JG, Bedforth NM, Ahmed AB, et al. Br. J. Anaesth. 1998; 81: 327-32.

5AP3-3

Partitioning inspiratory resistance during desflurane anesthesia at 1.0 and 1.5 MAC

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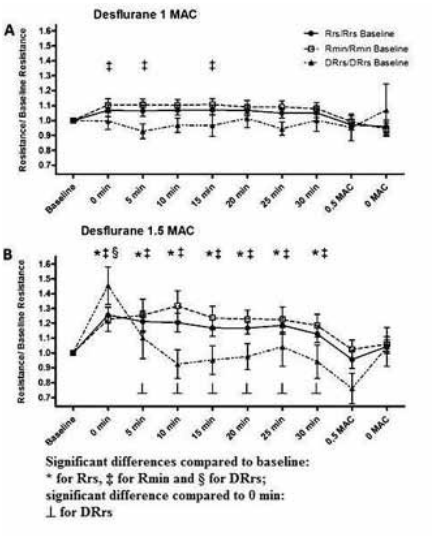
Background and Goal of Study: The effect of desflurane on respiratory mechanics is not well studied. Absence of bronchodilation and a tendency to produce bronchoconstriction have been reported in clinical studies.The present study investigated the effects of desflurane on total inspiratory resistance (Rrs) and its components, minimal (Rmin) and effective resistance (DRrs) during 30 min administration at 1.0 and 1.5 MAC in healthy patients undergoing general anesthesia.
Materials and Methods: Twenty two patients were intubated after intravenous induction to anaesthesia and ventilated with volume control mode. A pneumotachograph and a pressure transducer were used for the measurements of flow, tidal volume and inspiratory pressures. Anaesthesia maintenance was achieved with desflurane : 1 MAC was administered for thirty minutes and the aforementioned parameters were recorded every five minutes. Then desflurane was turned off and measurements were recorded at 0.5 and 0 MAC. The same recordings were performed at 1.5 MAC. The inspiratory hold manoeuvre was used to calculate inspiratory resistance. Rrs, Rmin and DRrs were calculated every 5 minutes, based on the equations: Rrs = [Pmax – Pplat] / V', Rmin = [Pmax – P1] / V', DRrs = [P1- Pplat] / V', where Pmax= peak airway pressure, P1= airway pressure when flow is zero, Pplat= plateau pressure and V'=flow.
Results and Discussion: Desflurane at 1 MAC increased significantly only Rmin at 3 time points (0,5 and 15min, $p < 0.05$). At 1.5 MAC, Rrs and Rmin exhibited a sustained increase during the 30 min of administration ($p<0.001$ for all comparisons).An early peak at 0 min of both Rrs and DRrs was noticed (+25.7 ± 5.23 % and +45.5±12.6 % above baseline respectively, $p<0.001$). Rmin exhibited a late peak at 10 min (+ 31.78 ± 10.31 % above baseline, $p<0.001$). Rrs and Rmin decreased to baseline values only when desflurane was turned off whereas DRrs declined significantly after the initial peak.



Conclusion(s): Desflurane at 1.5 MAC increased Rrs due to a significant increase of airway resistance (Rmin). A possible favourable effect on the component of resistance attributed to tissue viscoelastic properties and alveolar time-constant inequality was suggested (DRrs).

5AP3-4

High dose sufentanil and not profound muscle relaxation makes pressure support ventilation impossible

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Background and Goal of Study: When full muscle relaxation is needed it was assumed that pressure support is impossible. However we found earlier that support ventilation can be given during full muscle relaxation. To exclude auto triggering we wanted to evaluate the effect of giving an additional bolus of 15 ug Sufentanil during full muscle relaxation on pressure support.
Materials and Methods: Ten patients scheduled for a general anesthesia needing muscle relaxation and intubations were included with patient informed consent and approval of the hospital ethical committee. They were first ventilated without muscle relaxants through a laryngeal mask after an induction dose of 2.5 mg/kg Propofol and no more than 10 ug of Sufentanil. Sevoflurane inhalation was given at 1 Mac for maintenance. The patients were pressure support ventilated with a General Electric Aestiva S/5 with a trigger sensitivity of less than 0.4 L/min. The support pressure was adapted to ensure a normal tidal volume ventilation and to keep end tidal CO2 between 35 and 45 mmHg. A rocuronium infusion was given at 500 mg/h till TOF and PTC were 0. The rocuronium infusion was stopped and a bolus of 15 ug Sufentanil was given. The backup ventilation mode was set to start after 30 seconds of no ventilation. The depth of muscle relaxation is noted. At TOF 4/4, TOF 1/4, TOF 0 and PTC > 5 and PTC < 5 and after Sufentanil bolus the ventilation frequency was measured if PSV was still active.
Results and Discussion: No backup mode started in any patient before the Sufentanil bolus was given. The respiratory frequency varied in some patients but was not significant different at the 4 levels of muscles relaxation. The respiratory frequency declined after the Sufentanil bolus to zero. All backup modes started and took over the ventilation. These results mean that only Sufentanil and not muscle relaxation could stop the patient from triggering the ventilator. The support level is set to the same level as in pressure controlled ventilation allowing normal ventilation. Auto triggering of the ventilator as a possible trigger mechanism during full muscle relaxation is therefore excluded. We can only conclude that for a still unknown reason, different from auto triggering Pressure support ventilation is possible during deep muscle relaxation.
Conclusion(s): High dose of Sufentanil and not profound muscle relaxation makes pressure support ventilation impossible.

5AP3-5

The effects of the alveolar recruitment maneuver on arterial oxygenation and hemodynamics during laparoscopic cholecystectomy operations

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Background and Goal of Study: Abnormalities in gas exchange that occur during anaesthesia are mostly caused by atelectasis and these alternations are more pronounced in laparoscopic surgery. We tested the effect of alveolar recruitment maneuver on arterial blood gasses and hemodynamics in patients undergoing laparoscopic cholecystectomy.
Materials and Methods: Fourty five ASA I or II patients were allocated to one of the three groups. Control group received no PEEP. The second group received 8 PEEP. The third group received initial control period with 8 PEEP and after pneumoperitoneum was accomplished; a peak inspiratory pressure (PIP) of 30 cmH_2O and a PEEP of 10 cmH_2O, a PIP of 35 cmH_2O and a PEEP of 15 cmH_2O and then a PIP of 40 cmH_2O and a PEEP of 20 cmH_2O was applied gradually. Every step lasted for five breaths. Soon after PEEP values were decreased gradually and PEEP 8 was then maintained. SO_2, PaO_2 $PaCO_2$ and K^+ values in arterial gas analysis, $ETCO_2$values and hemodynamics were compared between three groups. Data were analysed statistically by One Way Annova, Kruskal Wallis and Friedman tests. A *p* value <0.05 was considered statistically significant.
Results and Discussion: We found that alveolar recruitment increased intraoperative PaO_2 but this increasement was significant at only 30th minute ($p<0.0125$). In all groups $PaCO_2$ values were increased but it was lowest at 30th minute in alveolar recruitment group ($p<0.0125$). The alternations of SO_2, PaO_2, $PaCO_2$ and K^+ levels indicated that an increase occured in SO_2 levels in the 5th and 30th minute after intubation in PEEP and alveolar recruitment groups($p<0.01$). PaO_2 level decrease in the 5th minute is less in alveolar recruitment group compared to the control group ($p<0.001$). PaO_2 level decrease in the 30th minute and in the PACU is less in alveolar recruitment group in regard to the control and PEEP groups ($p<0.001$). K^+ level changes in 30th minute is less in alveolar recruitment group compared to the control group ($p<0.01$). No difference was observed in $PaCO_2$ level alternations and hemodynamics between three groups. The effects of alveolar recruitment on oxygenation did not last after trachea was extubated as PaO_2 values decreased in both alveolar recruitment and control groups in the PACU compared to the intubation.
Conclusion(s): In conclusion alveolar recruitment may be an effective mode of improving gas exchange during laparoscopic cholecystectomy operations but the benificial effects on oxygenation is short lived and disappear after the trachea was extubated.

5AP3-6

Respiratory predictive factors of intraoperative desaturation in morbid obese patients undergoing bariatric surgery

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Background and Goal of Study: Morbid obesity is risk factor for the development of intraoperative oxygen desaturation. This study was designed to assess the possible association between preoperative respiratory factors and occurrence of intraoperative desaturation in morbid obese patients operated on laparoscopic gastric bypass surgery (LGB).
Materials and Methods: After local Ethics committee approval, 74 morbid obese (body mass index (BMI) > 40 $kg.m^{-2}$) patients undergoing LGB were included. Anaesthesia was standardized. Intraoperative desaturation was defined as arterial oxygen saturation (SaO_2) < 90% during at least 5 minutes. Characteristics of the population, sleep studies, respiratory function test, arterial blood gases were registered in each patient. Results are presented as mean ± SD. Differences between desaturation (DESAT) group or not (not DESAT) were analyzed by Chi-square and Fisher tests for the qualitative variables and by Wilcoxon test for quantitative variables. P<0.05 considered as significant (*). A step-by-step logistic regression (Wald test) was performed to determine the predictive risk factors of intraoperative desaturation.

	DESAT (n=17)	Not DESAT (n=57)
Age (year)	43±7	39±9
Male (n (%))	6 (41)*	4 (7)
BMI (kg/m^2)	47.6±5.4	48.0±6.6
Sleep apnea (n(%))	10 (58.8)	23 (40)
Sleep hypoventilation (SH) (n(%))	8 (47.1)*	4 (7.8)
FEV1 (%)	83.4±13.8*	93.4±11.0
Vital capacity (%)	84.9±13.7*	97.9±11.8
PO2 (mmHg)	83.2±20.6*	92.7±19.6
PCO2 (mmHg)	43.6±5.4*	39.6±3.9

Results and Discussion: Among 74 patients, 17 presented intraoperative desaturation. Table resumes the data. The significant independent risk factors identified with the logistic regression were the presence of sleep hypoventilation and hypercapnia.
Conclusion(s): Morbidly obese hypercapnic patients and/or those with a significant increase of PCO_2 during night (SH) are at high risk of intraoperative desaturation.

5AP3-7

High-degree airway obstruction results in severe reduction of lung pressure amplitude and high intrinsic PEEP

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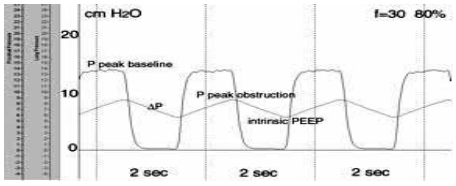
Background and Goal of Study: Tumors and other neck pathologies may cause severe airway obstruction that limits gas flow, affects lung pressure and reduces efficacy of mechanical ventilation. In this lung model study we determined lung pressure and pressure amplitude ΔP in the presence of high-degree (>80 %) obstruction.
Materials and Methods: An inflated balloon catheter was used to resemble a 80% reduction of cross sectional tracheal area *(CSA, Myer-Cotton III)*. Mechanical ventilation was applied from a high-pressure source *(TwinStream, C. Reiner Corp., Austria)* via an injector to achieve proximal airway pressures of 10 – 20 cm H_2O at a rate of 30 min^{-1} in a test lung *(Model 5600i, Michigan Instruments Inc., MI, USA)*. Peak lung pressures (P_{peak}) and intrinsic PEEP were measured and the resulting pressure amplitude ΔP (P_{peak} – PEEP) was calculated. ANOVA for repeated measurements was performed using Tukey's post hoc test, when applicable ($p< 0.05$). All analyses were carried out using SPSS statistical software 17.0 *(SPSS, Chicago, IL, USA)*.
Results and Discussion: High-degree airway obstruction resulted in reduction of P_{peak} from 14.0 cmH_2O to 8.6 cm H_2O (-37%), while PEEP reached 67% of maximal lung pressure (Fig. 1). The pressure amplitude ΔP decreased from 14.0 cm H_2O to 2.83 cm H_2O (-79.8 %). Such changes of ΔP may be associated with highly reduced tidal volumes and may indicate inefficient ventilation.Figure 1: Reduction of peak lung pressures ($P_{peak\ obstruction}$), generation of intrinsic PEEP, and reduction of pressure amplitude ΔP



Conclusion(s): High-degree airway obstruction will severly reduce lung pressure amplitude ΔP. It is unclear whether increases of inspiratory pressure will improve ventilation or will further increase intrinsic PEEP.
Acknowledgements: We are grateful for the technical assistance and help offered by Carl Reiner Corp.

5AP3-8

Predictors of tracheal extubation in the operating room in adult liver transplantations

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Background and Goal of Study: Early tracheal extubation has been safely performed in the operating room (OR) after large operative procedures. The duration of postoperative mechanical ventilation and its influence on pulmonary function in liver transplant recipients is still debated. Pulmonary complications in the postoperative course of liver tranplantation are known to be associated with high morbidity and mortality. Immediate postoperative extubation may reduce the incidence of postoperative respiratory complications after orthotopic liver transplantation (OLT). In this study we aimed to determine the predictors of immediate extubation in the OR after OLT.
Materials and Methods: The records of 57 patients who underwent OLT, performed by the same team in the Baskent University Hospital, from January 2000 to June 2006, were retrospectively analyzed. The patients were divided into two groups according to whether they had undergone extubation in the OR or in the intensive care unit (ICU). Collected data included demographic features; co-morbidities; etiology of the liver failure; perioperative laboratory values; intraoperative hemodynamic parameters; use and volume of crystalloids, colloids, blood products, and albumin; portal vein clamping time; requirement for inotropes, vasopressors, and antihypertensive drugs, and duration of anesthesia.

Results and Discussion: Immediate extubation in the OR was performed in 33 patients. Patients who were extubated in the OR were not significantly different from those who were not in terms of demographic features and preoperative characteristics (p>0.05 for all). Patients who were extubated in the OR had a significantly shorter duration of the anesthesia (10.3±2.7 hours *vs* 11.5±2.4 hours, p=0.024) and a shorter portal vein clamping time (71±22 min *vs* 93±43 min, p=0.020) and received more fresh frozen plasma (FFP) intraoperatively (27±15 mL/kg *vs* 46±27, p=0.009). Binary logistic regression revealed that intraoperative PaO_2 (odds ratio 1.01, *p=0.035*) and amount of FFP administered intraoperatively (odds ratio 1.053, *p=0.011*) were predictors of immediate extubation after liver transplantation.
Conclusion(s): In conclusion, our results demonstrated that intraoperative PaO_2 values and the amount of FFP administered are the predictors of early extubation in the OR. As immediate extubation after liver transplantation in selected patients is reported as a safe and cost-effective intervention, clinical guidelines for candidate selection need to be established.

5AP3-9

Monitoring intraoperative tidal volume distribution using electrical impedance tomography during upper abdominal surgery

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Background and Goal of Study: Upper abdominal surgery impairs postoperative lung function, with mechanical ventilation per se as one cause due to redistribution of tidal volume to anterior lung regions. Tidal volume distribution can be measured by using electrical impedance tomography (EIT). The aim of our study was to evaluate EIT during upper abdominal surgery, with respect to a) feasibility of belt position, b) feasibility of intraoperative measurements c) monitoring of tidal volume distribution over time.
Materials and Methods: With IRB approval and written informed consent, EIT was performed during upper abdominal surgery for one minute at different time points: pre-intubation, post-intubation, at skin incision (0h), every subsequent hour, and post extubation. PEEP was set to 5 cmH_2O throughout surgery. End expiratory pCO_2 was maintained at 38mmHg. Prior to extubation a manual recruitment maneuver was performed. Belt position was adjusted to not interfere with operating field. A minute image was calculated for every time point by averaging maximum impedance changes (dZ) of every breathing cycle. Regions of interest (ROI) were defined as horizontal halves of the thorax and used to calculate proportions of global impedance change in dorsal regions.
Results and Discussion: In all patients (n=14) EIT measurements were successfully performed. Belt position was higher than usual: ICR 4 in 7, ICR 3 in 3 and ICR 2 in 4 cases. In 2 cases there were problems with skin contact of one dorsal electrode, but all images were valid. EIT measurement cannot be facilitated during electrical cautery for reasons of patient safety. Thus, we unplugged the belt from the device and measured EIT when no cautery was done. No patient experienced burns or other skin lesions after wearing the belt for several hours. Tidal volume distribution shifted significantly after intubation towards ventral areas, indicated by a decrease of global impedance change in dorsal regions from 0.42 to 0.27 (p<0.05, Figure 1). However, after extubation, this effect was reversed and tidal volume distribution returned to the pattern before intubation (0.41, p>0.05).

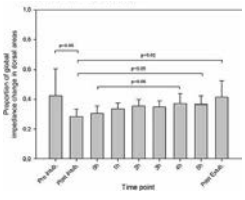

Figure1. Distribution of tidal volume overtime.

Conclusion(s): Intraoperative EIT measurement is safe and feasible during upper abdominal surgery.

5AP4-1

Comparison of oxygenation during one lung ventilation in prone position with lateral decubitus position in esophagectomy

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Background and Goal of Study: Intrathoracic procedures can be performed with thoracoscopy in esophagectomy because laparoscopic technique has recently been developed. During intrathoracic procedures, prone positioning of the patient allows gravity to facilitate optimal exposure of the esophagus, thereby affording a superb surgical view[1]. Furthermore, a double-lumen endotracheal tube (DLT) is not mandatory in prone patients because good exposure of the surgical field is achieved by establishment transitory pneumothorax using carbon dioxide (CO_2; 6 mmHg)[2]. In the current study, we compared the influences of prone positioning with lateral decubitus positioning on oxygenation in esophagectomy.
Materials and Methods: We enrolled patients who underwent esophagectomy via thoracoscopy in the prone position between July 2009 and December 2009 (group P) and patients who underwent thoracotomy in the lateral decubitus position between April 2008 and June 2009 (group L). A combination of general anesthesia and epidural anesthesia were administered to the patients. Patients received pressure-controlled ventilation. One-lung ventilation (OLV) was performed using a bronchial blocker in group P and a DLT in group L. Arterial blood gas analysis was performed before the start of the operation (T1), at 20 min after the initiation of OLV (T2), at the end of the operation (T3), and at 20 min after extubation in the ICU (T4). P < 0.05 was considered to be statistically significant.
Results and Discussion: A total of 17 patients were enrolled (P = 8, L = 9). The operation time in group P was longer than that in group L (684 ± 59 min vs. 567 ± 50 min, P<0.01). The total loss of blood and infusion fluid in group P was significantly lower than that in group L (229 ± 99 ml vs. 440 ± 229 ml, 3068 ± 439 ml vs. 4883 ± 1206 ml, respectively). There were no significant differences between the ventilator settings in the 2 groups at any time points. The PaO_2/F_IO_2 ratios (P/F ratio) at T1 were not significantly different. However, the P/F ratio at T2 in group P was significantly higher than that in group L (218 ± 80 mmHg vs. 145 ± 57 mmHg, P=0.03). No complications occurred during anesthesia in any group. Prone positioning is a useful technique for esophagectomy; however, countermeasures should be undertaken to avoid tube trouble and other complications.
Conclusion(s): During OLV in esophagectomy, prone positioning provides better oxygenation than that achieved with the lateral decubitus position.
References:
1 Y.S.Choi, et al.Surg Endosc. 2009.
2 G.Dapri, et al.Surg Endosc. 2008.

5AP4-2

High frequency jet ventilation during bilateral thoracotomy with pneumonectomy

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Background and Goal of Study: Bilateral thoracotomy with pneumonectomy and trachea resection is a massive operation technically complex for surgeons, and containing high risk for the patient. Thus the goal of anesthesiological management is to create conditions both appropriate for operating personnel and safe for the people operated. To a great extend it implies the problem of finding the ventilation mode to provide sufficient oxygenation without overdistention of the lung.
Materials and Methods: A 59-year-old woman, 85 Kg, with cylindroma of trachea bifurcation, lower part of trachea and upper parts of main bronchi confirmed by biopsy was submitted to thoracic surgery unit for an operation. She presented the signs of severe tracheal stenose. Initially orotracheal intubation was conducted and CMV mode used. After the trachea resection both lungs were separately intubated: left one through the operation wound, right one through the orotracheal tube. Two separate ventilators were used. For 40 minutes the patient was conducted high frequency jet ventilation. There was no possibility to keep the left lung, and after the pneumonectomy the remaining right lung was ventilated in high frequency jet ventilation mode for 20 minutes, until the wound was closed.
Results and Discussion: High frequency jet ventilation avoided the overdistention of lungs, which during thoracotomy increases the risk of barotrauma and iatrogenic trauma. Also it provided convenient operating conditions for the surgeons. The conventional one-lung ventilation is associated with increased inspiratory pressure, which may lead to undesired consequences. Reduction of the tidal volume does not always solve the problem, as hypoxemia may occur. High frequency jet ventilation appeared to be the most desirable method, for it provided the appropriate gas exchange not provoking the expected complications. During the operation the arterial blood gases were measured. After the pneumonectomy, while the right lung was ventilated in high frequency jet mode the gas pattern was as follows: PaO2 – 79

mm Hg, PaCO2 – 43,8 mm Hg, SaO2 – 95%, while FiO2 – 45% The patient left the hospital a month after the operation, in good condition, having no complaints.

Conclusion(s): High frequency jet ventilation during bilateral thoracotomy with pneumonectomy is an appropriate method of ventilation, as it provides adequate gas exchange and avoids some of the undesirable effects.

5AP4-3

Anesthetic and postoperative management for living-donor lobar lung transplantation

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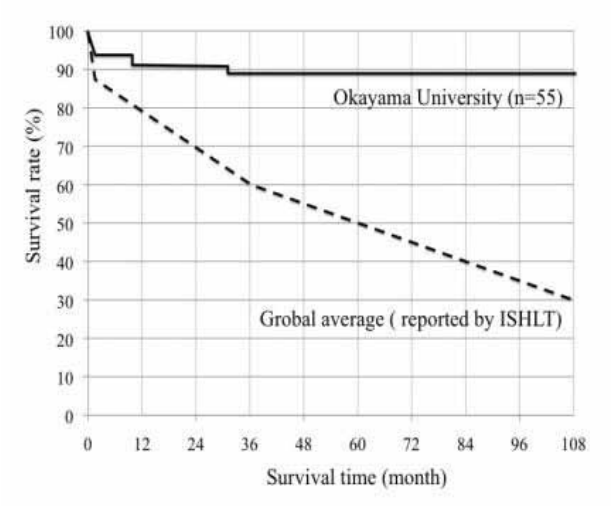
Background and Goal of Study: Living-donor lobar lung transplantation (LDLLT) was developed in 1996, and the recent overall actuarial survivals (#1) of 70%, 54%, and 45% at 1, 3, and 5 years, respectively, were comparable with those of reported cadaveric lung transplantation (CLT) from the International Society for Heart and Lung Transplant registry. The early mortality was high. In Japan, the preoperative conditions of donors are too severe to wait CLT, the implanted lobes are small, and the procedures need cardiopulmonary bypass (CPB), which deteriorates lung reperfusion injury. However, our early mortality is low. The anesthetic and postoperative management for LDLLT should be different from those for CLT. We summarize the anesthetic and postoperative management of LDLLT, and report on our 11-year experience.

Materials and Methods: [Patients] Between 1998-2009, we performed LDLLT in 55 critically ill patients, including 17 patients on a ventilator and 2 patients on extracorporeal membrane oxygenation (ECMO). Diagnoses included primary pulmonary hypertension (PPH) (n=19), idiopathic interstitial pneumonia (n=13), bronchiolitis obliterans (n=10), and others (n=13). [Anesthetic Management] Ten patients needed ECMO before induction of anesthesia and eleven patients were catheterized for ECMO. Progressive hypoxia or hypercarbia raised during pneumonectomy before CPB. Lung transplantation was performed with CPB in all patients. Before completing the implantation, nitric oxide inhalation was initiated. [Postoperative Management] The patient was kept intubated for at least 3 days. The postoperative management included slow weaning from a ventilator, avoidance of cardiac failure especially in PPH patients, intravenous administration of carperitide.

Results and Discussion: The short and long term survival rate improved in comparison with ISHLT registry. Three PPH patients died caused by bleeding and early graft failure postoperatively, and one patient died by aspergillosis. The duration of mechanical ventilation ranged from 3 days to 4 months.



Conclusion(s): The optimal anesthetic and postoperative management can contribute to the better outcome of LDLLT.

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1 Starnes VA, et al. J Thorac Cardiovasc Surg. 2004; 127: 114-122.

5AP4-4

Remote ischemic-reperfusion preconditioning in patients during lung lobectomy. A study of oxidative stress markers in pulmonary exhaled water

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Background and Goal of Study: Oxygen deprivation from ischemia or non ventilation causes hypoxic lung injury. Paradoxically the reperfusion of hypoxic lung may result in further injury by oxidative damage (1). The aim of the present study is to evaluate whether the remote ischemia-reperfusion preconditioning might be protective against oxidative damage in 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 preconditioning). 20 patients were randomized before surgery to three 5 minutes ischemia cycles separated by 5 minutes of reperfusion by a tourniquet in a leg. The collection of exhaled water in patients mechanically ventilated was through an endotracheal tube. The aim of this study was to test the oxidative stress markers levels (8-isoprostane, nitrites and nitrates) in the condensate of exhaled water (2). During surgery the lungs were ventilated with a volume-controlled mode (7 ml/Kg) and FiO_2 0.4. Water exhaled samples were obtained 5 minutes after lung reexpansion.

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<0.05). In control group: 8-isoprostane (pg/ml) 34.6 ± 16.5; $NO_3 + NO_2$ (µM) 30.9 ± 56.9. In preconditioning group: 8-isoprostane (pg/ml) 25.2 ± 11.0; $NO_3 + NO_2$ (µM) 8.4 ± 6.2. These results in exhaled water shown an decrease of 8-isoprostane levels in preconditioning group than control group (within preconditioning) (See Table 1).

Oxidative stress markers in exhaled water after lung reexpansion

	CONTROL	PRECONDITIONING	
8-isoprostane (pg/ml)	34.6 ± 16.5	25.2 ± 11.0	P = 0.03
NO3 + NO2 (uM)	30.9 ± 56.9	8.4 ± 6.2	P = 0.06

Conclusion(s): Collapsed lung during the surgery and the next reexpansion of operated lung after lobectomy causes oxidative stress. Remote preconditioning by ischemia-reperfusion protects against lung oxidative damage during lung lobectomy.

References:

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2 Horváth I, et al. Eur Respir J 2005; 26: 523-548.

5AP4-5

Oxidative stress by lung reexpasion during pulmonary lobectomy. Prevention by propofol and FiO_2 0.8

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Background and Goal of Study: Previous reports have reported an oxidative stress on lung parenquima during lung lobectomy due to oxygen deprivation. Because during one lung ventilation the operated lung is completely collapsed and hypoperfused (1, 2). The aim of the present study is to evaluate whether the supplemental oxygen (FiO_2 0.8) and/or Propofol are protectives against oxidative stress in patients undergoing lung lobectomy.

Materials and Methods: Prospective, aleatory and double blind study. Fifty-seven patients undergoing lung diagnosis of pulmonary carcinoma were programmed for lung lobectomy in three groups: A (n=24, ventilated with FiO_2 0.35 anaesthetized with thiopental and sevoflurane), B (n=16, ventilated with FiO_2 0.8 anaesthetized wit thiopental and sevoflurane), C (n=17, ventilated with FiO_2 0.8 anaesthetized with propofol). During surgery the lungs were ventilated with a volume-controlled mode (7 ml/Kg). The arterial blood samples were obtained 5 minutes after lung reexpansion. The aim of this study were to investigate through several oxidative stress markers: malondialdehyde (MDA), oxidized glutathione (GSSG) and glutathione (GSH) during lobectomy at different times, especially 5 minutes after the pulmonary reexpansion.

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<0.05).These results in blood 5 minutes after the pulmonary reexpansion, shown an decrease of oxidative stress in C group (ventilated with FiO_2 0.8 and anaesthetized with propofol).

Oxidative stress markers in blood after lung reexpansion during lung lobectomy

	group A	group B	group C
MDA (nmol/ml)	1.60 ± 7,8	1.30 ± 0.40 b	0.89 ± 0.30 c
GSSG (nmol/ml)	31.0 ± 8.0	1.3 ± 0.41 b	0.90 ± 0.35 c
GSH (nmol/ml)	449 ± 108	454 ± 90 b	525 ± 94 c
PaO2 (mmHg)	139 ± 31 a	260 ± 95 b	266 ± 102 c

(a) P< 0.05 in A vs. B; (b) P< 0.05 in B vs. C; (c) P< 0.05 in A vs. C

Conclusion(s): Reexpansion of the operated lung after lobectomy causes oxidative stress with FiO_2 0.35 and anaesthesia with thiopental and sevoflurane. However, FiO_2 0.80 plus Propofol protects against lung oxidative damage during lung lobectomy.

References:

1 Misthos P, et al. *Eur J Cardiothorac Surg* 2005; 27: 379-383.
2 Lases EC, et al. *CHEST* 2000; 117:999-1003.

5AP4-6

The effect of one lung ventilation on venous admixture during different anesthetic techniques

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Background and Goal of Study: The most favourable anesthetic technique for patients undergoing thoracotomy with one lung ventilation (OLV) has not been yet certainly established. The effect of intraoperative thoracic epidural anesthesia (TEA) with local anesthetics on hypoxic pulmonary vasoconstriction (HPV) and oxygenation during thoracic surgery and OLV still remains unclear. The aim of this study was to compare the values of venous admixture during general anesthesia (GA) and OLV, as well as during combination of TEA and GA with OLV.

Materials and Methods: In this prospective clinical study thirty patients who had prolonged period of OLV for elective thoracic surgery were randomly allocated into two groups (n=15 each). In 15 patients (GA group), fentanyl/propofol/rocuronium anesthesia was used. Another 15 patients (TEA group) were anesthetized with fentanyl/propofol/rocuronium plus epidural thoracic bupivacaine 0.25%, 6-8 ml/h. A double-lumen endotracheal tube was inserted, and mechanical ventilation with 50% oxygen was used during the entire study. Arterial blood gases were recorded in a lateral position with two-lung ventilation, and 15 and 30 min. (OLV 15, OLV 30, respectively) after initiating OLV in all patients. We measured PaO2, arterial oxygen saturation (SaO2) and venous admixture percentage (Qs/Qt%). For the purpose of this study, the quantitative value of Qs/Qt**%** was mathematically calculated by the blood gas analyzator AVL Compact 3. A p value <0.05 was taken to be statistically significant.

Results and Discussion: When OLV was instituted arterial oxygenation decreased, whereas Qs/Qt% increased. There were no statistical differences between the two groups for PaO_2 at OLV 15 (GA=9,97 kPa, TEA= 9,46 kPa) and OLV 30 (GA=10,3 kPa, TEA=9,8 kPa); for SaO2 at OLV 15 (GA=90,29%, TEA=89,0 %) and OLV 30 (GA=93,5%, TEA= 91,2%) and with values of Qs/Qt% at OLV 15 (GA=12,26%, TEA= 13,5%) and OLV 30 (GA=13,15%, TEA=13,9%).

Conclusion(s): Both techniques, general anesthesia and general anesthesia combined with TEA are suitable for thoracic surgery when OLV is used, considering arterial oxygenation. There was no significant difference in PaO_2 and Qs/Qt during each administration.

5AP4-7

High prevalence of asymptomatic sleep apnoea in patients with atherosclerosis needing revascularization

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Background and Goal of Study: Acute myocardial infarction is common after peripheral revascularization (11% incidence during the postoperative 48 hours). 22-42 % of the operated patients die within 5-years.[1] Sleep apnea is associated with increased cardiovascular morbidity and mortality.[2] We therefore investigated the prevalence of sleep apnea and its associated characteristics in patients with advanced atherosclerosis obliterans (ASO) needing surgical intervention.

Materials and Methods: 290 ASO patients referred for infra-inguinal vascular surgery were screened prospectively. After exclusions including symptomatic obstructive sleep apnea (OSA), 73 eligible patients (47 men) were enrolled for a preoperative polygraphic sleep study to screen for latent OSA. The frequency of the respiratory events per hour of sleep (the apnoea/hypopnoea index, AHI) was calculated. The severity of OSA was classified as mild, moderate or severe according to the AHI of 5-14, ≥15 or ≥ 30, respectively.

Results and Discussion: The sleep study revealed OSA in 58 (78 %) patients. Severe OSA was found in 21 (29%) patients (see table for patient characteristics). Although hypertension and diabetes mellitus are suggested to be independently associated with OSA, their prevalence did not correlate with the presence or severity of OSA in this study. The role of asymptomatic OSA in postoperative cardiac events and overall vascular damage in ASO patients remains to be established.

Patient characteristics

N=73	No OSA n=15(21)	Mild OSA n=25(34)	Moderate/severe OSA n=33(45)	P value Moderate/severe vs. No-Mild OSA
Age (yrs,SD)	66 (6)	66 (10)	69 (9)	NS
Body mass index (kg/m2,SD)	27 (4)	26 (4)	27 (3)	NS
Ejection fraction (%,SD)	68 (6)	64 (7)	60 (9)	0.03
CAD (n,%)	4 (27)	8 (32)	12 (36)	NS
Hypertension (n,%)	10 (67)	10 (40)	20 (61)	NS
Diabetes (n,%)	7 (47)	12 (48)	11 (33)	NS
BQ 2-3 (n,%)	3 (15)	10 (25)	10 (33)	NS
ESS score (mean,SD)	4 (3)	4 (6)	4 (3)	NS

CAD = coronary artery disease; ESS = Epworth Sleepiness Scale (score >10 pathologic); BQ 2-3 = Berlin Questionnaire with 2-3 categories (out of 3) positive, indicating high risk of OSA

Conclusion(s): The prevalence of asymptomatic OSA is exceptionally high in patients with advanced atherosclerosis undergoing vascular surgery. The preoperative patient characteristics including co-morbidities and medication or screening tools cannot be used to distinguish ASO patients with OSA from ASO patients without OSA.

References:

1 J Am Coll Cardiol. 2003;42:1547-54.
2 Lancet. 2009;373:82-93.

5AP4-8

Sevoflurane administration improves gas exchange in a lung autotransplant model

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Background and Goal of Study: Sevoflurane has proved to be protective over ischemia reperfusion injury (IRI) in myocardial and liver tissue [1, 2], but data available are not enough to demonstrate this fact on lung tissue. The importance of this entity is that it entails the main cause of primary graft failure in lung transplant. In previous research, our team has proved that sevoflurane diminishes the inflammatory response in the IRI. The aim of this study was to determine whether the result of that protective effect could be an encouragement of gas exchange in lung tissue.

Materials and Methods: 20 large-white pigs divided into two groups (sevoflurane preconditioning and control) were submitted to a lung auto-transplant. All of them receive the same anesthetic induction (fentanyl 3 ug/Kg, propofol 3 mg/Kg, atracurium 0,5 mg/Kg) but maintenance was performed with sevoflurane 4% (sevo group) or propofol 10 mg/Kg/h (control group), until pulmonary artery clamp was done. Then propofol 10 mg/Kg/h was used for the two groups. In order to analize the efficacy of gas exchange in both groups, we measured, 10 and 30 minutes after the graft was reimplanted, PaO2 in femoral artery, pulmonar artery and pulmonar vein. In these same samples PCO2 and pH was also determined in order to assure the homogeneity of ventilation and acid-base balance in both groups. We used U Mann-Whitney and Wilcoxon as non-parametric test to find statistical meaning.

Results and Discussion: PaO2 measured in pulmonary vein was significantly higher in the group who received sevoflurane comparing to the control group [413,778mmHg ±31,909 vs 277,800mmHg ± 52,735 respectively]. No significant results were observed while comparing systemic arterial and pulmonary arterial PaO2 as well as PCO2 and pH.

Conclusion(s): Sevofluorane preconditioning makes lung function get better so that an outstanding improvement in gas exchange can be noticed probably related to a decrease in oxidative stress.

References:

1 Yin D, Ding JW, Shen J, et al. Am J Transplant. 2006 Jan;6(1):60-8.
2 Zoulay D, Del Gaudio M, Andreani et al. Ann Surg. 2005 Jul;242(1):133-9.

Transfusion and Haemostasis

6AP1-1

Change from aprotinin to tranexamic acid in cardiac surgery: Effects on morbidity & mortality

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Background and Goal of Study: Following the publications of increased mortality with aprotinin in cardiac surgery patients, most cardiac surgery centers switched to tranexamic acid as antifibrinolytic. This retrospective study compares the effect of this switch on morbidity and mortality in our hospital.
Materials and Methods: We compared patients undergoing cardiac surgery with cardiopulmonary bypass in 2006 (N=261), all of them received high-dose aprotinin, i.e. $2 \bullet 10^6$ KIU as a bolus, $2 \bullet 10^6$ KIU in the pump priming and a continuous infusion of $0.5 \bullet 10^6$ KIU/h, with patients in 2008 (N=288) who received tranexamic acid, 30 mg/kg as bolus, 2 mg/kg in the pump priming and an infusion of 16 mg/kg/h. We compared overall mortality and morbidity, as well as transfusion requirements. Continuous variables were analyzed by t-test and categorical variables by Chi-square test. A p value < 0.05 was considered significant.
Results and Discussion: The change from aprotinin to tranexamic acid was not associated with a higher use of blood products. Other studies concluded also to an equal effectiveness of aprotinin and tranexamic acid in reducing transfusion requirements. We did not observe a change in mortality/morbidity, except a higher rate of new onset of atrial fibrillation in the tranexamic acid group. This may be related to a sicker population as indicated by a higher NYHA class and higher ASA score.

Transfusion data

	Tranexamic acid	Aprotinin	p
Perop blood loss(mL)	300 ± 953	300 ± 901	0.36
Postop Hb (mg/dl)	9.2 ± 1.9	8.7 ± 1.5	0.82
Transfused patients (N/%)	155 (55%)	160 (61%)	0.13
Surgical re-exploration (N/%)	33 (11.7%)	19 (7.3%)	0.13
Surgical cause of bleeding (N/%)	10 (30.3%)	4 (21.1%)	0.47

Morbidity & mortality

	Tranexamic acid	Aprotinin	p
Myocardial ischemia (N/%)	14 (5.0%)	19 (7.3%)	0.26
Renal insufficiency (N/%)	38 (13.5%)	27 (10.2%)	0.26
Dialysis (N/%)	9 (3.2%)	11 (4.2%)	0.47
New atrial fibrillation (N/%)	38 (13.5%)	16 (6.1%)	0.04
Seizures (N/%)	4 (1.4%)	4 (1.5%)	0.91
Stroke or TIA (N/%)	9 (3.2%)	8 (3.1%)	0.93
Confusion	14 (5.0%)	15 (5.8%)	0.69
Arterial or venous thrombosis (N/%)	3 (1.1%)	1 (0.4%)	0.35
Inotropic support (N/%)	92 (32.6%)	104 (39.9%)	0.08
Mortality (N/%)	26 (9.2%)	20 (7.7%)	0.51

Conclusion(s): The change from aprotinin to tranexamic acid was not associated with a change in mortality or morbidity, nor with a change in transfusion requirements.
Reference:
1 Mangano et al: N Engl J Med 2006.

6AP1-2

Prophylactic use of low dosages of tranexamic acid and epsilon aminocaproic acid in heart surgery

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Background and Goal of Study: Extracorporeal circulation implies changes in coagulation mechanisms; hyperfibrinolysis is one of the causes of perioperative bleeding. Objective: to compare the use of low dosages of tranexamic acid (TA) and epsilon aminocaproic acid (EACA) in the prophylaxis of excessive bleeding in cardiovascular surgery.
Materials and Methods: A prospective study was blindly carried out in 100 patients programmed for heart surgery. This group was divided randomly into two groups, with 50 patients in each of them: EACA (E) and TA (T). All patients were treated with the same anaesthetic, surgical and extracorporeal circulation protocols. Group E patients were given 100-125mg/kg of EACA once the induction and the ECC were done. Group T patients were given 10 mg/kg of TA at the same moments of surgery. The level of statistics significance was $p < 0.05$.
Results and Discussion: The bleeding of the first day (p>0.05) was higher than that of the second day in Group T (518± 249 vs. 474 ± 235 ml/m²/hour). The duration of the bleeding (in days) was longer in Group T: 1.9 ±1 vs. 1.4 ±0.7 days (p>0.05). The intraoperative consumption of hemoderivatives was similar in both groups, but it was higher in Group T (1.9±1 vs. 1.4±0.7) (p>0.05) during the first day. In Group E, there were three cases in which patients had to undergo a new surgery due to excessive bleeding; meanwhile there were none in Group T. The length of stay in the Intensive Care Unit was longer in Group E: 73.4± 73 vs. 64.5 ± 60 hours (p>0.05).
Conclusion(s): We concluded that the use of AT, in the provided dosages, is useful to prevent excessive bleeding, without significant differences with EACA.

6AP1-3

Blood sparing effect and safety of tranexamic acid compared to aprotinin in adult cardiac surgery

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Background and Goal of Study: Due to the withdrawal of aprotinin (A) for safety reasons (1), pharmacological approach of intraoperative bleeding has been switched to tranexamic acid (T) in most of the European cardiac centers. The aim of the study was to compare the blood sparing effect and the side effects of T and A in adult cardiac surgery patients.
Materials and Methods: Following institutional Ethics Committee approval, perioperative data of 271 consecutive patients undergoing cardiac surgery under cardiopulmonary bypass (CPB) from September 2006 to December 2008 were retrospectively reviewed. During the first 13 mo, A was the antifibrinolytic agent in use (group A: N = 145), while during the last 13 mo, T was used (group T: N = 126). Anesthetic and surgical protocols remained unchanged. Calculated blood loss (2), transfusion requirements and postoperative mortality and morbidity were compared between groups. The incidence of acute renal failure (ARF) using the same definition as Fergusson et al was evaluated. Statistical analysis included Mann-Whitney U test and Chi². Data: median [interquartile] or percentage (%).
Results and Discussion: Demographic and surgical characteristics were not different between groups.

	Group A (N=145)	Group B (N=126)
Antifibrinolytic use (%)	74	70
Calculated blood loss (ml)	652 [490-839]	682 [527-928]
Re-do surgery (%)	3.5	5.6
RBC transfusion (%)	43	39
FFP transfusion (%)	21	20
Platelets transfusion (%)	19	13
30-day mortality (%)	3.5	4.6
ICU stay (days)	3 [2-4]	3 [2-4]
ARF (%)	2.8	9.5*
Hospital stay (days)	10 [9-12]	10 [9-13]

* p<0.05

Conclusion(s): In our population, the switch from A to T was associated with an increased incidence of ARF, in particular in valvular surgery patients (3 versus 15%, p = 0.015). Administration of T should not be recommended in valve surgery.
References:
1 Fergusson DA et al. N Engl J Med 2008; 358:2319-31.
2 Samama CM et al. Anesth Analg 2002; 95:287-93.

6AP1-4

Blood sparing effect and safety of tranexamic acid compared to aprotinin in paediatric cardiac surgery

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Background and Goal of Study: Due to the withdrawal of aprotinin (A) for safety reasons (1), pharmacological approach of intraoperative bleeding has been switched to tranexamic acid (T) in most of the European cardiac centers. The aim of the study was to compare the blood sparing effect and the side effects of T and A in paediatric cardiac surgery patients.
Materials and Methods: Following institutional Ethics Committee approval, perioperative data of children undergoing cardiac surgery under cardiopulmonary bypass (CPB) were retrospectively reviewed. The 1st group included

consecutive patients operated from 11/2006 to 10/2007: they all received A (10^6 KIU/m^2; group A: N=218). The 2nd group included consecutive patients operated from 02/2008 to 01/2009: they all received T (30 mg/kg at induction; 16 mg/kg/h and 2 mg/kg in CPB; group T: N=211). Anaesthetic and surgical protocols remained unchanged. Measured and calculated blood loss (2), transfusion requirements and postoperative mortality and morbidity were compared between groups using Mann-Whitney U test and χ^2. Data: median [interquartile] or percentages (%).

Results and Discussion: Demographic and surgical characteristics did not differ between groups except for a lower incidence of female sex and cyanotic diseases in the T group.

	Group T (N=211)	Group A (N=218)
Calculated blood loss (ml/kg)	18 [12-29]	22 [13-32]
Re-do surgery (%)	0.5	1.4
RBC Transfusion (%)	68	72
FFP transfusion (%)	18	18
Platelets transfusion (%)	6	12*
Mortality (%)	1.4	3.2
ICU stay (days)	4 [3-7]	5 [3-9]*
Hospital stay (days)	14 [10-18]	14 [11-21]

* p<0.05

Conclusion(s): In our population, the switch from A to T had no negative effects on transfusion requirements and postoperative morbidity and mortality.

References:

1 Fergusson DA et al. N Engl J Med 2008;358:2319-31.
2 Samama CM et al. Anesth Analg 2002;95:287-93.

6AP1-5

Time-dependent changes in intraplatelet signaling pathways relevant to platelet function defect after cardiac surgery with cardiopulmonary bypass

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Background and Goal of Study: Hemostatic deterioration and consequent perioperative bleeding is a common and important complication of cardiac surgery. We thus sought to delineate underling intraplatelet signaling pathways that contribute to perioperative platelet function defects.

Materials and Methods: With IRB approval and informed consent, we enrolled 20 patients undergoing cardiac surgery with on-pump (n=10) or off-pump (n=10) cardiopulmonary bypass and 5 healthy volunteers. Patient blood sample was obtained just after induction of anesthesia, 1 h after cardiopulmonary bypass, at weaning from cardiopulmonary bypass, 8 h after weaning from bypass, and 24 h after induction.

Results and Discussion: Thrombin-induced platelet aggregability and PAC-1 and P-selectin expression were reduced at weaning from cardiopulmonary bypass. Furthermore, intraplatelet Bak and Bax expression and phosphorylation of p38 mitogen-activated protein kinase (p38 MAPK) and Akt were pronounced, with p38MAPK dominant at weaning from cardiopulmonary bypass. 24 h after surgery, all markers returned to baseline values. Changes in these intraplatelet signalings were greater during on-pump than off-pump surgery. Changes similar to those observed during on-pump bypass were induced by application of shear stress to whole blood obtained from volunteers. Bak and Bax expression on platelets was inhibited by p38 MAPK inhibitors, and accelerated by Akt inhibitors. Application of cell permeable Bak BH3 peptide to the washed platelet solution reduced the thrombin-induced PAC-1 and P-selectin expression on platelet, and intraplatelet changes in calcium concentration.

Conclusion(s): Shear stress application to the platelets by cardiopulmonary bypass increases Bak and Bax expression on platelets by intraplatelet p38 MAPK phosphorylation, which consequently reduces thrombin-induced platelet aggregability, and PAC-1 and P-selectin expression on platelets. That the platelet-function defect following cardiac surgery with cardiopulmonary bypass was reversible is consistent with intraplatelet signaling changes. Intraplatelet Bak and Bax inhibition has potential for maintaining platelet function in cardiac surgery with cardiopulmonary bypass.

6AP1-6

Thrombin generation predicts bleeding following cardiopulmonary bypass surgery

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Background and Goal of Study: Bleeding post cardiopulmonary bypass surgery (CPB) is associated with major morbidity and mortality. We investigated haemostatic tests before and immediately after CPB to see if any predicted excess bleeding in the first 24h. Clot formation depends critically on amount and rate of thrombin generation (TG) so we measured calibrated automated thrombography (CAT): rate of TG and endogenous thrombin potential (ETP measure of thrombin produced).

Materials and Methods: With ethical approval 77 patients were recruited. Fibrinogen, prothrombin time (PT), activated partial thromboplastin time (aPTT), coagulation factor levels (FII-FXII) and CAT were measured pre and post CPB. Bleeding over the 24 hours post bypass showed a bimodal distribution. The 22 patients who bled more than 1L were compared to the 55 who bled less than 1L.

Results and Discussion: Patients who bled >1L had lower FIX-XI, platelets and longer aPTT compared to those who bled <1L, with lower ETP, peak and rate of TG. ROC analysis shows post-operative aPTT and rate of TG were potentially most useful for predicting bleeding. Pre-operative ETP and TG rate were lower in those who bled >1L (P<0.03) despite being in normal range. ROC analysis AUC (95%CI): ETP 0.68 (0.54-0.82) P=0.03, rate 0.76 (0.62-0.89) P=0.004. No other pre-operative tests predicted post-operative bleeding.

PostCPB tests	Blood loss first 24h			ROC analysis
	<1L n=55	>1L n=22	P	AUC(95%CI)
Platelets	121(98-144)	94(71-124)	0.02	
PT	16(15-17)	16 (15-19)		
APTT	40(33-54)	61(43-74)	<0.001	0.75(0.62-0.88) P=0.002
TT	12(13-14)	12(11-14)		
Fibrinogen	1.6(1.3-1.9)	1.4(1.0-2.1)		
Factor II	44(37-53)	45(27-53)		
FV	64(74-101)	55(44-72)		
FVII	61(49-69)	54(41-73)		
FVIII	98(124-330)	80(71-131)		
FIX	93(105-156)	77(58-88)	<0.006	0.69(0.52-0.86) P<0.05
FX	45(35-55)	31(23-40)	<0.001	
FXI	58(67-96)	45(31-58)	0.005	
FXII	46.5(55-148)	32(47-110)		
CAT Thrombin Generation				
Lag	5.3(4.4-7.1)	5.2(3.6-7.0)		
ETP	1025(652-1386)	684(344-1003)	<0.02	0.71(0.57-0.85) P=0.009
Peak	155(88-217)	89(31-146)	<0.01	0.69(0.54-0.83) P=0.02
Rate	45(18-68)	17(4-32)	<0.01	0.76(0.62-0.89) P=0.004

Conclusion(s): Pre and post-operative TG assay and post-operative aPTT are potentially useful for predicting bleeding in the first 24h after CPB surgery.

6AP1-7

Coagulation parameters, bleeding, and transfusion after paediatric open heart surgery: A prospective observational study

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Background and Goal of Study: Preoperative fibrinogen levels predicted postoperative bleeding and transfusion in adults (1,2). We investigated the correlation between perioperative coagulation parameters and postoperative bleeding in children undergoing complex cardiac surgery.

Materials and Methods: 54 children (63±17 cm, 6.10±4.2 kg) with acyanotic and cyanotic malformations were included in a prospective observational study. Surgical variables, postoperative bleeding volumes and transfusions were documented. Laboratory variables included platelet count, prothrombin time, activated partial thromboplastin time, fibrinogen concentration (Clauss method) and rotational thrombelastometry (ROTEM®, Pentapharm, Munich). Laboratory testing was performed before anaesthesia, during and after surgery until the 5th postoperative day. Statistical analysis: Spearman rank correlation.

Results and Discussion: Postoperative bleeding volume exceeded 150 ml in 30 children (55%), 33 children (61%) received packed red blood cell transfusions postoperatively. Moderate correlations were found between fibrinogen concentration immediately after surgery (r=-0.50, p = 0.0028) and clot strength in the EXTEM test (r=-0.51, p = 0.0054).

Conclusion(s): These results indicate that fibrinogen is a key protein in haemostasis also in paediatric cardiac surgery: Fibrinogen concentration and fibrin polymerization correlates with postoperative bleeding comparable to adults (1). Early identification of children at increased risk of excessive bleeding after complex cardiac surgery offers the possibility of early and targeted coagulation therapy.

References:

1 Karlsson. Transfusion. 2008;48:2152-8.
2 Blome. Thromb Haemost 2005;93:1101–7.

6AP1-8

Perioperative antithrombin III levels in cardiac surgery with extracorporeal circulation: Preliminary study

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Background and Goal of Study: In cardiac surgery, the extracorporeal circulation (ECC) is potentially associated to low levels of antithrombin III (AT III) due to a reduced synthesis, an increased loss or/and hyperconsumption. These deficits may be related to an increased incidence of thrombotic events and may affect the surgical results. The aim of this study was to measure different levels of AT III perioperatively in cardiac surgery using ECC and to analyse the relation between AT III and postoperative complications.
Materials and Methods: We designed a prospective observational study where adults patients scheduled for elective cardiac surgery with ECC were included over a period of two months. AT III was measured at 4 different times: preoperatively, immediately after surgery, in the first and second postoperative days; other variables recorded were: demographics, co-morbilities, heparin and protamine doses, activated clotting time (ACT), ECC time, cross-clamping time, ECC minimal temperature, thrombotic complications, bleeding, transfusions, reoperations, intubation time, ICU/hospital stay and mortality.
Results and Discussion: 20 women and 28 men were included: mean age 65.7 yrs, logistic euroscore 10.8, kind of surgery: coronary 16.6%, valve 64.5%, combined 18.8%. The mean levels of AT III (expressed in % of activity) at the four different times were: 89±12.8%, 49.8±9.7%, 73.7±11% and 76.2±1% respectively. Mean ACT: 516±98 sec after 3mg/kg weight of heparin. Total heparine dose/weight: 5.4±1 mg and protamine 242±51 mg. ECC time: 116±38 min; clamping time: 86.6±34 min. ECC minimal temperature: 31.7±1.8ºC. Total drainage bleeding: 553±262 ml. Transfused patients: 54.2%. One reoperation due to bleeding. Intubation time: 9.7 hrs. ICU stay: 3.8±3.3 days; hospital stay 13.5±12 days. Five patients required vasopressors >24 hrs, one had an acute myocardial infarction. Eight patients increased their serum creatinine levels > 2 mg/dl and 3 needed hemofiltration. Two strokes, one mesenteric isquemia and 5 bound infections were observed. One patient died postoperatively due to a septic shock.
Conclusion(s): We observed a reduction of the AT III activity of 39.2% between the baseline levels and the levels immediately after surgery. These levels improved partially without reaching the initial levels during the two following days. No significant relation was found between AT III levels and thromboembolic complications and/or patients' outcome. This is a preliminary study that will be continued in order to analyse a bigger sample size.

6AP1-9

Effect of cardio-pulmonary bypass on procoagulant components of haemostasis in cardiac surgery

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Background and Goal of Study: Bleeding following cardio-pulmonary bypass (CPB) is a frequent complication of cardiac surgery. It is unclear if coagulopathy is mainly caused by a deficit of procoagulant substrate, represented by fibrinogen and platelets, or by a deficit of the global activity of the procoagulant enzymes, functionally reflected by thrombin generation. Identifying the component responsible for the coagulopathic status may have an impact on the haemostatic therapy. Haemostatic therapy is generally performed with allogeneic blood products, but their transfusion is associated with a number of risks, including pathogen transfusion, immune suppression and acute lung injury. Therefore, a precise assessment of the post-CPB coagulation status is necessary.
Materials and Methods: Coagulation parameters were measured preoperatively and the end of CPB in 90 patients undergoing cardiac surgery. Following parameters were measured: fibrinogen concentration, platelet count, prothrombin time (PT), thromboelastometric data, including clotting time (CT) and maximum clot firmness (MCF) in the EXTEM test and the MCF of the fibrin-based clot in FIBTEM test, as well as the lag time of thrombin generation and the endogenous thrombin potential (ETP).
Results and Discussion: By the end of CPB, fibrinogen had decreased to 58% (from median 3.3 to 1.9 g/L), platelet count to 45% (from 232 to 104 x 10^3 /µL), and PT increased to 132% (from 14 to 18.5 s), all changes statistically significant (p<0.0001, Mann-Whitney U test). The thromboelastometric results showed a decrease of MCF EXTEM to 89% (from 61 to 54 mm) and of MCF FIBTEM to 67% (from 18 to 12 mm), while CT was prolonged to 150% (from 48 to 72 s) (p<0.0001 for all parameters). As for thrombin generation, the lag time was significantly shortened from 3.0 to 2.0 min (p<0.0001), while ETP decreased to 93% (from 1485 to 1382 nM x min) (p=0.1336, not statistically significant).
Conclusion(s): The procoagulant substrate appears to be more severely affected by cardiopulmonary bypass than the procoagulant enzymes in cardiac surgery. The choice of therapy may be considerably influenced by these findings.

6AP2-3

Comparison of POCT i-Stat international normalized ratio (INR) with standard INR in paediatric patients undergoing major surgery

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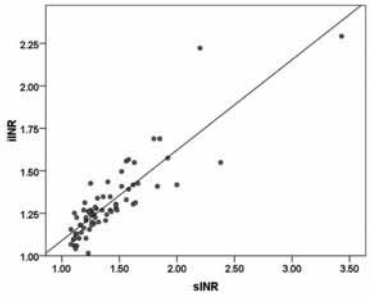
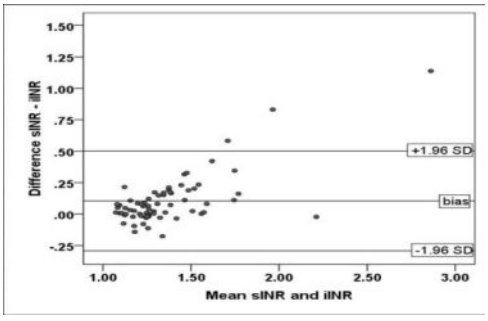
Background and Goal of Study: Standard coagulation testing is time-consuming and delayed results do not represent the actual haemostatic state. The goal of this study was to evaluate the correlation of the Quick test's corresponding International Normalized Ratio (INR) of the i-Stat device (Abbott Laboratories, Illinois, USA), a point of care testing (POCT) system, with the standard INR measured with the STA® Compact device (Roche Diagnostics AG, Rotkreuz, Switzerland) in children undergoing major surgery with significant blood loss.
Materials and Methods: Nineteen patients (age 0.7-14.2 years (median 5.5); weight 8.2-72.0 kg (17.4)) undergoing craniofacial (n=6), spine (n=11) or hip surgery (n=2) were included. Blood for both tests were taken from the same sample at the following time points: after induction of anaesthesia, at start of surgery, during operation and at the end of the procedure. They were immediately analyzed with both techniques. Data were compared using Bland-Altman analysis and Spearman correlation.
Results and Discussion: Standard INR (sINR) ranged from 1.08 to 3.43 (median 1.29) and INR of i-Stat (iINR) from 1.02 to 2.29 (median 1.27) with a Spearman correlation of r=0.85 (p<0.001). Figure 1: Comparison of sINR and iINR values; r=0.853 (p<0.001). Figure 2: Bland-Altman-Plot of sINR and iINR (bias=0.10; 1.96SD=0.40). While INR values were reported from the standard laboratory 53.8 min (±13.4) after blood sampling, i-Stat results were available after 5.5 min (±2.6). The overall correlation between sINR and iINR values was good. The two upper most outliers in the Bland-Altman-Plot had extreme low Quick values of 21 and 31%, representing a severe coagulopathy.





Conclusion(s): For INR values ≤ 1.62 (Quick values ≥ 35%), the i-Stat device with PT/INR cartridge represents a fast and reliable alternative to the standard laboratory PT/INR testing.

6AP2-4

Effect of rivaroxaban on blood coagulation using the viscoelastic coagulation test ROTEM™

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Background and Goal of Study: Rivaroxaban is an oral direct inhibitor of Factor Xa for the prevention of venous thromboembolic events in adults undergoing major orthopedic surgery of the lower limbs. There is no routine coagulation monitoring required but rivaroxaban possess a dose-dependet inhibition of Factor Xa activity. Until now, there exists no standard for calibration of anti-factor Xa activity. We examined the influence of rivaroxaban on activated rotation thrombelastometry ROTEM™, a frequently used point of care blood coagulation test.
Materials and Methods: 21 healthy male volunteers were included in the study after institutional approval of the protocol. Blood was obtained before and 2.5 hours after oral administration of 10mg Rivaroxaban (Xarelto™). Quality of clot formation was measured by the viscoelastic coagulation test ROTEM™ analyzing extrinsic- (Extem) and intrinsic-thrombelastometry (Intem). The following parameters were for interest: The onset of coagulation (coagulation time CT), kinetics of clot formation (clot formation time; CFT) as well as the alpha Angle and maximum clot firmness (MCF).
Results and Discussion: All baseline variables measured by ROTEM™ were within normal limits as given by the manufacturers. After data analyzing using nonparametric analysis with the Mann-Whitney-U-Test and post hoc comparison with Bonferroni correction, we found a considerable difference of the coagulation times CT of Extem (69±20s and 166±273s; $p < 0.001$) and Intem (221±53s and 268±68s; $p = 0.012$). All other examined parameters posses no statistical significant difference to the baseline values.
Conclusion(s): Oral intake of 10mg Rivaroxaban impairs blood coagulation 2.5 hours later statistical significant when measured using ROTEM™. We found an obvious difference of Extem-CT and Intem CT with a distinct range of the Extem-CT compared to the Intem-CT. To the best of our knowledge such effects of a direct thrombin inhibitor on viscoelastic coagulation monitoring parameters are not described. Further studies are needed to deterimine a possible value of Rotem especially in the practice of anaesthesia. In summary, Rivaroxaban influences blood coagulation as measured using ROTEM™. There is a significant difference compared to baseline for CT in the Extem- and Intem-measurements.

6AP2-5

Thromboelastography as screening tool for preoperative assessment of haemostatic abnormalities and risk of hemorrhagic complications in pediatric neurosurgical patients on long-term valproic acid therapy

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Background and Goal of Study: Severe intracranial hemorrhagic complications have been reported during anticonvulsive treatment with valproic acid (VPA) in children [1]. The goal of this study was to assess thromboelastography (TEG) as screening tool of haemostatic abnormalities in pediatric neurosurgical patients on long-term VPA therapy.
Materials and Methods: Blood samples for coagulation testing were preoperatively taken from 26 children (age: 9±4,7 yr, weight: 31±12 kg) on long-term VPA therapy (834±431 mg/kg/day) without bleeding history. 10 patients received VPA monotherapy, others received combined therapy with VPA. Standard coagulation laboratory tests (aPTT, PT, fibrinogen level, platelets count) were performed in all patients. TEG was performed by using native whole blood samples (TEG®5000, Haemoscope, USA). Main TEG parameters were analyzed (r, k, α, MA, LY30, CI). VPA therapy was not interrupted. Hemorrhagic complications were analyzed. Student's unpaired two-sample *t*-test or Mann Whitney test were used according to results of Kolgomorov-Smirnov test.
Results and Discussion: TEG signs of coagulopathy (CI<-3) were observed in 16 of 26 patients (CG group). Reaction time was 26±6 in CG vs. 12,8±4 min in patients with normal TEG parameters (NG group), p=0,01. Clot formation time was 13±4 in CG vs. 6±2 min in NG, p=0,01. Alpha angle was 18±6,7 in CG vs. 33±9° in NG, p=0,01. Maximal amplitude was 39±6 in CG vs. 51±5 mm in NG, p=0,01. Standard coagulation tests abnormalities were revealed in 5 patients in CG group. Specifically, significant difference in among standard tests was revealed only concerning to platelets count ($206±67x10^9$ in CG vs. $281±61x10^9$ l in NG, p=0.01). There were 2 hemorrhagic complications in CG despite of absence of any abnormalities in laboratory tests (1 postoperative haematoma, 1 chronic subdural haematoma).
Conclusion(s): TEG more frequently revealed VPA-associated coagulopathy than standard laboratory tests. TEG-evidence of coagulopathy may be predictive factor of postoperative hemorrhagic complications. Intracranial bleeding is extremely life-threatening, so we would like to recommend an important step in decision-making: if pediatric neurosurgical patient on long-term VPA therapy revealed any abnormality on preoperative TEG, VPA therapy should be stopped and surgery delayed till full recovery of normal TEG parametrs.

Reference:

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6AP2-6

Early clot firmness accurately predicts maximum clot firmness in thromboelastometry during cardiac surgery

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Background and Goal of Study: To ease transfusion and haemostasis management algorithms have been proposed based on point-of-care rotational thromboelastometry (ROTEM). However, early treatment decisions are hampered delayed by the long assay time to reach maximum clot firmness (MCF). Accordingly, we assessed whether early clot firmness accurately predicts MCF.
Materials and Methods: ExTEM (extrinsic activation by tissue factor + heparin inhibitor), FibTEM (ExTEM with additional cytochalasin D, to abolish platelet function), InTEM (intrinsic activation by elagic acid and phospholipids), and HepTEM (InTEM + heparinase) assays were performed in 82 patients undergoing cardiopulmonary bypass (CPB) surgery, i.e., prior to and after heparin administration, as well as after protamine administration. Clot firmness measured 5, 10, and 15 minutes after assay initiation was related to MCF eventually obtained (at least 40 min). Statistics: Regression and Bland-Altman analyses, the latter to assess bias between time related variables and MCF.
Results and Discussion: Data (table 1 and figure 1) reveal no major differences between clot firmness after 10 minutes and, with a mean bias of 9.1 mm (±3.1 SD) (ExTEM), 9.13 (±2.41) (InTEM), 10.84 (±2.76) (HepTEM), and 4.2 (±2.44) (FibTEM) over all data points.

Table 1. Bias (± SD) at specific time points, as obtained from Bland-Altman analysis, and mean MCF (± SD) for different assays and conditions.

Assay type / time	all data	before heparin	after heparin	after protamine
ExTEM / 5 min	18.69 (±3.64)	15.89 (±3.76)	20.47 (±3.09)	18.44 (±3.04)
ExTEM / 10 min	9.1 (±3.1)	6.68 (±2.11)	10.59 (±2.95)	8.92 (±2.79)
ExTEM / 15 min	4.84 (±2.4)	3.11 (±1.45)	6.04 (±2.62)	4.58 (±1.9)
ExTEM / MCF	55.81 (±9.87)	63.29 (±8.97)	51.92 (±10.31)	55.6 (±7.34)
InTEM / 5 min	18.83 (±3.7)	17.16 (±3.87)		19.74 (±3.3)
InTEM / 10 min	9.13 (±2.41)	7.72 (±2.83)		9.89 (±1.75)
InTEM / 15 min	4.8 (±1.9)	3.72 (±2.07)		5.39 (±1.53)
InTEM / MCF	57.77 (±8.29)	62.52 (±8.24)		55.2 (±7.17)
HepTEM / 5 min	20.53 (±4.3)		20.56 (±4.43)	20.5 (±4.23)
HepTEM / 10 min	10.84 (±2.76)		11.05 (±3.09)	10.64 (±2.42)
HepTEM / 15 min	6.16 (±2.32)		6.37 (±2.55)	5.95 (±2.01)
HepTEM / MCF	52.4 (±8.98)		51.14 (±10.44)	53.63 (±7.19)
FibTEM / 5 min	5.44 (±2.71)	5 (±1.97)	5.51 (±2.86)	5.56 (±2.85)
FibTEM / 10 min	4.2 (±2.44)	3.76 (±1.64)	4.16 (±2.47)	4.42 (±2.68)
FibTEM / 15 min	3.5 (±2.35)	3 (±1.7)	3.49 (±2.26)	3.72 (±2.64)
FibTEM / MCF	16.35 (±6.33)	19.81 (±8.44)	14.65 (±5.92)	16.56 (±5.08)

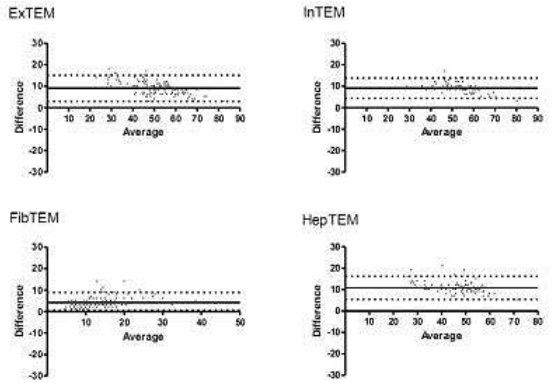

Figure 1: Bland-Altman plots for different assays over all data points. Difference: maximum clot firmness - clot firmness after 10 minutes, Average (maximum clot firmness + clot firmness after 10 minutes) / 2

Conclusion(s): Taking into account the bias at specific time points, clot firmness after 10 minutes quite reliably predicts MCF in all assays and, therefore, allows for time sparing yet reliable interpretation of ROTEM measurements prior, during, and

after heparin or protamine administration. However, even clot firmness after 5 minutes may be considered during more urgent situations when accounting for bias.

6AP2-7

Effect of magnesium sulphate on postoperative coagulation as measured by thromboelastography

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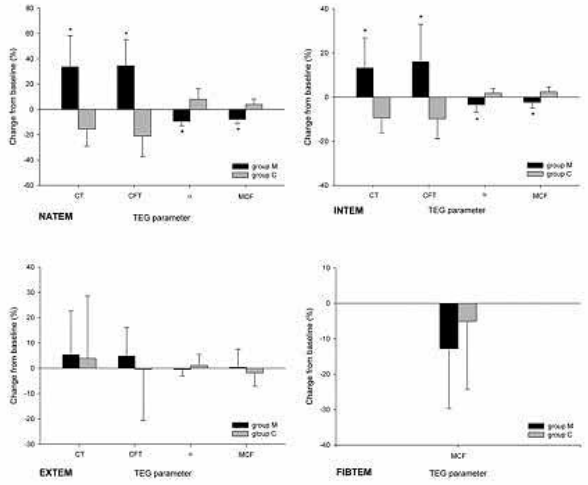
Background and Goal of Study: Arterial and venous thrombotic events are the clinical manifestation of postoperative hypercoagulability. Altered serum magnesium may play a role in the balance of coagulation. In this study, we investigated the effect of magnesium on the postoperative coagulation change in total intravenous anesthesia.

Materials and Methods: Forty patients were randomly allocated to two groups: group M (n = 20) and group C (n = 20). Group M received 50 mg/kg of magnesium sulphateover 10 minutes during the anesthesia induction, followed by the 15 mg/kg/h by continuous infusion during the operation. Group S received the same volume of isotonic saline as same method. Anesthesia was conducted with propofol and remifentanil, and crystalloid solution was infused at a rate of 4-5 ml/kg/h during the operation. Blood samples were collected immediately before and after the surgery to analyze hemoglobin (Hb), platelet (Plt), international normalized ratio (INR) of prothrombin time (PT), activated partial thromboplastin time (aPTT), serum magnesium, and for the thromboelastography (TEG) measurement. TEG was measured with the ROTEM® coagulation analyzer and NATEM, INTEM, EXTEM, and FIBTEM were performed.

Results and Discussion: In both groups, significant similar decreases in Hb ($p < 0.001$) and Plt ($p < 0.001$) after operation was shown but not different significantly between groups. PT (INR) and aPTT were also had no difference. There was a significant serum magnesium reduction in group C (1.02 ± 0.07 to 0.98 ± 0.06) ($p = 0.003$) and increase in group M (1.05 ± 0.07 to 1.58 ± 0.17) ($p < 0.001$). On TEG results, NATEM and INTEM reflected significant changes between two groups, that is, the percentage changes of CT (clotting time) and CFT (clot formation time) in group M were significantly larger compared to group C. The percentage changes in the α-angle and MCF (maximum clot firmness) were significantly smaller in group M, however, EXTEM and FIBTEM had no significant changes.



Conclusion(s): Intraoperative magnesium infusion, maintaining serum magnesium within normal or partially increased level, attenuated the postoperative hypercoagulability. This can be applied usefully to the patients with the perioperative high thrombotic risk.

6AP2-8

Level of agreement between the Clauss fibrinogen test and the rotation thromboelastometry FIBTEM test in cardiothoracic surgery

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Background and Goal of Study: It has been shown that fibrinogen is the first coagulation factor that may reach a critical level during perioperative bleeding. In cardiac surgery, fibrinogen levels are mainly monitored through routine laboratory tests, although it has been suggested that fibrinogen testing using rotational thromboelastometry (FIBTEM) may be a time saving alterative. Data concerning the level of agreement between the classical Clauss fibrinogen and the FIBTEM test is however limited. The aim of the present study was therefore to evaluate the association between both tests and to determine their specificity and sensitivity in the cardiothoracic surgical setting.

Materials and Methods: Patients (n=23) were included who underwent elective moderate to high-risk cardiac surgery using cardiopulmonary bypass (CPB). Citrated blood was drawn before induction of anesthesia (pre-CPB), after protamine administration (post-CPB) and at 3 (T=3) and 24 (T=24) hours postoperatively. All blood samples were subjected to a Clauss fibrinogen test and a thromboelastometry fibrinogen test (FIBTEM maximal clot firmness; ROTEM Delta, Pentapharm, Munich, Germany). Data were analyzed by correlation and specificity/sensitivity analyses and are represented as mean ± SD.

Results and Discussion: The fibrinogen concentration decreased from 3.2±0.7 g/l (pre-CBP) to 1.8±0.4 g/l (post-CPB) and increased above 2 g/l at T=3 and T=24 postoperatively. This was paralleled by FIBTEM values of 16.7±5.2 (pre-CBP), 9.7±3.4 (post-CBP), 12.4±5.3 (T=3) and 17.6±5.3 mm (T=24). There was a good correlation between the FIBTEM and Claus test for fibrinogen ($r=0.81$; $P<0.001$). Subsequently, the specificity and sensitivity of the Clauss and FIBTEM test as predictors for post-CPB Fresh Frozen Plasma (FFP) administration were calculated. Using a cut-off value of either 1g/l or 2g/l plasma fibrinogen, the specificity of the Clauss test was 100% and 31%, whereas the sensitivity was 11% and 78%, respectively. The FIBTEM test revealed a specificity of 92% and a sensitivity of 56% as predictor of the FFP need post-CBP.

Conclusion(s): In conclusion, there is a high level of agreement between the Clauss and FIBTEM fibrinogen tests. Moreover, the FIBTEM test showed a high specificity to diagnose the need for FFP, as source of fibrinogen, whereas its sensitivity was moderate. Our findings suggest that the FIBTEM test provides an alterative for the Clauss test to monitor the functional fibrinogen capacity during cardiothoracic surgery.

6AP3-1

A total balanced volume replacement strategy using a new balanced 6% hydroxyethyl starch preparation Tetraspan (HES 130/0.42) in patients undergoing major orthopaedic surgery

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Background and Goal of Study: The kind of fluid for correcting hypovolaemia is still a focus of debate. The goal of this study was to test the equivalence of efficacy and compare the safety of the 6% hydroxyethyl starch Tetraspan (HES 130/0.42/6:1) THES and a conventional, non-balanced fluid regimen CNBF for intravascular volume replacement therapy during major orthopaedic surgery.

Materials and Methods: 78 patients scheduled for major orthopaedic surgery were enrolled in a prospective, randomised, double-blind study. Hydroxyethyl starch was used as the exclusive artificial colloid and for intraoperative plasma volume substitution from induction of anesthesia until 2 hrs after the end of surgery. Efficacy was evaluated by comparing the amount of colloid infused, hemodynamics and colloid osmotic pressure (COP). Safety endpoints were blood loss, the use of allogenic blood products, coagulation variables and adverse events.

Results and Discussion: Effectiveness, as assessed by the total amount of infused volumes within the treatment period, was different between THES and CNBF (1,650 mL +/- 467 mL vs 2,095 mL +/- 626 mL) (P=0,0489). In addition, no differences were found for the use of other colloids (pasteurised plasma), hemodynamics and COP. In HES 130/0.42 patients, the postoperative increase of von-Willebrand factor (vWF) was higher ($P < 0.01$), blood loss was lower and less packed red blood cells were transfused.

Conclusion(s): Hydroxyethyl starch 130/0.42/6:1 Tetraspan is an effective plasma volume expander in orthopaedic surgery and may be used as the sole artificial colloid to cover the perioperative period.

Reference:

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6AP3-2

Risk factors for bleeding and transfusion during orthotopic liver transplantation

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Background and Goal of Study: Orthotopic liver transplantation (OLT) can be associated with haemorrhage particularly in patients with severe liver

dysfunction. Bleeding can occur at any time during the procedure and blood products must always be available. Bleeding and blood product requirements are hardly predictable [1, 2]. The aim of this study was to determine the risk factors for massive bleeding and transfusion during OLT in our institution.
Materials and Methods: We conducted an analysis of our OLT registry from 2004 to 2008. Univariate analysis (Chi-square test) and then multivariate analysis (logistic regression) were performed to identify risk factors for bleeding > one blood volume and for transfusion requirement > 4 red blood cells (RBC) units. ROC-curve analysis was used to determine optimal threshold values. Data are expressed as median [interquartile range] or OR [95% CI].
Results and Discussion: Between January 1 2004 and December 31 2008, 148 OLT were performed. Patients (men 72.3%) were 51 [46-58] years old. MELD (Model for End-stage Liver Disease) score was 14 [11-18] and for the 130 cirrhotic patients Child score was 9 [7-10]. Hepatocellular carcinoma (HCC) was present in 54 cases. Total blood loss was 4.0 [2.0-7.1] l, peroperative transfusion requirements were 4 [2-8] red blood cells (RBC) units and 4 [0-11] viro-attenuated plasma. Patients without HCC were at higher risk of bleeding *versus* those with HCC (p=0.004). In multivariate analysis, Child A category was protective whereas MELD score was a risk factor of bleeding: OR 0.16 [0.04-0.59] and 1.13 [1.02-1.24] respectively. ROC curve analysis for MELD score showed that a score of 12 was predictive of a bleeding > one blood volume with a sensitivity of 84 [73-91] % and a specificity of 51 [39-62] % (AUC=0.70). Preoperative haemoglobin was the sole risk factor for transfusion requirement; a threshold of 12.1 g/dl was predictive for transfusion requirement > 4 RBC units with a sensitivity of 70 [58-81] % and a specificity of 70 [60-79] % (AUC=0.71). Peroperative viro-attenuated plasma transfusion was correlated with RBC transfusion (R^2= 0.67).
Conclusion(s): Massive bleeding can occur at any time during OLT and risk factors found in our series are clinically poorly relevant. These results should make us cautious regarding our management of blood products for OLT.
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6AP3-3

Do third-generation colloidal solutions affect initial haemostasis?

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Background and Goal of Study: The aim of the present study was to assess the impact of third-generation colloidal solutions on crystalloids during initial haemostasis in parturients scheduled for Caesarean section (CS) under combined spinal-epidural anaesthesia (C.S.E.).
Materials and Methods: We studied 30 parturients, aged 25-30 years, ASA I-II, with a similar demographic background, scheduled for CS under CSE. The study exclusion criteria included: pathology of pregnancy, haemostasis and abnormalities administration of drugs affecting haemostasis. By blinded random sampling, the parturients were divided into two groups: Group A (n=15), the control group, and Group B (n=15). Before CSE, the parturients in Group A were pre-loaded with 1500ml of Ringer's Lactate (RL) crystalloid solution, while those of Group B with 500ml of a third-generation colloidal solution, with 6% hydroxyethyl starch 130/0.4 (HES). Two blood samples were taken from the parturients of both Groups: the first before pre-loading, time T_0 and the second after the end of pre-loading, time T_1. The assessed parameters were: PLT counts, PLT function of with col/epi and col/ADP and Von Willebrand factor ristocetin cofactor activity (VWF:RCo).
Results and Discussion: The statistical analysis of the results after ANOVA dispersion analysis did not show any statistically significant (SS) changes between the two groups in any parameter for time T_0 ($p > 0.05$), while an SS difference was shown only in two of these, col/epi and col/ADP for time T_1 ($p = 0.031$ and $p = 0.017$ respectively). The SS limit was set at $p < 0.05$.
Conclusion(s): The study showed that pre-hydration with third-generation colloidal solutions affects initial haemostasis, prolonging the formation time of the platelet plug. However, in absolute values, this prolongation did not exceed the upper normal limits, given that the VWF:RCo was not affected, and thus probably has no clinical effect, such as causing supradural haematomas. The evaluation of this conclusion requires further studies, as the international literature provides insufficient references.

6AP3-4

Coagulation changes following hepatic lobectomy: Preliminary results

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Background and Goal of Study: Most of the blood coagulation factors are produced by the liver, so that liver surgery could affect patients' coagulative profile. Several trials have used thromboelastography in order to study coagulative alterations following liver transplantation, but few data are available in the scientific literature regarding thromboelastograhic changes following major hepatic resection. The aim of the present study was to evaluate coagulation changes caused by major liver resection.
Materials and Methods: With Ethical Committee approval, 10 patients undergoing hepatic resection at the university Hospital of Parma (Italy) were prospectively studied. During surgery, general anaesthesia (GA) was maintained with oxygen and desflurane (6%). Arterial blood samples were collected immediately after GA induction (basal sample), 24 hours and 48 hours after surgery. Using a thromboelastograph, blood samples were analyzed for reaction time (r-time), maximum amplitude (MA)and alpha angle. Data distributions were analyzed using the Kolmogorov-Smirnov test. A series of correlated groups tests were then conducted comparing data collected at different times. According to data distribution, variables were compared using a paired-samples t-test (normally distributed variables) or a Wilcoxon signed-rank test (nonnormally distributed variables). After applying Sidak's correction for three comparisons, a value of $p < 0.017$ was considered significant. Variables are reported as mean (±SD).
Results and Discussion: The patients enrolled in the study included 5 men and 5 women, with an age range of 41 to 85 years. No statistical differences were found between basal and 24 hours postoperative values (r-time 10.4±1.6 min vs. 13.2±6.5 min respectively, p=0.181; MA 57.1±6.2 mm vs. 54.0±10.8 mm respectively, p=0.280; alpha angle 36.4±9.5° vs. 28.7±14.2° respectively, p=0.115), basal and 48 hours postoperative values (r-time 10.4±1.6 min vs. 10.8±4.6 min respectively, p=0.795; MA 57.1±6.2 mm vs. 54.0±17.1 mm respectively, p=0.551; alpha angle 36.4±9.5° vs. 38.7±10.7° respectively, p=0.631) or 24 hours and 48 hours postoperative values (r-time 13.2±6.5 min vs. 10.8±4.6 min respectively, p=0.455; MA 54.0±10.8 mm vs. 54.0±17.1 mm respectively, p=0.990; alpha angle 28.7±14.2° vs. 38.7±10.7° respectively, p=0.039).
Conclusion(s): According to present preliminary results, major hepatic resection seems not to influence patients' coagulative profile. However, the enrolment of further patients could led to new findings.

6AP3-5

Correlation of early rotation thromboelastography parameters with conventional coagulation tests in patients undergoing liver transplantation

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Background and Goal of Study: Massive blood loss and coagulopathy are common complications during orthotopic liver transplantation, affecting survival and mortality in several patients. Since the eighties thromboelastography (TEG®) and lately rotation thromboelastography (ROTEM®) has been used to guide transfusion therapy in liver transplantation. ROTEM parameters have been validated in different groups such as healthy pregnant, cirrhotic and trauma patients to assess the coagulation status. CA15EXTEM (cloth firmness after 15 min) and CA10FIBTEM (cloth firmness after 10 min) have been proposed as premature trustworthy indicators. The aim of this study is to evaluate the reliability of these parameters in patients who were undergoing liver transplantation.
Materials and Methods: Through this prospective observational study, thirty-seven patients undergoing liver transplantation were included. Standard coagulation and complete blood counts were performed upon their arrival to the operation room. We evaluated in the sample the MCF-EXTEM (maximal cloth firmness), CA15EXTEM, and CA10FIB-TEM values in the pre-anhepatic period and correlate them with conventional coagulation tests: Prothrombin Activity (PA), Fibrinogen level and Platelets count. The correlation between ROTEM data and the results of conventional coagulation tests was assessed by Spearman correlation analysis.
Results and Discussion: As expected, an inverse correlation was found between the MELD classification and the Prothrombin Activity (PA) ($r = -0.63$, $p < 0.0001$). It was also possible to detect a moderate positive correlation between MCF-EXTEM and CA15EXTEM (r=0.972, p<0.001); PA and MCF-EXTEM ($r = 0.50$, $p < 0.001$) and PA with CA15EXTEM ($r = 0.49$, $p < 0.002$). Also, a significant correlation is shown between fibrinogen level and CA10FIBTEM ($r = 0.66$, $p < 0.0001$) and between platelet count and MCF-EXTEM (r=0.52, p < 0.001).
Conclusion(s): In order to shorten the time of decision to treat coagulation disorders in liver transplantation, ROTEM parameters provide an earlier diagnosis of haemostasis abnormalities. Beyond this point CA15EXTEM and CA10FIBTEM show a moderate correlation with PA and fibrinogen level respectively. They might be reliable and earlier indicators that could be used to guide the coagulation therapy. However it will be necessary more studies to evaluate sensitivity, specificity, positive and negative predictive values.

6AP3-6

Differences in transfusion requirements of liver transplantation recipients: Non-heart-beating donors vs brain-death donors

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Background and Goal of Study: Non-heart-beating donors (NHBD) are increasingly been accepted for liver transplantation. Recipients of these grafts may have a higher risk of primary failure and post-reperfusion coagulopathy compared to brain death donors (BDD)[1]. The goal of this study is to assess if receiving NHBD liver grafts is associated with more blood components transfusion, antifibrinolytic drugs, fibrinogen and aFVIIr consumption.
Materials and Methods: We designed a retrospective cohorts study. During the last two years a group of recipients of NHBD grafts was collected and compared with a group of recipients of BDD grafts. Age, sex, weight, aetiology of liver disease, MELD score, ischemia times and preoperative coagulation tests were recorded. Transfused blood products were identified (expressed as median and interquartilic range in litres). Fibrinogen concentrate, antifibrinolytic drugs and aFVIIr administration were mesaured (showed as number of patients and frequency). The U-Mann Whitney for cuantitative variables and chi-squared test for cualitative variables were used.
Results and Discussion: Twenty three in the NHBD group and twenty three in the BDD group were recruited. Demographics values, aetiology and disease severity showed no significant differences between both groups. Results are summarized in Table 1. NHBD group patients received significantly more fresh frozen plasma (FFP), antifibrinolytic drugs and fibrinogen concentrates. Nearly significant differences were found regarding packed red blood cells and platelet units administered. A non significant difference in the aFVIIr use was found.
Conclusion(s): Our results suggest that NHBD graft recipients develop more severe coagulopathy and bleeding than BDD group. These reveals the different physiopathology of NHBD vs BDD, and should make the clinician anticipate the products will probably be needed. More studies are necessary to categorize the causes of these differences.
Reference:

1 Jimenez-Galanes, S. et al. Liver transplantation using uncontrolled non-heart-beating donors under normothermic extracorporeal membrane oxygenation. Liver Transpl, 2009. 15(9): p.1110-8.

6AP3-7

Predictors of primary graft non-function (PGNF) in adult recipients undergoing orthotopic liver transplantation (OLT)

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Background and Goal of Study: Primary graft non-function during the first month of OLT can seriously affect the morbidity and mortality. Antioxidants including methylene blue (MB) have been used to minimize the impact of ischemic-reperfusion injury on graft function and survival and ameliorate the hemodynamic tribulation during graft reperfusion. However, the effectiveness of this therapeutic intervention is not certain. The aim of this study was to identify the most important factors affecting early graft survival.
Materials and Methods: We reviewed the medical records of 240 adult patients who underwent first time OLT at UPMC, January 2005 – December 2006. One patient was excluded because of incomplete data. Patients were divided into two groups: group-1 (n =220) consisted of patients without PGNF and group-2 (n = 19) comprised patients with PGNF. Logistic regression was used to indentify significant predictors of PGNF from the following variables: age, gender, MELD score, extended donor criteria (EDC), surgical time, cold ischemic time (CIT), warm ischemic time (WIT), massive transfusion (more than 1 blood volume), MB and postreperfusion syndrome (PRS) (1).
Results and Discussion: [table1]Massive transfusion (p=0.018) and postreperfusion syndrome (p=0.0001) were the only significant predictors of PGNF. Patients who received massive blood transfusions and developed severe PRS were 59 times more likely to develop PGNF than those who did not.

	No PGNF (N=220),	PGNF (N=19),	p
Age (years),	56.11±9.52,	55.79±7.48,	0.885
Gender,	M:144 (60.3%); F: 76	(31.8%), M: 12 (5%); F: 7 (2.9%)	0.829
MELD score,	19.62±7.84,	20.11±10.53,	0.845
EDC,	115 (52.3%),	12 (63.2%),	0.351
Surgical time (hours),	7.16±1.78,	7.70±1.93,	0.212
CIT (hours),	10.87±2.41,	11.37±2.27,	0.384
WIT (min),	27.02±7.32,	37.79±28.67,	0.120
Methylene blue,	175 (79.5%),	18 (94.7%),	0.086
Blood transfusion /blood volume,	0.42±0.35,	0.95±0.72,	0.005*
PRS,	Mild: 209 (87.4%); , Severe: 11 (4.6%)	Mild :9 (3.8%); Severe: 10 (4,2%),	<0.0001*
Patient survival (1 year),	84.1%,	0%,	<0.0001*

t-test; Chi square test, p<0.05 was considered statistically significant

Conclusion(s): Massive blood transfusion and PRS is associated with primary graft non-function after OLT.
Reference:

1 Ibtesam Hilmi & al: The impact of Post-Reperfusion Syndrome on short-term and Liver Allograft Outcome in Patients Undergoing Orthotopic Liver Transplantation. Liver Transplantation, April 2008.

6AP4-1

In vitro determination of the inflammatory potential of blood products

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Background and Goal of Study: The routine storage of blood components leads to generation and accumulation of biologic response modifiers (cytokines and lipids) with potent inflammatory potential. Albeit stored in stabilising medium, cellular break down might account for a higher inflammatory potential in blood products with longer storage time. In view of blood transfusion safety, most blood products are nowadays leuko-reduced. However, transfusion-related inflammatory reactions (e.g. transfusion-related acute lung injury) still remain among the most feared complications of blood transfusions.
Materials and Methods: In supernatant from leukoreduced packed red blood cells (PRBC), platelet concentrates (PC), fresh frozen plasma (FFP) and Octaplas®, concentrations of IL-6, IL-8, TGF-beta, CD40-Ligand, MCP-1, CXCL-1, and total lipid concentration were storage-dependently determined. In a second step, to assess the inflammatory potential, supernatants were incubated with human blood microvascular endothelial cells (HBMVEC), unstimulated or previously primed with LPS, and de-novo synthesis of IL-6, IL-8, and CXCL-1 was measured.
Results and Discussion: Cytokine and lipid concentrations remained mostly stable throughout storage. However, they differed significantly between types of blood products. In our in vitro transfusion model, the inflammatory response to supernatant increased tremendously when HBMVECs were previously primed, with the highest burst upon exposure to PC and FFP. Statistical analysis identified a positive correlation between the initial lipid concentration in PRBC and PC and the magnitude of the inflammatory reaction. However, no correlation could be found between the initial cytokine concentration of a blood component and the inflammatory burst induced by its transfusion on HBMVECs.
Conclusion(s): These observations underline the hazardous nature of blood transfusions, irrespective of storage time and cytokine concentration, especially in patients with endothelial activation as seen in any systemic inflammatory reaction.

6AP4-2

Perioperative factors influencing blood loss and transfusion in scoliosis patients undergoing spinal surgical procedure

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Abstract 6AP3-6 – Table 1

	Red Blood Cells	Platelets	Fresh frozen plasma	Fibrinogen	Antifibrinolytic drugs	aFVIIr
Non-heart-beating donors	4.1(3.8)	0.7 (0.6)	5.1 (3.3)	21(91.3%)	22 (95.6%)	7(30.4%)
Brain death donors	2.6(1.9)	0.44 (0.3)	3.1 (1.8)	7 (3 %)	9 (39.1%)	2 (8.7%)
p	0.07	0.06	0.005	0.001	0.002	0.1

Background and Goal of Study: The purpose of this study was to identify clinical factors associated with an increased risk of perioperative blood loss and transfusion in Scoliosis patients undergoing spinal surgical procedure.
Materials and Methods: We retrospective evaluated 116 patients with scoliosis who underwent spinal surgical procedure and met our inclusion criteria at Nanjing Drum Tower hospital between August, 2005 and August, 2007. Clinical factors including pathological and surgical characteristics were studied to identify the association with blood loss and the need for perioperative allogeneic red cell transfusion.
Results and Discussion: 101 patients (87%) of the 116 patients received perioperative allogeneic red cell transfusion. On Spearman's correlation analysis, variables found significantly related to perioperative blood loss included cobb angle, number of vertebrae fused, pre-tansfusion haemoglobin, duration of surgery, intra-transfusion and post-operative drains. As to perioperative allogeneic red cell transfusion, Binary logistic regression analysis showed Cobb angle, number of vertebrae fused, intraoperative blood loss, and preoperative platelet count as independent influential factors. Weight, cobb angle, the amount of intraoperative blood loss were independently predictors of perioperative blood transfused according to stepwise multiple regression.
Conclusion(s): Our findings indicate that clinical variables such as cobb angle, number of veterbrae fused and duration of surgery may have negative effect on the risk of perioperative blood loss in patients undergoing spinal surgical procedure. Cobb angle, number of veterbrae fused, intraoperative blood loss and preoperative platelet count were the independent factors associated with blood transfusion. Weight, Cobb angle, veterbrae fused and the amount of intraoperative blood loss were independent predictors of the amount of intraoprative transfusion. The analysis of these parameters might help to stratify patients with different risks for transfusion and may increase the efficiency and reduce the cost of blood-ordering practices associated with spinal surgical procedure.

6AP4-3

Role of prothrombin complex concentrate in the clinical management of hemorrhagic situations in an academic tertiary care medical center

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Background and Goal of Study: Prothrombin complex concentrate (PCC) is a useful method for the prophylaxis (in surgery) and treatment in hemorrhagic situations caused by the congenital or acquired deficiency of vitamin K dependent factors of coagulation. The goal of the study was the evaluation for indications, efficacy and adverse effects related with the use of PCC.
Materials and Methods: We report the results of an observational, prospective study performed in a 420-bed general hospital. For each patient the following parameters were collected: age, gender,weight and height, relevant medical history, indication and dose of PCC, basic coagulation parameters previous to, and within 24 h after PCC administration, complementary therapies to improve coagulation, safety (by describing any adverse event documented in clinical records until discharge) and mortality.
Results and Discussion: During an eleven-month period, 26 patients received PCC. Indication: reversal of anticoagulant therapy before emergent surgery (16 patients, 61%), intracranial hemorrhage related to anticoagulant therapy (2 patients, 8%), live threatening hemorrhagic situations not related to anticoagulant therapy (8 patients, 31%; 3 cirrhotic patients, 4 septic patients, 1 consumption coagulopathy). In 18 (69%) cases was used as monotherapy but in 8 (31%) cases was combined with fresh frozen plasma, fibrinogen concentrate or FVIIa. The PCC dose was 16.35 (10.8) UI/kg body weight; m(SD). Only 7 patients (27%) achieved INR < 1.3. Nine patients (35%) died: multiorganic failure related to septic shock (5), neurological consequences (2), hemorrhagic shock (1) and respiratory failure (1). Other morbidity observed was: bacterial pneumonia (4), acute renal failure (4), evisceration (1), thrombotic complications (2) (transient ischemic attack and ischemic colitis).

Coagulation parameters before and after PCC administration

	Baseline; m(SD)	1 h after PCC; m(SD)
INR	2.28 (1)	1.47 (0.6)
PT (%)	35 (13)	59.5 (15.7)
Fibrinogen (mg/dL)	444 (232)	403 (226)

Conclusion(s): 1.- A high use of PCC (31%) was not related with anticoagulant therapy (off label). 2.- Only in 27% of patients, coagulation was completely normalized, probably of PCC underdosage. A dose PCC protocol according to baseline INR and body weight is required. 3.- The observed thrombotic complications rate (8%) was higher than reported[1] (1.5%).

Reference:

1 Leissinger CA, et al. Role of prothrombin complex concentrates in reversing warfarin anticoagulation: a review of the literature. Am J Hematol. 2008 Feb;83(2):137-43.

6AP4-4

Transfusion in gastrointestinal cancer surgery: A comparative study between two time periods

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Background and Goal of Study: Allogenic blood transfusion has been associated with increased infection risk, tumour recurrence and higher perioperative morbidity in patients with gastrointestinal (GI) cancer. In the last years, systematic oral iron is administrated when anaemia is present in GI cancer patients, in order to minimize transfusion requirements during surgery. Moreover, laparoscopy has become the standard approach for this surgery in our Institution.
Goal of Study: To compare blood transfusion requirements between 2003 and 2009 and to identify determinant factors for blood transfusion in patients with GI cancer underwent to colon or gastric tumour resection.
Materials and Methods: We retrospectively studied all patients with GI cancer submitted to laparoscopic resection during two different periods: Group 2003 (January 2003-December 2003) and Group 2009 (January 2009-August 2009). We compare those who received blood transfusion to those who did not in each period. Demographic data, diagnosis and cancer site, haemoglobin and hematocrit levels at time of diagnosis, the day of surgery (just after anaesthesia induction), and at discharge from hospital were registered. Blood transfusion requirements before, during and after surgery were also recorded.
Results and Discussion: There were no differences in demographic data between both time periods. Cancer location was similar except for rectum (less frequent in 2009). Hematocrit at time of surgery was higher in 2009 than in 2003 (31% *vs* 34%, respectively, p<0.05). Percentage of patients who required blood cell transfusion was higher in 2003 period compared with 2009 period (70 of 187 (37%) *vs* 51 of 183 (28%) patients respectively, *p*<0.05). In 2003, perioperative mean blood cell transfusion (n=70) was higher than in 2009 patients (n=51) (4.3±3.8 versus 1.2±2.8 red cell units, respectively, p<0.05).
Conclusion(s): These results suggest that better preoperative conditions (higher hematocrit and haemoglobin levels) and, probably, improvements in surgical technique have reduced blood transfusion in our GI cancer patients underwent surgery.

6AP4-5

The value of initial base deficit to predict blood transfusion requirements in elderly trauma patients

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Background and Goal of Study: Base deficit (BD) at admission to intensive care unit has been shown to be a valuable indicator to identify patients more likely to require transfusion after trauma [1]. However the number of studies is still limited to specifically evaluate its value and make final conclusions in elderly trauma patient population. The purpose of present study was to assess the ability of the initial BD to predict blood transfusion requirements in 60 years and older trauma patients.
Materials and Methods: A retrospective analysis of medical records of 128 patients with severe trauma admitted to a tertiary hospital intensive care unit from January 2008 through June 2009 was done. Patients' age range was 60-82 years. According to locally used protocols arterial blood gases were obtained within 1 hour of admission. The initial BD was assessed as an independent predictor of blood transfusion requirement using regression analysis. Paired t test, analysis of variance and chi squared analysis were also used to complete statistical measurements.
Results and Discussion: According to the results of regression analysis the initial BD was an independent predictor of blood transfusion requirement, with an odds ratio of 13.8 for BD of -7 mEq/L or less (confidence interval 3.62-35.28, *P*=0.037). Transfusion requirements increased as the BD became more severe. Packed red cell transfusions were required within 24 hours of admission in 78% of patients with a BD < or = -7 versus 17% of patients with a BD > -7 (p < 0.001, chi 2).
Conclusion(s): The BD at admission in trauma patient population over 60 years was an independent predictor of blood transfusion requirements within 24 hours, which increased with worsening BD. Blood transfusion requirements were significantly high when initial BD was less than -7 mEq/L, therefore this population of patients with BD < or = -7 should undergo type and cross-match soon after admission to save time before blood transfusion.

Reference:
1 Davis JW, Parks SN, et al. Admission base deficit predicts transfusion requirements and risk of complications. J Trauma Injury, Infection and Critical Care. 1996; 41: 769-774.
Acknowledgements: Authors express their deep gratitude to humanitarian association "HayMed" (France) for versatile support.

6AP4-6

Use and misuse of blood and blood products: Evaluation of the impact of new fridge lock system and the cost analysis

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Background and Goal of Study: The blood products are valuable resources and the wastage could impose massive economic burden to healthcare. The aim of the study is to look into the change in the pattern of the use and wastage after implementing fridge lock system in the hospital and the cost involved.
Materials and Methods: We looked into the yearly use of blood and the wastage of blood products between various specialties in this London teaching hospital. The fridge lock system would not allow returning the blood products back in to the fridge after a certain time (if they are out of temperature control). The blood transfusion team also kept a record of the labels from the blood products used. The details were retrospectively collected from the transfusion department database.
Results and Discussion: The average blood wastage in the United Kingdom is about 5%. At Kings College Hospital, the cost of yearly use of blood is about 5.5 million pounds. The wastage was 2.35% (£129382.86) and 5.12 %(£293340.9) in the year 2006-07 and 2007-08 respectively. A trust wide target of 4% for the blood wastage was set. The trust implemented the blood tracking system as well as fridge lock system in March 2008. Surprisingly, despite the measures to limit the wastage, this went up to 6.7 %(£400051.29) in 2008-09 which was higher than the previous year (2007-08). But, during the last 7 months (March 2009 onwards) wastage is down dramatically and currently is around 4.24 %(£161267.00)). When we realised that the blood wastage in the trust was above the national average, the plan for improving the situation was put in place. After the introduction of the blood tracking system the wastage was higher than expected. The lack of awareness and practical experience of the use of the new system as well as enhanced detection of the wastage contributed to the rise. The Transfusion managers as well transfusion specialist practioners worked to improve the "awareness" of the situation. They met various care group teams and presented the data in the monthly audit meetings. The wastage was reported as an "adverse incident". The wastage data was published in the monthly news letter of the trust. As the hospital staff got more used to the system and due to higher awareness, the wastage is less than the national average now.
Conclusion(s): Blood and blood products are made from limited resources. Raising awareness as well as implementing systems to prevent the wastage could have positive impact on the health care system.
Acknowledgements: Mr. Masa Ida Transfusion manager Kings College Hospital.

6AP4-7

Intraoperative fresh frozen plasma transfusion in patients with increased bleeding diathesis and its effects on clotting profile

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Background and Goal of Study: Intraoperative use of fresh frozen plasma (FFP) during active bleeding or due to increased bleeding diathesis remains quite common despite concerns regarding its clinical effectiveness and its potential complications. The purpose of this study was to investigate the effects of intraoperative FFP transfusion on clotting profile, new bleeding episodes and transfusion complications in patients undergoing lumbar spondylodesis.
Materials and Methods: In this controlled clinical trial we studied 70 patients (30 men, 40 women, of average age 53,4±14,1 years and average weight 80,34±15,63 kg) who underwent lumbar spondylodesis. Thirty-seven patients (group A) exhibited increased bleeding diathesis, as perceived by the surgeons, who requested FFP to be given intraoperatively. At the time of the FFP request PT, PTT and INR were checked and blood loss was documented. Thirty-three patients (group B) did not exhibit increased bleeding diathesis and did not receive FFP intraoperatively; they also had their PT, PTT and INR checked right before the end of the operation. Both groups had their postoperative blood loss documented and their clotting profile checked 6 hours postoperatively. Possible side effects associated with the use of FFP were also recorded. Comparisons between groups were made using student T-test.
Results and Discussion: None of the patients in group A suffered massive bleeding (median blood loss 577±381 ml). The FFP dose transfused in group A patients was 10 ml/kg. Both groups had normal intraoperative and postoperative PT, PTT and INR. Group A patients suffered significantly higher (p=0,00029) postoperative blood loss compared to group B patients. One patient in group A developed postoperative haemodynamic instability possibly associated with the FFP transfusion.

	GROUP A	GROUP B
Intraoperatively		
PT	14,9	13,9
INR	1,16	1,08
PTT	35,37	34,89
Postoperatively		
PT	14,38	13,97
INR	1,12	1,07
PTT	31,14	33,66
Blood loss	316,97	149,42 (p=0,00029)

Conclusion(s): The clinical impression of increased bleeding tendency was not confirmed by abnormal values of PT, PTT and INR and may require further testing. FFP transfusion did not have a beneficial effect on blood loss or clotting profile postoperatively. Therefore anaesthetic and surgical clinical practice must comply with the indications of FFP transfusion in the intraoperative period.

6AP4-8

Postoperative complications related to allogeneic transfusion in major surgery. The multicenter, prospective study *ARISCAT*

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Background and Goal of Study: The perioperative allogeneic transfusion has been associated with worse postoperative outcome although it is difficult to know which is the real role of transfusion due to numerous confounding factors in this context. The aim of this study is to assess the relationship between allogeneic transfusion and postoperative complications and mortality.
Materials and Methods: Data from prospective multicenter cohort study performed in 59 hospitals of Catalonia (Spain) during 7 randomly selected days in 2006, were analyzed. Perioperative data from patients undergoing major surgical procedures were compiled and analyzed according to the use of allogeneic blood transfusion (ABT). Associations were estimated by regression modeling with adjustment for potential confounding by the propensity score-based matching analysis for transfusion.
Results and Discussion: We included 2464 surgical patients and 11% were transfused in the perioperative period. Transfusion was associated with a nearly eight-fold increase in the odds off postoperative complications and 10 days longer hospital stay. After adjustment for the major confounding using logistic regression analysis, the allogeneic transfusion was still associated with increased postoperative complications (OR 1.8, 95% confidence interval 1.2-2.6). In a propensity-matched cohort of patients, allogeneic transfusion was associated with an increased respiratory failure OR 2.3 (1.1-5.02), increased postoperative infections OR 2.03 (1.01-4.08) and renal failure OR 3.4 (1.1-10.5), but not with increased 30 and 90 days mortality.
Conclusion(s): The allogeneic transfusion is a consistent factor of higher postoperative morbidity but not increases significantly the postoperative mortality, possibly because in the propensity-matched cohort, the sample was insufficient to assess this item.

6AP4-9

Fresh frozen plasma transfusion in cardiac surgery: Changes in the procoagulant haemostasis components

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Background and Goal of Study: Fresh frozen plasma (FFP) is often administered for the correction of bleeding following cardiac surgery. The effect of transfusion in relation to both standard coagulation tests, and to tests that reflect the functionality of the substrate elements (i.e. fibrinogen) and of the enzyme elements involved in thrombin generation has not been evaluated to date in the setting of acute bleeding after cardiopulmonary bypass. Since the transfusion of FFP is associated with a number of risks, including pathogen transfusion, immune suppression and acute lung injury, a precise assessment of its benefits regarding coagulation is necessary.

Materials and Methods: The study assessed the changes in coagulation induced by FFP administered at the end of cardiopulmonary bypass in 40 patients. Apart from standard laboratory analyses that included fibrinogen concentration and prothrombin time (PT), data on clot quality (thromboelastrometry, ROTEM®, using EXTEM and FIBTEM) and on thrombin generation was recorded.
Results and Discussion: Median FFP dose was 11 ml/kgbw with mean FFP unit volume of 280 ml. After transfusion, fibrinogen showed a statistically non-significant increase to 117% (from median 1.9 to 2.1 g/L, Mann-Whitney U test). PT decreased significantly ($p<0.0001$) to 87% (from 18.8 to 16.3 s) without reaching normal values in any of the patients. The thromboelastometric results showed that MCF EXTEM remained unchanged (from 54 to 55 mm) while MCF FIBTEM increased to 121 % (from 14 to 17 mm, $p>0.05$). CT was significantly shortened to 78% (from 75.5 to 59 s) ($p<0.0001$) and was normalized in 81% of the patients. As for thrombin generation, the lag time was significantly prolonged to 170% (from 1.7 to 2.9 min) ($p<0.0001$), while the endogenous thrombin potential surprisingly decreased to 93% (from 1387 to 1292 nM x min) ($p=0.1336$, not statistically significant).
Conclusion(s): In most patients, clot quality was not improved by FFP transfusion, but only acceleration of haemostasis was achieved. Further research is required to establish if this effect is sufficient to recommend FFP transfusion after CPB.

6AP5-1

Diagnostic value of the soluble transferrin receptor in the treatment of perioperative anemia with erythropoietin and intravenous iron

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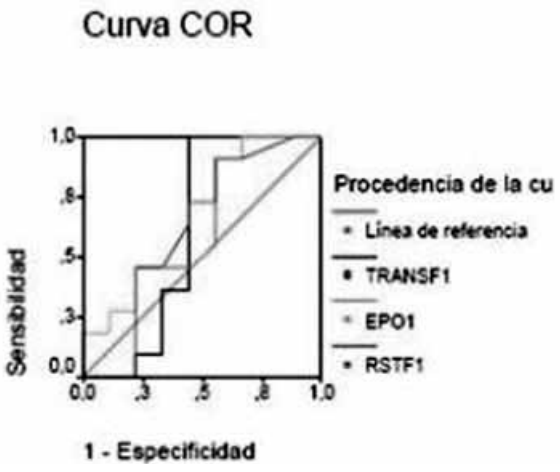
Background and Goal of Study: Preoperative anemia is usually present in patients scheduled by orthopedic surgery. Soluble transferrin receptor (sTfR) is not affected by inflammation and it allows for the discrimination of anemia associated with chronic diseases from iron deficiency anemia. The purpose was to find a laboratory trial to improve the treatment of perioperative anemia.
Materials and Methods: After obtaining written informed consent, 20 patients received 200 mg intravenous iron (Venofer) and 40.000 U.i erythropoietin subcutaneous (Eprex) over 7 days starting 4 weeks before surgery. Changes of C-reactive protein (CRP), Erythrocite sedimentation rate (ESR), endogenous erythropoietin (EPO) and iron status (ferritin, transferrin, sTfR)were measured at 4 weeks, day of surgery and at discharge 5th day. Data were analysed using ANOVA, Pearson´s correlation and followed by COR curves for variables with significance statistic. All statistics were performed with SPSS 13.0, and a p value of less than 0.05 was considered significant.
Results and Discussion: In the study there is 60% of positive response (increase haemoglobin in 1,5 gr.dl^{-1}) after this treatment. None of the variables analyzed showed positive correlation-r to the treatment response. However the three variables have been chosen with greater partnership, were analyzed by the ROC curves to observe the sensitivity and specifity of test used as predictors of treatment response. Observing that, none of them would be valid as a single test and no differences between them to suspect that with larger sample could be. We can also say that there is a statistical trend (r=0,45, p=0,06) between sTfR increased and hemoglobin increased during the preoperative period with the estimated treatment.



ANOVA -PEARSON CORRELATION-

Test	Positive Response	Negative Response	Signif
Transferrin	244,2±19,5	279,2±63,7	0,10
sTfR	3,1±0,5	3,6±1,3	0,29
ESR	38,6±22,5	55,1±16,1	0,08
Endog EPO	15,1±4,9	36,9±53,3	0,19

Conclusion(s): With the limitations of size sample, absence of a control sample, and initial functional iron deficiency in all patients selected we can say that none of the analyzed parameters allows us to predict response to our combination therapeutic.

6AP5-2

Improving preoperative haemoglobin values we can reduce allogenic blood transfusion and length of hospitalary stay in total knee arthroplasty

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Background and Goal of Study: Total knee arthroplasty is a procedure associated with important blood looss. The optimum strategy for reducing allogenic blood transfusion (ABT) is not established. Preoperative haemoglobin(Hb) value is the most important predictive factor for ABT. This prospective study shows that increasing preoperative Hb values associated with postoperative blood reinfusion system can reduce ABT index.
Materials and Methods: We conducted a quality improvement program to examine the effect of intravenous iron treatment + low dose erythropoietin(EPO) in our patients. Preoperative Hb values distribute the patients in four groups: GroupA:Hb≥15g/dl no treatement; GroupB:Hb ≥13-15g/dl receive 200mg iv iron one week before surgery; GroupC:Hb≥11-13g/dl receive 200 mg iv iron+ EPO 40000U sc. two weeks and 200mg iv iron one week before surgery; GroupD receive 200 mg iv iron+ EPO 40000U sc one dose three weeks and two weeks before surgery. All patients receive 200mg iv iron after surgery. We compare data with consecutive patients operated before the implementation of the program. We studied demographic data, values of preoperative haemoglobin and haematocrit, the day of sugery, and in the postoperative days 1,2and at discharge and secondary effects. Postoperative blood reinfusion system was used in all patients. Number of patients receiving ABT and number of units were also recorded. ABT was indicated if Hb levels ≤8,5g/dl (Hospital guidelines).
Results and Discussion: 478consecutive patients were included. 127 patients as a Control Group and 351patients in the treatment group(52 in group A, 194 in group B, 99 in group C and 6 in group D).Patients were similar in demographic data,type of prosthetic implant and length of surgery. Median values of preop. Hb were G. A 15,45±0,7g/dl, G. B 13,69±0,59g/dl, G.C 12,25±0,57g/dl, G.D10,21±0,89 and Group Control 13,65±1,27 g/dl. Hb and haematocrit values increased significantly after assigned treatment in groupC(12,56±0,86 p=0,0005) and D(11,65±1,64 p=0,01). **23patients of Control (18,1%) received ABT versus 40patients in treatment group (G.A 3, B 15, C20 and D2) (11,3%). Units per patient Group A 0,11±0,47; B 0,16±0,57; C 0,39±0,86; D 1±1,41, and in Control 0,35±0,84. No adverse effects were recorded. Hospitalary stay was reduced after treatment(7,47±2,77 vs 9,31±4,02 p=0,0001)**
Conclusion(s): Preoperative haemoglobin can predict the need for ABT transfusion. Preoperative treatment with iv iron±low doseEPO reduces in 40% ABT transfusion and decreases hospitalary stay in 2 days in our patients.

6AP5-3

Intravenous iron supplementation in elderly patients with traumatic hip surgery in order to reduce perioperative transfusion requirements

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Background and Goal of Study: Perioperative anemia is an independente risk factor for mortality and morbidity in traumatic hip surgery, especially in elderly patients. Aim of the study was to investigate whether giving an intravenous iron preparation (Venofer®) to anemic patients before and after traumatic hip surgery improves their anemia and reduces the need for perioperative blood transfusion
Materials and Methods: Among 560 elderly patients who underwent traumatic hip surgery between january and december 2009, we studied 68 anemic patients who received iron supplementation for at least 5 days perioperatively

(200mg/day) – Group A and 69 anemic patients who did not – Group B. Blood tests included FBC and blood film, serum iron, coagulation screen, renal and liver function tests and C-reactive protein. Anemia was defined as a hemoglobin (Hb) level at first presentation of ≤10.0g/dl. Hemoglobin, hematocrit (Ht) and serum iron levels were measured at first presentation, then immediately before and after surgery and in day three after surgery. We also calculated intraoperative blood loss and compared perioperative transfusion rates. We also try to minimize blood loss during surgery by using low blood pressure technique during the operation, zealously cauterized cut vessels, perioperative blood salvage technique.

Results and Discussion: There were no significant differences between groups A and B in age, sex, surgical technique, and operating time. Their Hb and Ht values were similar at first presentation, but significantly different immediately before surgery (both $P < 0.0001$). Hemoglobin increased significantly ($P < 0.0001$) after intravenous iron treatment. Overall, the mean maximum increase was 1.8 ± 0.6 g/dl (range, 0.6–2.8 g/dl) and serum iron (13.3 ± 4.6 to 13.1 ± 4.5 µm) did not change significantly after intravenous iron treatment. There were no significant differences in intraoperative blood loss between the groups, but significantly fewer patients in group A needed an intraoperative blood transfusion (5.9% vs 20.8%, $P < 0.05$) and in the first three day after the operation (2.3% in group A vs 11% in group B, p=0.05).

Conclusion(s): Routine iron supplementation for 3 days before traumatic hip surgery in elderly patients increases Hb and Ht values in anemic patients, and reduces the need for perioperative transfusion.

6AP5-4

Blood management in elective orthopedic surgery: A study in 23 centers in Belgium

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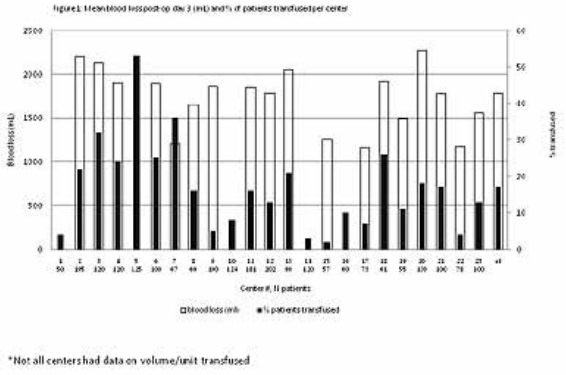
Background and Goal of Study: No recent data are available on blood management in elective knee or hip arthroplasty in Belgium. The primary objectives of this retrospective study were to determine prevalence of pre-operative anaemia and rates of transfusion in this population. Secondary objectives included blood loss, evolution of haemoglobin (Hb) and variability among centres.

Materials and Methods: Data were collected in consecutive patients (pts) undergoing elective surgery for hip or knee prosthesis in Belgium between Jan 1st and March 31st 2008. Pts were excluded if age <18, emergency surgery, major medical event (e.g. trauma, haemorrhage) in the 30 days before surgery or inclusion in an interventional study. Hb levels were collected pre- and post-operatively, and prior to transfusion. Blood loss was calculated as described (1). Transfusion rate was determined for the whole population and per centre. Descriptive statistics were calculated using SAS (version 9.1.3).

Results and Discussion: 2449 pts from 23 centres were included (median 100, range 50-202 per centre). Mean age was 66, 61% were women and 51% were hip surgeries. There were no bilateral surgeries, and 9% were revisions. Blood sparing techniques were used in 4%. Pre-op Hb was determined ≤7 days pre-op in 37% of pts, 8-21 days pre-op in 33%, and >21 days pre-op in 30%. Mean pre-op Hb was 13.9 g/dl (range of mean Hb per centre 13.4 – 14.3). Hb was <13g/dl in 24% of patients. 17% of pts were transfused (range per centre 2-53%). Timing of transfusions: day of surgery: 16%, post-op day 1: 16%, day 2-4: 40%, day 5+: 28%. Mean decrease in Hb from pre-op to last measured was 3.2 g/dl (range per centre 2-4.5). Mean pre-transfusion Hb was 8.2 g/dl (range per centre 7.1-9.3). Figure 1 shows the variability in blood loss and transfusion rates. Note: blood loss could not be calculated where volume of transfusions was not known.



Conclusion(s): In Belgium there is a remarkable variability in transfusion rates among centres, possibly in part related to differences in blood loss and transfusion trigger. Clearly, where improvement of blood management is needed this will require a tailored approach per centre.

Reference:

1 Samama CM et al. Anesth Analg 2002;95:287-93.

Acknowledgements: All RetroOrtho investigators.

6AP5-5

Utility of intravenous iron treatment for preoperative anemia with absolute or functional iron deficiency in orthopedic elective surgery patients

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Background and Goal of Study: Intravenous (IV) iron was shown to be effective in the treatment of absolute and functional iron deficiency anemia. The aim of this study is to assess the different characteristics of population with preoperative anemia and absolute or functional iron deficiency and it's influence in IV iron treatment response.

Materials and Methods: Clinical and laboratory data of 99 anemic patients undergoing hip and knee arthroplasty that received IV iron during 3-4 weeks before surgery to reach total iron deficiency, where reviewed. Group 1: 58 patients with absolute iron deficiency (IDA) (ferritin <30 ng/dl) and Group 2: 41 patients with functional iron deficiency (FID) or mix (ferritin > 30 ng/dl). Xi^2 or t Student were used to compare variables.

Results and Discussion: Patients with IDA were younger (70 vs 74 años) and with less comorbidity (19% ASA III vs 49% ASA III). Preoperative hemoglobin (Hb) were similar in both groups but IDA patients had lower MCV and MCH, but no significatively. In Group 1 the ferritin level was lower (13,7 vs 117ng/dl,), transferrin level was higher (326 vs 250 mg/dl) but plasmatic iron level was similar. Even though total iron deficiency was the same in both groups (806 vs 792 mg), we use similar IV iron doses (650 vs 534 mg) and during the same days, in functional iron deficiency patients required double doses of EPO (2.12 vs 1.17) to reach the same Hb level. However, in FID group the number of responders was higher (83 vs 58%).

Conclusion(s): IV iron was effective for the treatment of iron deficiency anemia both absolute and functional, however the functional iron deficiency required some doses of EPO to achieve the same increase in Hb, although it managed to increase the number of responders to the treatment.

6AP5-6

Risk associated with preoperative anemia in non-cardiac major surgery. AnesCardioCat prospective, multicenter study

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Background and Goal of Study: Preoperative anemia is an important risk factor for allogeneic transfusion and has been associated with worse postoperative outcome in patients with non cardiac surgery. Some recent study suggest that preoperative anemia is independently associated with increased mortality. The aim of this study is to measure the prevalence of preoperative anemia in moderate-high risk non-cardiac surgery and to assess the relationship between anemia with postoperative complications and mortality.

Materials and Methods: Prospective, observational, multicenter study of 23 hospitals in Catalonia in which clinical data was collected for all patients over 40 years scheduled on moderate- high risk surgery (according to the ACC/AHA surgery risk), in 6 random weeks during 2007-2009. We used the WHO definition of anemia. The unadjusted and adjusted relationship between anemia and postoperative complications was evaluated using logistic regression analysis and by the propensity score-based matching of anemia.

Results and Discussion: We included 3340 adult patients. The prevalence of anemia was 24.7%. Anemic patients were older, had more co-morbidity, worse functional class and the surgical complexity was significantly higher. In the anemic population 40% were transfused, had higher intraoperative instability and a greater number of cardiac events. Postoperative complications were 19.3% compared to 6.5% in non-anemic patients and cardiac and non-cardiac mortality were also significantly higher in anemic population. However in the analysis after adjustment for most potential confounders factors, postoperative complications and mortality showed no statistically significant differences between the anemic and not anemic group, although hospital stay was significantly longer in anemic.

Conclusion(s): Preoperative anemia is highly prevalent in moderate- high-risk surgery and it's associated with higher co-morbidity and the need for more aggressive surgery. These conditions increased the transfusion rate and

postoperative morbidity. Anemia is not an independent factor for higher risk of postoperative complications or mortality.

6AP5-7

Intravenous iron for the treatment of postoperative anaemia after nephro-urological surgery

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Background and Goal of Study: Postoperative anaemia has a multifactorial origin: blood loss and inflammatory response to surgery with functional iron deficiency. The objective of our study was to evaluate whether intravenous sucrose iron therapy (ISI) is effective for accelerateing recovery from acute postoperative anaemia.

Materials and Methods: Prospective randomized-controlled clinical trial was conducted from November 2007 to December 2008 in a nephro-urological center. Consenting adult patients, without preoperative anaemia (<130 g/L man, <120 g/L women) and undergoing major surgery were selected. Patients with a >20% loss of haemoglobin (Hb) or blood red cell mass (RBCM) related to the preoperative value during the first 72 hours after surgery were randomized to receive ISI supplementation (individually calculated dose – Venofer®) (iron group) or any treatment (control group). Main outcome: haemoglobin level recovery 15 days after surgery and 30 days after discharge from hospital. Secondary outcomes: iron parameters recovery, postoperative blood transfusion, infection and hospital stay. A restrictive transfusion protocol from our centre was applied. Statistic methods: mean, standard deviation and frequencies were used as a descriptive index. Repeated measures of the ANOVA and Wilcoxon tests were applied.

Results and Discussion: From 165 eligible patients, the main outcome was available in 63 (38.2%), nine women and 54 man with an average age of 63 ± 9 yr. Surgical procedures were: cistectomy (22), laparoscopic prostatectomy (23), open prostatectomy (10) and nephrectomy (8). Main results are shown in table 1. No differences (Hb) were observed in relation to surgical procedure or surgical approach (open or laparoscopic). Transfusion requirements were similar in both groups.

Table 1. Haemoglobin, reticulocytes and iron parameters*

	Preoperative		15 days after surgery		30 days after hospital discharge	
	No IV iron	IV iron	No IV iron	IV iron	No IV iron	IV iron
Haemoglobin ($g.L^{-1}$)	146.3 (11.5)	143.3 (11.4)	120.5 (16.7)	111.7 (18.8)	133.8 (12.9)	131.9 (13.8)
Haematocrit ($L.L^{-1}$)	0.49 (0.33)	0.41 (0.32)	0.36 (0.46)	0.34 (0.57)	0.39 (0.34)	0.39 (0.39)
Hypocromyc Eritrocytes (‰)	0.4 (0.4)	0.3 (0.2)	2.8 (2.8)	3.6 (2.9)	2.5 (3.4)	2.8 (2.9)
Reticulocytes ($x10^9.L^{-1}$)	72.8 (21.7)	67.1 (19.8)	126.9 (60.6)	131.5 (43.3)	88.3 (24.6)	85 (22.8)
CHr (pg)	33.7 (1.9)	34 (1.5)	–	–	32.2 (2.4)	32.8 (1.7)
Ferritin ($\mu g.L^{-1}$)	161 (75-297)	146 (74-228)	–	–	120 (58-245)	224 (132-342)
rTfR ($mg.L^{-1}$)	2.90 (0.97)	2.42 (0.59)	–	–	4.75 (1.88)	4.94 (1.08)

*All values are reported as mean (standard deviation), except Ferritin expressed as median and interquartil range
CHr: Reticulocyte haemoglobin content; rTfR: soluble transferrin receptor.

Conclusion(s): Postoperative iron supplementation does not appear to be effective for accelerating recovery from anaemia in patients without preoperative anaemia after nephro-urological surgery. This situation could vary in those patients with previous anaemia or iron deficiencies. However, we observed better recovery of ferritin levels in iron group.

6AP5-8

Preoperative anemia affects transfusion and outcomes in patients undergoing coronary bypass graft surgery (CABG)

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Background and Goal of Study: Preoperative hemoglobin (Hb) has been shown to be an independent risk factor for transfusion. Similar to transfusion of blood products, anemia has been related to short and long term morbidity and mortality in cardiac surgery (CS) patients. Considering both risks, anemia treatment would be mandatory before CS. The goal of this study is to evaluate the prevalence of preoperative anemia in scheduled CABG patients and to establish if there is any correlation between anemia, transfusion requirements and outcomes.

Materials and Methods: A single-center, one-year retrospective cohort was studied. Overall, hospital database registries for 107 consecutive patients undergoing CABG were evaluated. Cell saver was used in all patients. Perioperative clinical demographics (logistic Euroscore, cardiopulmonary bypass and crossclamp duration) and laboratory data (Hb, Hematocrit, platelet count) were collected. Blood products transfused, reinfused cell saver, and chest tube drainage were also measured. Anemia was defined as Hb < 13 g/dL. The following outcomes were evaluated: time from surgery to mechanical ventilation weaning, hospital discharge, postoperative clinical events (atrial fibrillation, heart failure, myocardial ischemia, stroke, renal failure, infections) and mortality. SPSS (v 17) was used for descriptive, logistic and multiple regression analysis. Results are presented as mean ± standard deviation and proportions.

Results and Discussion: Combined CABG and valve surgery was performed in 45 cases (43.7%). 51 patients (48%) had anaemia with no differences in surgical times and Euroscore. Older patients (69 vs 65 years, p=0.04), female gender (73% vs 42%; p<0.01) and smaller body surface area (1.5 vs 1.8; p=0.02) were more frequent among anemic patients (AP). Also, AP were more frequently transfused platelets (p=0.03) and packed red blood cells (PRBC). In average, AP were transfused 3.4 more PRBC units (CI 95%: 1.3 to 5.5) than no AP. Mechanical ventilation also lasted longer in AP (20 ± 43 vs 7± 4 hours; p=0,04). Clinical events and time until hospital discharge were similar in both groups. Mortality was 11,7% in AP and 5,8% in no AP; however this difference was not statistically significant, probably due to the small sample studied.

Conclusion(s): Anemia is very prevalent among CS patients. Most AP have greater transfusion requirements and more prolonged mechanical ventilation. Further research is warranted to understand if therapies aimed at correcting anemia prior to elective CS could decrease morbidity and mortality.

6AP6-1

Antitromboprophylaxis in high-risk patients with gastric bleeding due to the use of low-dose ASA and NSAIDs

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Background and Goal of Study: Low-dose acetylsalicylic acid (ASA) and anti-steroidal anti-inflammatory drugs (NSAID) are among the most widely used medications in the adult at-risk populations. On the other hand, the risk of upper gastrointestinal bleeding (GI) is magnified 2- to 4- fold in patients receiving these drugs compared to non-users. **Aim:** Evaluation of the safest antithromboprophylaxis treatment in high-risk patients with gastric bleeding due to the use of low-dose ASA and NSAIDs.

Materials and Methods: During 2008 – 2009, 53 patients(mean age 48±15 years) were treated in ICU with GI bleeding as complication of the above mentioned medications. Bleeding site was localised through fibrogastroscopic procedure and sclerotisation was realised through physiologic solutions with adrenaline 1:10 000. Gastric tube was left in the stomac for 30 +/-7 hours. Gastroprotective therapy consisted in administration of high parentheral dosis of proton pump inhibitors (PPI), H2 antagonists and antacids given PO. Antithromboprophylaxis was realised in two ways: group I= 26 patients with physical maneuvers, group II= 27 patients with physical maneuvers + LMWH (low molecular weight heparin). RBC, Hc, Hb Platelet, PTT, BP, Fc, creatinine, and BUN were evaluated.

Results and Discussion: Once bleeding stopped and anemia corrected, physical maneuvers in Gr I continued for 7 +/-2 days. In 3 patients(11,5%), the clinic of iscemic cerebral insult was installed in days 4-7 (in 1 patient insult was as second episode). The diagnose was confirmed by the neurologist after the CT scan. In the Gr II length of the treatment was 8 +/-1,5 days without evidence of thrombotic complications. The follow-up period of both groups was 10 days. Early resclerotisation procedure was needed in 2 patients (one from each group).

Conclusion(s): The combination of physical maneuvers with LMWH resulted more efficient in the prevention of thrombotic complications in high risk patients with GI bleeding from low-dose ASA and NSAIDs use.

Reference:

1 Geert WH. Chest 2001; 119; 132S-175S.

6AP6-2

Thrombotic risk and antiplatelet use in noncardiac surgical population

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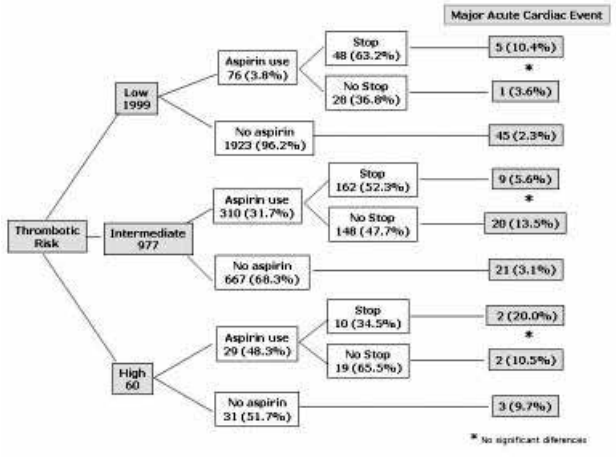
Background and Goal of Study: Discontinuing aspirin treatment may increase the risk of cardiovascular (CV) complications in the perioperative period. The aim of our study was first, to determine the chronic antiplatelet use in our surgical population, and second was to analyse our current practice in the perioperative management of aspirin therapy.

Materials and Methods: A prospective multicentre cohort study (ANESCARDIOCAT) was performed in 23 hospitals (Catalonia, Spain) during 6 randomized weeks in 2007-8. Eligible subjects were patients aged over

40 yr undergoing intermediate-high surgery-specific risk noncardiac surgery (AHA), under general or regional anaesthesia. We collected demographic data, preoperative patient characteristics, type of surgery and anaesthesia, perioperative events and in-hospital mortality. Patients were classified by thrombotic risk as Low: primary prophylaxis with ≤ 2 CV risk factors, Intermediate: primary prophylaxis with > 2 CV risk factors and secondary prophylaxis, High: secondary prophylaxis with active cardiac conditions. We excluded all patients on clopidogrel and/or oral anticoagulant treatment in the analysis of perioperative aspirin management. The exact Fisher Test was used to compare qualitative variables and a t test was used to compare quantitative variables.

Results and Discussion: A total of 3195 patients were included, of whom 574 (17.9%) were on antiplatelet therapy. Only 32.6% and 62.2% of patients in intermediate and high risk groups respectively were treated with an antiplatelet drug. Among patients with prior history of ischemic cardiac disease only 67% were on long-term antiplatelet treatment. Perioperative management of aspirin and inhospital major acute cardiac events related to stopping or continuing aspirin use are shown in figure 1. Nearly 20% of patients did not restart aspirin therapy at the moment of discharge. Fig 1. Thrombotic risk, perioperative aspirin management and inhospital cardiac events.



Conclusion(s): Aspirin is underused in our surgical population with intermediate or high thrombotic risk. No statistical significant differences were found related to in-hospital cardiac events. Attention is needed on restarting chronic aspirin therapy in the postoperative period.

6AP6-3

Severe antithrombin III deficiency is a predictor of disseminated intravascular coagulation in patients with systemic inflammatory response sindrome

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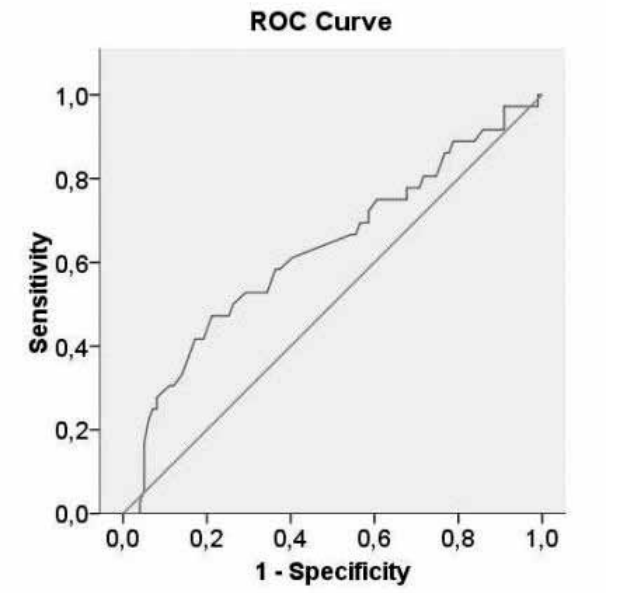
Background and Goal of Study: To present day there is no universal diagnostic algorithm for DIC. Decreased platelet count, prolonged prothrombin time and increased fibrin degradation products (FDP) are mostly used laboratory criteria of DIC. Antithrombin III (AT) deficiency is frequently observed in systemic inflammatory response syndrome (SIRS) the same as in DIC. At the same time diagnostic value of AT deficiency for DIC is not determined. The aim of the study is to investigate the association between AT deficiency and DIC in SIRS patients

Materials and Methods: 135 consecutive ICU patients with 3-4 SIRS criteria were included into the study. During 4 days after SIRS manifestation patients were assessed for DIC using diagnostic criteria by the Japanese Association for Acute Medicine (JAAM). Also general condition, laboratory parameters and 30-day mortality were evaluated.

Results and Discussion: DIC emerged in 26.6% of SIRS patients. In patients with severe AT deficiency <50% odds ratio for DIC was 3.5 (95% CI 1.2; 10.4). Partly this association is explained by correlation of AT with DIC criteria – platelet count and INR. AT deficiency <50% had 36% sensitivity and 85% specificity for DIC (area under ROC – 0,63 (95% CI 0.52; 0.74, p=0.021). AT deficiency did not have significant prognostic value(p=0.18), while INR was a significant predictor of outcome (p=0.024).

Variables, predicting DIC

Independent variables	Regression coefficient	p	Odds Ratio	95% CI for OR
Gender (females/males)	1.58	0.007	4.85	1.54; 15.30
AT deficiency <50%	1.26	0.022	3.52	1.20; 10.40
Fibrinolysis time	-0.02	0.049	0.98	0.96; 1.00



Variables, predicting outcome at the 30th day

Independent variables	Regression coefficient	p	Odds Ratio	95% CI for OR
INR	1.94	0.020	6.92*	1.36; 35.25
APACHE II	0.12	0.014	1.13*	1.02; 1.24
Age (years)	0.03	0.065	1.03	1.00; 1.07
AT deficiency <50%	-0.85	0.180	0.43	0.12; 1.48

Conclusion(s): Severe AT deficiency is associated with increased risk of DIC in patients with SIRS. INR in comparison with AT has a higher prognostic value in SIRS patients.

6AP6-4

The effect of red blood cells function during autologus blood salvage using by plasmalyte A

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Background and Goal of Study: The purpose of this study is to observe the blood red cell function during blood salvage with plasmalyte A as the wash solutions. Normal saline, the standard wash solution in cell saver autologous blood transfusion,is associated with acid-base and electrolyte derangements. Plasmalyte-A is a physiologic,balanced multielectrolyte crystalloid solution that approximates the electrolyte content of plasma. Design: Open-label,prospective, randomized study.

Materials and Methods: Sixty patients,ASA I–II,Scheduled for spinal fusion,were randomly assigned to two groups:normal saline(group NS,n=30);plasmalyte-A(group P-A,n=30).They were prospectively randomized to receive normal saline or Plasmalyte-A as wash solutions. Shed blood were collected,the same person always performed the sampling and operated the autotransfusion machine (Cell Saver-5,Hemonetic,USA),This machine is of standard design and be used in the manufacturer,s standard guidelines.The settings of the machine were as follows:priming of the bowl 300ML/min;washing 1000ML solution at a rate of 300ML/min in the better quality automatic wash mode, emptying of bowl 200ML/min,the bowl size used was the low volume 125ML bowl. The centrifuge spins at 5650rpm.with a maximum controlled suction of 150mmHg.then empties at 500ml/min.Blood sampling were taked at preoperative in venous and withdrawn from the holding bag through a stopcock at stage of first cycle was completed.

Results and Discussion: Compared with preoperative red cells 2,3-DPG,ATP,EI and fragility of two groups salvaged red cells were not markedly decreased, MDA is not significantly increased., There were no statistical

differences. Compared with NS as solutions, 2,3-DPG,ATP, of salvaged red cells in group Plasmalyte-A were markedly increased, fragility is significantly markedly decreased, MDA is significantly decreased. There were statistical differences. Potassium, sodium and Chloride of salvaged red cells in group Plasmalyte-A were similar to preoperative red cells. But in group NS sodium and Chloride is significantly increased. Potassium is significantly decreased. There were statistical differences between two groups.

Conclusion(s): Fewer acid-base and electrolyte derangement were observed when blood was washed with plasmalyte-A.and quality of salvage red blood cell were better than group NS. We conclude that Plasmalyte -A, a physiologic, balanced,multielectrolyte solution,should be considered as the wash solution in intraoperative blood salvage.

6AP6-5

Dexmedetomidine enhances adenosine diphosphate-induced platelet aggregation and P-selectin expression

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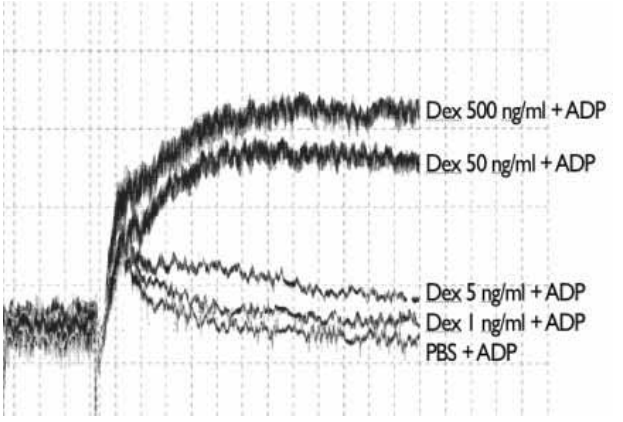
Background and Goal of Study: Increased platelet aggregation and P-selectin expression have been proved to play important roles in the pathogenesis of cerebral infarction and coronary events. As a sedative agent has been widely used in ICU, dexmedetomidine was an adjuvant to light anesthesia, especially for the elderly, due to its less effect of respiratory depression. We investigated the effects of dexmedetomidine on adenosine diphosphate (ADP)-induced platelet aggregation and P-selectin expression.

Materials and Methods: Blood samples were collected from healthy volunteers and platelet rich plasma (PRP) were prepared for the determination of platelet aggregation and P-selectin expression. After adding aliquots of dexmedetomidine to each PRP sample, ADP was then added as an inducer of platelet aggregation and P-selectin expression. By aggregometry, platelet aggregation was assessed as the intensity of light transmission. Flow cytometry was used to determine the expression of P-selectin on the platelet surface by measuring the intensity of fluorescence using phycoerythrin-conjugated CD62P monoclonal antibody.

Results and Discussion: Low concentration of ADP (5μM) could induce platelets to form loose aggregates. Dexmedetomidine at concentration between 1 – 5 ng/ml had minimal effect on the aggregation. Nonetheless, higher concentration of dexmedetomidine (50 and 500 ng/ml) could potentiate ADP-induced loose platelet aggregation to form the firm aggregates. Around plasma concentration of clinical effects (1 – 5 ng/ml), we first demonstrated that dexmedetomidine may increase P-selectin expression induced by ADP. At high concentration of 50 and 500 ng/ml, dexmedetomidine may increase P-selectin expression to the extent of 3 – 5 times when compared with that induced by ADP alone.



Conclusion(s): This preliminary study implied that the pro-aggregatory effect of dexmedetomidine might be taken into consideration when using the drug on high-risk patients. Further studies on mechanisms of dexmedetomidine-enhanced platelet aggregation and activation have being undertaken.

6AP6-6

Tranexamic acid reduces with 50% the total nasal bleeding of patients that underwent functional endoscopic sinus surgery

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Background and Goal of Study: Tranexamic acid was used in the cardiovascular,obstetrical, orthopaedics bleedings. In Otorhinolaryngology, the facts regarding the use of tranexamic acid are very few. Evaluate the efficiency and safety of the use of tranexamic acid on postoperatory and after nasal pack removal blood loss, at pacients with chronic rhinosinusitis, that underwent functional surgery, with establishing an administration plan.

Materials and Methods: After acception from the Ethics Committee and informed consent, we designed a prospective, double blinded, randomised clinical trial, that was conducted on 60 pacients admitted in the ENT Department of our hospital for FESS treatment of chronic rhinosinusitis, between January and October 2009.The patients were randomized into two groups by age and sex. The study group received 10mg/kgc tranexamic acid in 10ml saline solution and the control group received 10ml saline solution with two administrations: before induction and before nasal pack removal. Surgery was performed under general anesthesia inhalotor pivot, standard intra and postoperatory monitoring and pain treatment were applied. The individual data measured concerned the intraoperative bleeding, nasal packs bleeding, blood coughed up, vomit, preoperative,postoperative and after nasal pack removal haemoglobin.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 tranexamic acid efficiency evaluation, statistically significant diferences were registered ($p<0.001$) between groups: **total blood loss intraoperatively and post-surgery decreased to 1/2 level** in study group compared with controls ($p=0.000106$); **reduction of bleeding after nasal pack removal was three times lower** ($p=0.000048$); the **decrease was higher for hypertension or hepatitis comorbidity**. **No adverse reactions** were observed. A contribution to these results is brought by the rich vascularization of nasal mucosa, when considering the inflamatory chronic factor and the stimulation of fibrinolisis due to the prolonged presence(two days) of the nasal packs.

Conclusion(s): Tranexamic acid reduces with 50% the total blood loss intra and postoperative in functional surgery for chronic sinusits. The administration in two doses is easy and safe and could be included in a tratment plan.

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6AP6-7

The impact of modified ultrafiltration on perioperative hemostasis in cardiac surgery patients – A prospective randomized controlled study

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Background and Goal of Study: Modified ultrafiltration (MUF) has been shown to reduce the inflammatory response to cardiopulmonary bypass (CPB). Its impact upon the coagulation system in patients undergoing cardiac surgery is still unknown. Therefore we evaluated the impact of MUF on perioperative hemostasis.

Materials and Methods: Fifty patients scheduled for elective complex cardiac surgery were enrolled in this prospective randomized study. Preoperatively, patients were randomized to a control group (Group 1, n=25) or a MUF group (Group 2, n=25). After CPB, a MUF of 3000 ml was performed using a BC140plus Filter (Maquet, Germany) in Group 2. Blood samples were taken before (time point, T1) and 30 min after MUF (T2) in both groups. Patients did not receive any blood products or coagulation factors during the observation period. Conventional laboratory coagulation analyses, thrombelastometry (ROTEM, Pentapharm, Germany) and platelet function analyses using the new Multiple Electrode Aggregometry (MEA) device (MULTIPLATE, IL, Germany) were performed at time points T1 and T2. Intra- and postoperative transfusions requirements, hemostatic therapy and blood loss were recorded.

Results and Discussion: There were no significant group differences in patients age, body mass index, preoperative euroSCORE and CPB-duration. Conventional laboratory and thrombelastometric parameters did not change significantly between T1 and T2. Platelet aggregation at T2 did not change significantly in Group 1 [442(276/511)AU*min median(25th/75th percentile) vs. 480(336/627)AU*min for TRAPtest ($p=0.121$); 219(79/474)AU*min vs. 257(106/541)AU*min for ASPItest ($p=0.160$); and 280(188/388)AU*min vs. 301(193/393)AU*min for ADPtest ($p=0.143$)]. In contrast, platelet aggregation at T2 significantly improved in Group 2 [651(499/866)AU*min vs. 551(325/910) AU*min for TRAPtest ($p=0.047$); 520(363/692)AU*min vs. 289(160/484)AU*min for ASPItest ($p=0.025$); and 394(281/512)AU*min vs. 296(158/457)AU*min for ADPtest ($p=0.016$)]. The cumulative chest tube blood loss was significantly higher in Group 1 at 24h [1075(800/1400) vs. 900(500/1100), $p=0.039$] and

48h postoperatively [1400(900/1750) vs. 900(550/1350), p=0.026]. There were no group differences in perioperative transfusion requirement or hemostatic therapy within the first 48 hours postoperatively.
Conclusion(s): MUF increased platelet aggregation and reduced postoperative blood loss in a significant manner.

6AP6-9

Efficacy of cell-saver in reducing homologous blood transfusions and inflammatory response during on-pump cardiac surgery in low-risk patients: A prospective randomized study

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Background and Goal of Study: Mediastinal blood reinfusion with cell saver is effective in reducing blood transfusions in patients at high-risk for operative bleeding during cardiac surgery. However, the use of this device in low-risk patients remains controversial. In addition, the influence of autotransfusion with cell-saving devices on postoperative systemic inflammatory response has not been clearly established. Therefore, we conducted a prospective, randomized controlled trial to examine the hypothesis that the use of cell salvage during routine cardiac surgery would reduce the proportion of patients exposed to allogeneic blood transfusion and the postoperative systemic inflammatory response.
Materials and Methods: We included 63 patients and randomly assigned them into the control (Co; n=29) o cell saver (CS; n=34) group. We excluded high-risk surgical patients (defined as EuroSCORE>10%) and patients with high-risk for operative bleeding (defined according to SCA guidelines). All patients had cardiopulmonary bypass surgery. Five perioperative blood samples (arterial blood before operation, after the CBP bypass was finished, and 1-, 6- and 24-hours after operation) were obtained from each patient. ELISA was conducted to determine the levels of pro-inflammatory cytokines including interferon gamma (IF-γ), interleukin 6 (IL-6), IL-8, and IL-12(p40).
Results and Discussion: There was no difference between the two groups in the proportion of patients exposed to allogeneic blood transfusions (group CS:n=12; 40%), (group Co:n=13; 46,4%)(p=0,79). Preoperative haemoglobin<13,3 g/dl (RR=2,4 CI95%:1,3-4,7) and body surface area< 1,74 (RR=2,1 CI95%:1,2-3,9) were the main independent predictors of increased transfusion requirements in all patients. In the subgroup of patients with preoperative haemoglobin<13,3 g/dl, the use of cell saver did not reduce the need of allogenic blood transfusion. Significantly increased concentrations of cytokines IL-6, 8, and p40, were noted postoperatively in all patients, with peak serum levels at 1 hour. No differences in cytoquine serum levels were observed between the CS and the Co group at any postoperative measurement time.
Conclusion(s): The routine use of cell salvage does not reduce the need of allogeneic blood transfusion in low-risk patients undergoing cardiac surgery. However, correction of preoperative haemoglobin levels may avoid unnecessary transfusions in these patients. Reinfusion of blood with cell saver does not contribute to a decrease in postoperative inflammatory response.

Neurosciences

7AP1-1

Lidocaine metabolites reduce glycine transport in primary rat astrocytes

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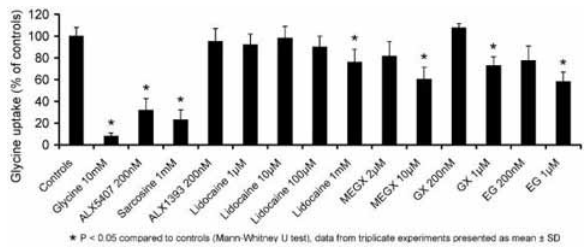
Background and Goal of Study: Glycine is a major inhibitory neurotransmitter, but also acts as obligatory coagonist at excitatory NMDA receptors. The synaptic glycine concentration is controlled by the glycine transporters GlyT1 and GlyT2, whereat glial cells specifically express GlyT1 (1). Lidocaine, applied systemically, has antinociceptive effects. The mechanism is not fully understood, but glycinergic mechanisms may be involved (2). In the present study, we investigated the effect of lidocaine and its metabolites on glycine transporter function.
Materials and Methods: Glycine transporter expression in primary rat astrocytes was assessed by qPCR, western blot and immunostaining. The effects of lidocaine and its metabolites monoethylglycinexylidide (MGEX), glycinexylidide (GX) and n-ethylglycine (EG) on glycine transporter function were investigated with glycine uptake experiments. Astrocytes were pretreated for 30 min with lidocaine, lidocaine metabolites, specific GlyT1 inhibitors (ALX5407, sarcosine), a specific GlyT2 inhibitor (ALX1393) or glycine at indicated concentrations. Then [14C]-labelled glycine was added and radioactivity of washed samples was measured after 30 min.
Results and Discussion: Investigation of glycine transporter expression confirmed a predominant expression of GlyT1 in rat astrocytes, while GlyT2 was barely detectable. Uptake of glycine was strongly inhibited by pretreatment with ALX5407 (200 nM), sarcosine (1 mM) and glycine (10 mM), while ALX1393 (200 nM) had no effect. The lidocaine metabolites MGEX, GX and EG significantly reduced glycine uptake while lidocaine reduced glycine uptake only at toxic concentrations (Fig. 1).



* P < 0.05 compared to controls (Mann-Whitner U test), data from triplicate experiments presented as mean ± SD

Conclusion(s): The major metabolites of lidocaine, but not lidocaine itself reduce the uptake of glycine in primary rat astrocytes, presumably by inhibition of GlyT1. This effect is seen at concentrations of lidocaine metabolites that can occur systemically during epidural anaesthesia. Therefore, glycine transporter inhibition could provide a molecular mechanism for the observed antinociceptive effect of systemic lidocaine.
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7AP1-2

Xenon decreases cerebral oxygen and glucose consumption in neurosurgical patients

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Background and Goal of Study: Xenon has excellent anesthetic properties but little is known about its effect upon cerebral metabolism. The aim is to evaluate the effect of xenon on cerebral metabolism in neurosurgical patients during xenon anaesthesia.
Materials and Methods: With local ethical committee approval 10 anaesthesias were carried with TAEMA *Felix Dual* station (Air Liquide Medical Systems, France) in patients undergoing aneurism clipping or supratentorial tumor removal under BIS control (BIS, Aspect Medical Systems, USA). After induction and intubation with midazolam 2,5-5 mg, propofol 1-2 mg/kg and fentanyl 3-5 mkg/kg and a period of oxygen in air inhalation a 10-min denitrogenation was hold, then xenon delivery was started. Till xenon accumulation anaesthesia was maintained with propofol and when BIS fell to 40 propofol infusion was stopped and single-agent xenon anaesthesia was maintained. After intubation catheters were inserted into the bulbus of the right internal jugular vein and into left radial artery. Blood samples were analyzed with Radiometer ABL800 Flex gas analyzer (Radiometer, Denmark). Oxygen content and glucose concentration were measured 1) during propofol anaesthesia with 30% oxygen in air inhalation (baseline), 2) after denitrogenation, 3) at 65% of xenon (1 MAC anaesthesia), 4) at steady state xenon anaesthesia (45 min from denitrogenation). Statistical analysis was done with SPSS 9.0 software with Wilcoxon Signed Ranks Test.
Results and Discussion: Results are shown in table 1. With xenon accumulation (stage 3) there is a decrease in arterio-venous difference in oxygen and glucose (p<0,05), most prominent during steady state xenon anesthesia (stage 4) (p<0,05) with no change in lactate levels. So at xenon stages oxygen and glucose consumption was lower.

Oxygen content and glucose concentration in radial artery and right internal jugular vein bulbus

Stage	CtaO2(vol%) (median)	CtjvO2(vol%) (median)	CtaO2-CtjvO2 (vol%)(median)	Glucose concentration in arterial blood (mmol/l) (median)	Internal jugular vein glucose concentration (mmol/l) (median)	Arterio-venous glucose difference (mmol/l) (median)
propofol anesthesia	17,6	8,5	7,6	5,8	5,1	0,8
after denitrogenation	19,3	8,3	7,7	6,1	4,9	0,8
65% xenon anesthesia	17,5*	9,8*	5,4*	6,1	5,2*	0,3*
steady state xenon anesthesia	16,8	9,2	5,3*#	5,6*	5,5	0,3#

*p<0,05 compared to previous stage; #p<0,05 compared to the second stage

Conclusion(s): Comparing to propofol xenon improves cerebral oxygenation and decreases cerebral metabolism in neurosurgical patinets.

7AP1-3

Sevoflurane impairs olfactory memory, but preserves olfactory function

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Background and Goal of Study: Anaesthesia has been postulated to cause hyposmia or even anosmia. We studied the effect of general and epidural anaesthesia in olfactory function and memory, along with the possible mediating role of melatonin and oxytocin.

Materials and Methods: Sixty adult patients, ASA class I or II, scheduled for minor surgery (40-120min), were randomly allocated to general anaesthesia with propofol (group P), general anaesthesia with sevoflurane (group S), or epidural anaesthesia (group E). Exclusion criteria included smoking, alcoholism, psychiatric disease, allergic rhinitis and airway infection. Twelve hours preoperatively (*t*= 0), at 0.5h (*t*=1) and 3h (*t*=2) following end of anaesthesia, olfactory function and memory were tested with the n-butyl-alcohol detection test and the University of Pennsylvania Smell Identification Test, respectively. Blood samples were also drawn for melatonin and oxytocin levels determination. Statistical analysis involved the Kruskall-Wallis and the Mann-Whitney *U* post-hoc test.

Results and Discussion: Forty-eight patients (*n*=16 in each group) were included in the final analysis. Patients' age, sex distribution and duration of anaesthesia did not differ between groups. Olfactory acuity remained intact in all patients, before and after anaesthesia. Postoperative wrong recognition of odours which were preoperatively recognized correctly was more frequent in group S compared to group E (time-point 1, p=0.019; time-point 2, p=0.026) and group P (time-point 1, p=0.047; time-point 2, p=0.035). This was accompanied by reduced plasma melatonin levels in group S compared to group E (*t*=2, p = 0.019) and P (*t*=2, p = 0.021), but no difference in oxytocin levels.

Conclusion(s): Misinterpretation of odours is more likely after sevoflurane anaesthesia, despite maintenance of intact olfactory function. Melatonin reduction could mediate the olfactory misinterpretation after sevoflurane anaesthesia.

7AP1-4

Fos expression in sensitive cortex at different anesthetic depths, following peripheral noxious stimuli

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Background and Goal of Study: It is known that inhibition of nociceptive stimuli propagation during anesthesia require high dose of anesthetic. In this study we investigated the role of the anesthetic depth on fos expression in sensitive cortex, following the same peripheral noxious stimuli under different degrees of isoflurane anesthesia.

Materials and Methods: All the experimental procedures were done in accordance with the ethical rules approved by the Ethical Committee of Carol Davila University. In this study we used Wistar rats (n=10), divided in 2 groups (5 rats each). The first group received a peripheral noxious stimulus under a profound isoflurane anesthesia with a burst suppression ratio of 5:1 on electroencephalogram (EEG). The second group received a peripheral noxious stimulus under a less profound isoflurane anesthesia, associated with slow waves on EEG. All rats received a short time anesthesia of 5 minutes, and a noxious stimulus consisting in 1 minute mechanical clamp of the left hindpaw. Two hours later, the brain was removed under ketamine anesthesia, and a frontal section including sensitive cortex was harvested for the assessment of fos expression by imunodetection.

Results and Discussion: Our data suggest a differentiated fos expression in sensitive cortex, at different anesthetic depth. Fos expression on sensitive cortex, during profound isoflurane anesthesia was 40±2.23, positive nuclei per section, comparing with 15±1.58 positive nuclei per section, during less profound anesthesia. T-test has been used for statistical analysis, and this difference is considered to be extremely statistically significant, with a p-value less than 0.0001. These outcomes harmonize with new investigations that consider burst-suppression as a state of high cortical excitability.

Conclusion(s): Expression of fos in the sensitive cortex, as a response to pain induction, is related with the anesthetic depth. Our outcomes suggest a high cortical expression of fos, during profound isoflurane anesthesia, without intra-anesthetic opioid analgesia.

Acknowledgements: Elena Copaciu, MD, PhD, Assoc. Prof. of Anesthesia & Intensive Care Carmen Ardeleanu, MD, PhD, Prof. of Morfopathology.

7AP1-5

Effects of propofol and pentobarbital on calcium concentration changes in presynaptic boutons on the rat hippocampal neuron

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Background and Goal of Study: There are numerous reports on intravenous anaesthetic actions on postsynaptic events in the central nervous system. However, little evidence has yet been established how general anaesthetics influence the presynaptic processes. The neurotransmitter release is regulated by the level of presynaptic Ca^{2+} concentration ($[Ca^{2+}]_{pre}$). In the present study, we investigated the effects of the intravenous anaesthetics propofol and pentobarbital on the release of transmitters by measuring $[Ca^{2+}]_{pre}$ in the presynaptic nerve terminals (boutons) on a dissociated single hippocampal neuron.

Materials and Methods: Sprague-Dawley rats of 10–14 days old were decapitated under pentobarbital anaesthesia and brain slices were made. Hippocampal CA1 area was touched with a fire-polished glass pipette, which vibrated horizontally, and neurons were dissociated, which were attached with presynaptic boutons [1]. Using a confocal laser scanning microscope, the presynaptic boutons were visualized with FM1-43 dye and $[Ca^{2+}]_{pre}$ was measured with fluo 3-AM [2]. To evaluate $[Ca^{2+}]_{pre}$, the mean intensity (F) of the bouton was calculated and the data were expressed as the ratios of fluorescence intensity changes (ΔF) relative to the control values before stimulation (F_0), namely $\Delta F / F_0$.

Results and Discussion: High-K^+ (15 – 90 mM) increased the $[Ca^{2+}]_{pre}$ concentration-dependently in the Ca^{2+} containing solution. Propofol (10 μM) and pentobarbital (300 μM) suppressed the increase in $[Ca^{2+}]_{pre}$ induced by high-K^+ in the boutons attached on the dendrite. The large majority of excitatory synapses are located on dendritic spines; therefore, these agents may have some effects on Ca^{2+} mobilization in the excitatory presynaptic boutons.

Conclusion(s): Propofol and pentobarbital may affect the release of neurotransmitters from the excitatory presynaptic nerve terminals due to inhibition of the increase in $[Ca^{2+}]_{pre}$.

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7AP1-7

Thiopental changes the actin cytoskeletal organization in cultured neurons

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Background and Goal of Study: We have previously shown that propofol change the cytoskeletal arrangement of cultured neurons by initiating formation of a ring structure of the cytoskeletal protein actin (1,2). The actin is rearranged in a dose and time-dependent manner with a maximum of rings visible after 20 minutes at clinically relevant doses. To evaluate if this is a specific effect of propofol, we studied thiopental and its effect upon actin rearrangement.

Materials and Methods: Experiments were done on cortical brain cells from newborn rats cultured on cover-glasses (3). Cells were exposed to calcium containing buffer, with or without supplementation of thiopental or Na2CO3, for 0-20 minutes. The cytoskeletal actin was visualized with fluorescent phalloidin, and cells with actin rings were counted in a fluorescent microscope.
Results and Discussion: Thiopental (1mM) caused maximum actin ring formation in 24.2 (± 1.8)% of cells at 20 minutes, compared to 8.8 (±0.0) in cells stimulated with buffer only, n=3. No change from baseline was seen with Na2CO3, the buffering substance used in clinically available thiopental vials. Discussion: Thiopental, at doses that corresponds to induction doses, causes the same actin rearrangement as propofol does. Both propofol and thiopental shows the same maximum percentage of cells with actin rings (about 25%) at the same time (20 mins) after stimulation. No effect was shown when buffer was used, showing that this is a specific effect of thiopental.
Conclusion(s): Thiopental causes actin cytoskeletal reorganization in cultured neurons, supporting the results from propofol studies. This implies that cytoskeletal rearrangement is part of the anaesthetic mechanism.
Acknowledgements: This study was supported by Linköping Society of Medicine and the Östergötland County Council.
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7AP2-2

Xenon preconditioning increases expression of HSP 72 and attenuates cognitive impairment after orthopaedic surgery in mice

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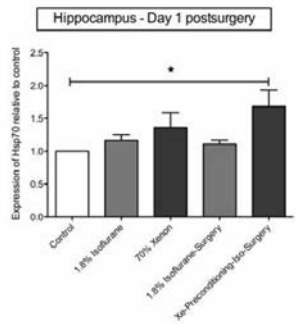
Background and Goal of Study: Postoperative cognitive dysfunction (POCD) is a common complication in elderly following surgery that has been linked to increased morbidity and mortality. Aseptic trauma, including surgery, activates the innate immune response and causes remote organ changes; in the central nervous system this may lead to the development of POCD. Previously, induction of heat shock protein 72 (Hsp72) was shown to be neuroprotective against neuroinflammation following brain ischemia1. Preconditioning with xenon has been shown to confer neuroprotection2,3. We hypothesized that xenon prevents the development of POCD through upregulation of Hsp72.
Materials and Methods: Twenty-four hrs after training for the establishment of long-term memory with fear conditioning, C57BL/6 adult male mice (3-6 months old) were exposed to either 70% xenon or 70% nitrogen balanced with oxygen (preconditioning) for 20 min. Thereafter, they were subjected to tibial fracture with intramedullary pinning under 1.8% isoflurane anaesthesia or 1.8% isoflurane anaesthesia alone. Naïve animals without any treatments served as controls. Contextual hippocampal-dependent memory formation was assessed on day 1 and 7 after surgery. Other cohorts, treated as above, were killed on the 1st postoperative day and the hippocampus was harvested for assessment of Hsp72 expression with western blot. One-way ANOVA followed by Tukey multiple comparison test was performed for data analysis.
Results and Discussion: Surgery induced a significant decrease of freezing behavioral time when compared to that in controls on the 1st postoperative day while xenon preconditioning prevented such decline. This pattern of changes remained up to day 7 after surgery. Hsp72 expression was significantly ($p < 0.05$) increased (1.6 fold) with xenon preconditioning when compared to that of control.



Conclusion(s): Xenon preconditioning attenuates cognitive decline following surgery and this benefit may be due to the upregulation of Hsp72.
Acknowledgements: Lei Zhuang for helping to develop the WBs.
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7AP2-4

Is there any cognitive dysfunction in operations of short duration (<3hours)

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Background and Goal of Study: Study of the cognitive neuroscientific basis of general anesthesia involves the evaluation of anesthetic agents effect on consciousness and the brain mechanisms underlying cognitive function. Central nervous system dysfunction after anesthesia and/or surgery can occur at any age. The aim of the present prospective observational study was to evaluate whether operations of short duration induce cognitive dysfunction.
Materials and Methods: Sixty two consecutive patients subjected to abdominal operations were enrolled. Twelve patients were excluded because of long (>3hours) operative time. A database was formed keeping demographic, pre- and post- operative characteristics of the patients. The cognitive function of the patients was evaluated one week before, one day and one month after the operation. We used the Nu-DESC and the CAM-ICU test, which were for the first time translated and validated in Greek.
Results and Discussion: The mean age of the patients was 46.2 yeas, the mean ASA 2.3 and the mean BMI 26.3kg/m2. The CAM-ICU test was unable to reveal any dysfunction at all three time points of the study. The Nu-DESC test revealed cognitive dysfunction 24 hours postoperatively in 6 patients (12%). The score for these patients was 2 (not delirium) but this was significantly altered from its preoperative value (0 for all patients). Nu-DESC showed no cognitive dysfunction for all patients when it was repeated one month postoperatively.
Conclusion(s): Patients present alterations in the cognitive function even after abdominal operations of small duration. When comparing Nu-DESC and CAM-ICU tests, the first seems more appropriate when evaluating cognitive function. However, larger prospective trials are necessary in order to further validate these results.

7AP2-7

Inflammatory response and procoagulant and fibrinolytic markers in acute post-anoxic cerebral injury

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Background and Goal of Study: Some physio-pathological phenomena and several biochemical markers join focal cerebral ischemia and post-anoxic cerebral injury. A massive activation of the inflammatory system and of the coagulative cascade occur in acute focal stroke: ischemic stroke causes alterations of the thrombotic and fibrinolytic systems with formation of thrombin-antithrombin III complex (TAT). Experimental research showed that the early administration of ATIII decreases the volume of ischemia in mice and might be neuroprotective. Among proinflammatory cytokine IL-18 plays a crucial role in neuroinflammation and neurodegeneration. S100B protein, produced by astroglial cells, is involved in cytokine cascade and has been suggested as a marker of brain injury. We aimed to establish the extent of the relationship between inflammatory biomarkers (S100B and IL-18) and procoagulant and fibrinolytic markers (ATIII, TAT, D-dimer, FDP) in cardiac arrest survivors (ACC); and to investigate the association of brain inflammatory biomarkers (S100B and IL-18) and severity of coma.
Materials and Methods: We enrolled 13 comatose ACC patients and 10 healthy voluntaries to assess the IL-18 normal serum values. In all patients we measured the plasma levels of: TAT, D-dimer, FDP, percent activity of ATIII and IL-18 at the 1st and the 5th day after the stroke onset; S100B serum levels within the first 24 hours. All patients were evaluated using Glasgow Coma Scale (GCS) during all the period of hospitalization.
Results and Discussion: In all patients plasma levels of TAT increased at all time points and were associated with increased D-dimer and FDP levels. Percent activity of ATIII was not decreased on day 1 and 5 after the cardiac arrest.IL-18 levels were significantly ($p<0.05$) elevated at the 1st and 5th day compared to the control subjects. S100B serum levels were significantly higher in ACC patients compared to normal value. No correlation was found between inflammatory and procoagulant and fibrinolytic biomarkers and between IL-18

serum levels and GCS on admission. S100B serum levels were higher (p<0.01) in those patients who had the poorer neurological examination (GCS 3-8).
Conclusion(s): IL-18 and S100B serum levels in ACC patients suggest a massive activation of the inflammatory cascade in acute post-anoxic cerebral injury. Thrombin enhanced inflammatory process is suggested by an elevation of TAT. Further studies should analyse the role of inflammatory cascade in stroke patients and provide clues to therapeutic approaches.

7AP2-8

The role of cerebral oximetry and plasma levels of *NMDA* receptor antibodies (NR2Ab) for diagnostic of postoperative cognitive dysfunction

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Background and Goal of Study: Postoperative cognitive dysfunction (POCD) in the elderly patients is an unwanted complication of the postoperative period. POCD is probable, the result of a neuroinflammatory process and it is only detectable through the usage of neuropshycological tests. The aim of the study is to evaluate the importance of the following factors in the developement of POCD: the individual risk factors, the intra or postoperative occurence of cerebral desaturation episodes (NIRS) and cerebral ischemia, quantified by detection of high plasma concentration of NMDA receptor antibodies (NR2Ab).
Materials and Methods: The pilot, prospective, randomised ethically approved and consented study enrolled 50 ASA I – III patients, aged over 65. 25 patients were scheduled for urologic surgery (group S) and have been compared with 25 nonsurgical subjects (group NS). The NS group was divided in two subgroups: 15 in-hospital patients, with medical diseases (group NSH) and 10 control not-hospitalised elderly, (group NSNH).Neuropshycological tests have been applied in all patients preoperatively (group S) or as a primary evaluation (group NS) and, subsequently, at 10 days, 1,3 and 12 months postoperative or post primary evaluation. Group S was also divided in two subgroups: 16 patients with cerebral oximetry monitoring 24 hours from the beginning of the surgical procedure (group SX) and 9 patients with standard monitoring but without cerebral oximetry (group SNX). Plasma levels of NR2Ab were recorded preoperative or on primary evaluation and at one month. POCD was defined by a composite Z score >1,96 and the SX group has been compared with the other groups. Fischer exact and *t* test were used and p<0.05 was considered significant.
Results and Discussion: Compared with the NS group, the incidence of POCD in group S was significantly higher (p<0.01) at 10 days and 1 month postoperatively but not at 3 and 12 months. There were no differences in POCD incidence at any time, while comparing any other groups, including SX group compared with SNX group and NSNH group compared with NSH group. Regarding the NR2Ab plasma levels, at 1 month postoperatively there were no differences between the POCD patients of group S when compared with the patients of group NS (1.78±0,63 vs 1.6±0,45 ng/dL).
Conclusion(s): In a pilot study, POCD after urologic surgery has a maximum incidence in the first month postoperatively regardless the use of cerebral oximetry monitoring and without significant increase of NR2Ab plasma levels, making improbable a cerebral ischemic ethiology.

7AP2-9

Effects of neuroinflammation on microcirculation in the brain – Visualized by intravital microscopy

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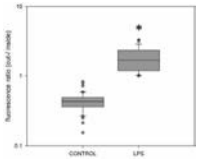
Background and Goal of Study: Neuroinflammation is involved in a variety of clinical situations such as cardiopulmonary bypass, stroke, neurodegenerative diseases and sepsis. Systemic infection and its consequences are the most common causes of death and despite recent advances in the rapid diagnosis and treatment, the neurologic sequelae (septic encephalopathy) remain poorly understood in modern anesthesia and intensive care. In order to study the possible patho physiological mechanisms, we investigated the altered blood brain barrier (BBB) permeability using intra vital microscopy (IVM) in a lipopolysaccharide (LPS) model.
Materials and Methods: 14 male Lewis rats (mean weight 275 g) were anesthetized (Pentobarbital) and were randomly assigned to be treated with LPS 4 hours prior to IVM as compared to sham treated control animals. By a unilateral cranial window, the pial vessels were investigated by IVM for extravasation of FITC-albumin and for an increase in the number of adhering leukocytes to the endothelium by staining the leukocytes with Rhodamine. Blood samples were drawn and investigated for cytokines.
Results and Discussion: A significant increase (*) of extravasation of FITC-albumin could be demonstrated using an apparent fluorescence index comparing intra and extra vascular brightness of fluorescence (Mann-Whitney U, P<0,001). Boxplots are given with a median and 25%/75% percentile. A significant increase of IL-4, -6, KC and TNF could be demonstrated in LPS treated animals.



Conclusion(s): Severe sepsis like syndrome could be induced by systemic LPS administration. Neuroinflammation shown as septic encephalopathy involves disruption of the BBB and cerebral oedema formation. For the first time the direct effect of LPS induced sepsis like syndrome on the pial vessels could be shown in vivo by using fluorescence IVM. An increase in the number of adhering leukocytes to the endothelium could be shown as a secondary effect. The BBB and the sepsis related inflammatory response is elucidated as an important target for the development of new therapeutic strategies. This finding might also be important for other conditions that involve breakdown of the BBB such as cardiopulmonary bypass, trauma and toxic encephalopathy.

7AP3-3

Human calcium-induced and cyclosporin-sensitive permeability transition detected in viable mitochondria isolated from the adult human brain and liver

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Background and Goal of Study: Energetic function of mitochondria is vital for cellular homeostasis and relies on an intact and impermeable inner membrane. In situations of cellular calcium overload and altered redox state, common following ischemia and traumatic brain injury, mitochondria can undergo a rapid permeabilization of the inner membrane, the so-called mitochondrial permeability transition (mPT). The mPT has been implicated as a plausible mechanism of cellular degeneration inferred by protective action of cyclosporin-A (CsA) and other cyclophilin-D (CypD) inhibitors in several animal models of acute and chronic neurological disease. It is, however, unclear if calcium can trigger the mPT phenomenon in adult human mitochondria. Therefore the objectives of the present study were: (i) To detect calcium-induced mPT in mitochondria extracted from viable human brain and hepatic tissue. (ii) To determine whether calcium-induced mPT in human mitochondria is sensitive to modulation by CypD inhibition and endogenous regulators. (iii) To evaluate whether calcium-induced mPT in human mitochondria is sensitized by oxidants.
Materials and Methods: Human brain tissue was obtained from 4 male patients undergoing neurosurgery. Human liver tissue was obtained from 5 male patients undergoing liver resection. The human study was approved by the Ethical Committee of Hachioji Medical Center, Tokyo Medical University, permit number 12-01. Calcium-induced mPT was investigated in human material by functional and morphological assays – quantitative calcium infusion, membrane potential, classical light scattering and electron microscopy. CypD was visualized using Western blotting. An ELISA kit for detection of human Cyt c was used.
Results and Discussion: Coupled respiration and reversible calcium-induced permeability transition (mPT) was detected in isolated human brain and liver mitochondria. The CypD and mPT inhibitor cyclosporin A increased calcium retention capacity in human brain mitochondria and inhibited swelling, membrane potential loss and cytochrome c release in energized human liver mitochondria.
Conclusion(s): We provide novel evidence of the existence of calcium-induced mitochondrial permeability transition in human brain and liver mitochondria highlighting its relevance to pathological conditions involving intracellular calcium dysregulation and an altered redox state such as ischemia-reperfusion and traumatic brain injury.
Acknowledgements: This study was supported by the Swedish Research Council and by the Japanese Ministry of Health, Labour and Welfare.

7AP3-4

Minocycline decreases mortality and perilesional microglial activation in a combined model of traumatic brain injury and sepsis in the rat

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Background and Goal of Study: The superimposition of sepsis and traumatic brain injury (TBI) increases mortality, exacerbates morphological and functional cerebral damage and causes persistent perilesional microglial activation in the rat [1]. In this experimental condition, a protective effect might be obtained by administering drugs that modulate both sepsis and/or cerebral inflammation. Minocycline, through its antibacterial and immunomodulatory action, might satisfy both requirements [2,3], therefore, we assessed whether it can reduce or prevent cerebral damage in the combined model of TBI and sepsis.
Materials and Methods: TBI was induced by controlled cortical impact (CCI) on the left parietal cortex and sepsis by contemporary cecal ligation and puncture (CLP). Mortality, weight, neurological function (via the Morris Water Maze (MWM) and the beam balance (BB) tests) and histology were evaluated for 14 days in 3 groups of rats: sham, CCI+CLP, and CCI+CLP+minocycline (n=at least 10 for each group). Minocycline (45 mg/Kg i.p.) was administered every 12 hours for 3 days starting immediately after injury and its concentration in cerebral tissue was measured at steady state (72 h) by using a microbiological assay.
Results and Discussion: Minocycline cerebral tissue concentration was 0.91 mcg/ml (blood/brain ratio: 20/1). Minocycline treatment significantly reduced mortality and improved body weight gain and reduced microglial activation in the perilesional area (microglia showed highly ramified processes, indicating a quiescent state compared to the phagocytic phenotype observed in untreated rats). Despite these positive effects, functional impairment was not decreased, as the MWM and BB tests were altered in comparison to controls.
Conclusion(s): Our results show that in this combined model, minocycline reduced mortality and improved body weight gain. However, despite its favorable effect in modulating microglia, it failed to prevent the exacerbation of the neurological impairment caused by the simultaneous occurrence of sepsis and TBI.
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7AP3-5

Exendin-4 reduces infarct volume after transient focal cerebral ischaemia in mice

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Background and Goal of Study: Exendin-4 is a glucagon like peptide 1 analogue, which modulates calcium responses to glutamate and membrane depolarization in neurons. We investigated the neuroprotective effect of exendin-4 against transient middle cerebral artery occlusion (MCAO) in mice.
Materials and Methods: Mice were divided into two groups at random. Anesthesia was induced and maintained with inhalation of Isoflurane, nitrous oxide and oxygen in spontaneous breathing. The regional cerebral blood flow was measured with the transcranial laser Dopplar. A silicon-coated filament was inserted and advanced to the origin of the MCA. After the 50 minutes period of MCAO, reperfusion was accomplished by withdrawing the filament. Exendin-4 (5mcg/kg, is) or normal saline was treated 30 minutes before MCAO and 3, 24, 36 hours after MCAO in 1st study, and it was treated 3, 24,36 hours after MCAO in 2nd study. The blood glucose level was measured before and after MCAO. Three behavior tests were performed 48 hours after MCAO. Mice were euthanized and transcardially perfused. The brain was sliced and stained for the neuronal specific antigen NeuN by immunohistochemistry, and Infarct Volume (IV) was measured. Differences were subjected using student t-test and significance was accepted at $p<0.05$.
Results and Discussion: There was no significant difference in any biological data between both groups. In the 1st study, IV in exendin-4 group was significantly smaller than that in control group (22.0±8.7 m3, 39.1±8.7m3, $p<0.001$). But, in the 2nd study, the IV in exendin-4 group was similar with that in control group. In pre and post treatment of exendin-4 study, the blood glucose level during MCAO in exendin-4 group was higher than that in control group. There was no significant difference in any behavior test between both groups. The lower blood glucose level during MCAO might reduced the ischaemic damage. Gilman, et al reported that Glucagon-like peptide 1 modulates calcium responses to glutamate and membrane depolarization in hippocampal neurons. Calcium responses to glutamate occurs immediately after cerebral ischaemia. Our results suggest that pre treatment of exendin-4 plays an important role for neuroprotective effect during MCAO.
Conclusion(s): In our model in mice, pre and post treatment of exendin-4 (5mcg/kg, is) decreased the blood glucose level during MCOA, and reduced the infarct volume 48 hours after MCAO significantly.
Acknowledgements: Great thanks for Tadeusz Wieloch and all members in Wallenberg Neuroscience Center, Lund University, Sweden.

7AP3-6

Regulating blood glucose concentration improve hippocampus neuronal impairment by transient global brain ischemia

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Background and Goal of Study: It has been reported that both of hyperglycemia and hypoglycemia are harmful to ischemic brain. We designhned this study to observe whether regulating glucostasis can improve the hippocampus neuronal damage by transient global ischemia/reperfusion.
Materials and Methods: After institutional approval, 64 SD rats were randomly allocated into 4 groups (n=16 in each), contral group (group C), global brain ischemia/reperfusion group(group I/P), blood glucose fluctuation group (group F) and blood glucose stabliliation group(group S). The global cerebral ischemia was made in latter 3 groups by bilateral common carotid artery occlusion combined with hemorrhagic hypotention. Following 15-minute ischemia, the rat brain was reperfused. Perioperative blood glucose concentrations were controlled to desired levels by euglycemic insulin clamp technique (EICT) in group F and group S. In group S, blood glucose concentrations were regulated to the range of basal level plus/minus 0.5 mmol/L, while the concentrations were regulated to 0.5-1.2 mmol/L less or 0.5-1.2 mmol/L more than the basal level in group F. At the endpoint of 3 hour after starting reperfusion, hippocampus was obtained from eight rats in each group for histopathology and immunohistochemistry test. Hippocampus neuronal damage and neuronal apoptosis were detected using HE staining and TUNEL immunostaining respectively. In the other eight rats in each group, shuttle box task were performed once perday from the 1st to 5th day after transient global ischemia/reperfusion. The rates of active avoidance reaction and the latency of escaping response were observed and recorded to detect the memory ability for each rat. These rats were then kelled and the hippocampus was removed for pathology detection. ANOVA and paired t-test were used to perform statistical analysis.
Results and Discussion: Hippocampus neuronal damage(death and apoptosis) occured markedly at 3rd hour and 5th day after transient global ischemia/reperfusion in group I/P. The damage was alleviateed in group S ($P<0.05$), but no difference was found between group F and group I/P. The rates of active avoidance reaction and the latency of escaping response in each group were consistent with the level of neuronal damage, with improved results in group S compared with group F and group I/P.
Conclusion(s): Regulating perioperative glucostasis would improve the hippocampus neuronal damage by transient global ischemia/reperfusion.
References:
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7AP4-1

Middle cerebral artery flow velocity and CO_2 reactivity during the combination of hemodilution and sevoflurane-induced hypotension in elderly patients

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Background and Goal of Study: Controlled hypotension using sevoflurane combined with hemodilution preserves cerebral blood flow. However, effects of the combination remain to be clarified in elderly patients. This study was designed to evaluate the effect of acute normovolemic hemodilution (ANH) and sevoflurane-induced hypotension on middle cerebral artery flow velocity (Vmca) and CO_2 reactivity in elderly patients using transcranial Doppler sonography (TCD).
Materials and Methods: After institutional approval and informed consent, 20 patients undergoing hip surgery were randomly divided into two groups according to age. Group A (n=10) included patients aged less than 60yr (50±6 yr, mean±SD) and group B (n=10) more than 70yr (76±5 yr). Anesthesia was maintained with N_2O-O_2-sevoflurane. ANH was produced by drawing 800 ml of blood and replacing it with same amount of hydroxyethyl starch (final Hct 24-26%) and MAP was maintained at 55 mmHg for 80 minutes by increasing the inspired concentration of sevoflurane. $PaCO_2$ was maintained at 40 mmHg initially, and changed range of 30-50 mmHg. Vmca was measured by TCD and relative CO_2 reactivity values were obtained by dividing the percentage change in the Vmca by the change in $PaCO_2$ (%ΔVmca/$\Delta PaCO_2$, %/mmHg). Vmca and blood gas were measured before hemodilution (T0), after hemodilution (T1), 80 minutes after starting hypotension (T2), and 60 minutes after recovery from hypotension (T3). Statistical significance ($P<0.05$) was determined using AVOVA and Student's t-test.
Results and Discussion: Vmca was 52±3 cm/s in group A and 51±3 cm/s in group B at T0, and it significantly increased at T1 (61±3 cm/s, $p<0.05$ vs. T0 in group A and 58±2 cm/s, $p<0.05$ vs. T0 in group B). In group A, Vmca returned to pre-hemodilution value at T2 (51±3 cm/s, $p<0.05$ vs. T1) and recovered at

T3 (56±3 cm/s, p<0.05 vs. T2). In group B, Vmca decreased less than pre-hemodilution value at T2 (44±3 cm/s, p<0.05 vs. T1 and group A) and returned to pre-hemodilution value at T3 (50±3 cm/s, p<0.05 vs. T2 and group A). In group B, %ΔVmca/Δ$PaCO_2$ significantly decreased at T2 [2.26±1.45 %/mmHg, p<0.05 vs. group A (3.20±1.51 %/mmHg)]. Sevoflurane-induced hypotension during hemodilution might impair the response of cerebral large vessels to $PaCO_2$ in elderly patients.

Conclusion(s): The results indicate that a moderate ANH increases Vmca, while the combination of sevoflurane-induced hypotension would impair the blood flow and CO_2 reactivity in elderly patients.

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7AP4-2

Cortical physiology during induction and recovery from propofol anesthesia

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Background and Goal of Study: EEG has limitations in its ability to interrogate cortical physiology due to the band pass filter qualities of the skull, thus limiting its reliable frequency range to less than 40Hz. In contrast, electrocorticography (ECoG) records signals directly from the surface of the brain. It has the advantages of greater spatial resolution and access to higher frequencies not detectible at the scalp such as gamma rhythms (>40 Hz) which have been shown to better correlate to a higher cognitive processes (1).

Materials and Methods: Electrocortical activity was recorded from implanted arrays of subdural electrodes in 8 human subjects with intractable epilepsy during induction and /or recovery of a propofol anesthetic.(induction and recovery: 5 patients, induction only: 2 patients, recovery only: 1 patient). Endpoints for the induction and recovery recordings were defined respectively as the loss or gain of ability to follow a verbal command. Average spectral power changes in six bands were evaluated followed by analysis with regard to cortical location.

Results and Discussion: Induction: The delta frequency band (0-2Hz) demonstrated a significant increase in power in frontal lobe. The theta frequency band (3-8Hz) decreased. Similarly the mu (8-12Hz) and beta (18-23Hz) bands show decreases in power, but all had a high degree of inter subject variability. Two gamma frequency bands (75-100Hz and 200-225Hz) demonstrated a significant power decrease in all cortical locations. Awakening: Delta power changes were associated with a high degree of inconsistency across patients, some showing increase and others decrease. Theta and mu bands were likewise inconsistent. However beta and the low and high gamma bands showed a significant increase in power that was highly consistent across subjects and cortical locations. These results suggest that induction and awakening processes are not mirror images of one another. Further, it demonstrates that gamma frequency ranges, known to be associated with cognitive functioning, more reliably distinguish the “awake” and “asleep” states as defined in this study.

Conclusion(s): Algorithms for assessing depth of anesthesia might be improved by taking into account the asymmetry of the induction/recovery transitions.

Acknowledgements: J Breshears is the main author of this abstract.

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7AP4-3

Effects of beach chair position and induced hypotension on cerebral oxygen saturation in patients undergoing arthroscopic shoulder surgery

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Background and Goal of Study: The beach chair position and induced hypotension has been used to improve surgical field during arthroscopic shoulder surgery. However, it has the potential to cause postoperative neurological complications due to cerebral hypoperfusion. The purpose of this study was to investigate the influence of beach chair position and induced hypotension on cerebral oxygen saturation (rSO_2) in patients undergoing arthroscopic shoulder surgery by using near infrared spectroscopy.

Materials and Methods: Twenty patients scheduled for arthroscopic shoulder surgery were enrolled prospectively. The Mini Mental State Examination (MMSE) was conducted before surgery and 1 day after surgery. After induction of anesthesia, mechanical ventilation was controlled to maintain $PaCO_2$ at 35 to 40 mmHg. Anesthesia was maintained with sevoflurane (1 MAC) and remifentanil (0.1-0.2 μg/kg/min). Hypotension was induced and maintained at a mean arterial pressure (MAP) of 60-65 mmHg with remifentanil. Cerebral oxygen saturation was measured using the INVOS 5100 cerebral oximeter. MAP, rSO_2 were recorded at the following times: before induction (T_0), immediately after induction (T_1, baseline), after beach chair position (T_2), immediately after induced hypotension (T_3), 1 hr after induced hypotension (T_4), after supine position at the end of surgery (T_5). Cerebral desaturation was defined as a reduction of rSO_2 less than 80% of baseline value ≥ 15 seconds. A decrease in the MMSE score ≥ 2 points from baseline was considered a decline in cognitive function.

Results and Discussion: In the beach chair position and induced hypotension, rSO_2 decreased significantly compared to baseline value. There were two patients who showed an episode of cerebral desaturation. A decline in cognitive function was not observed in any of the patients.

Table 1. The changes in regional cerebral oxygen saturation (rSO2) and mean arterial pressure (MAP)

	T0	T1	T2	T3	T4	T5
MAP	105.0±13.2	84.4±12.9	74.8±14.1*	63.7±5.4*†	64.1±3.8*‡	79.9±11.8
Left- rSO2	66.2±5.9	73.9±6.8	67.3±7.8*	66.2±7.6*	65.8±8.8*	71.3±11.1
Right- rSO2	64.5±6.4	72.5±5.7	66.6±6.8*	65.4±7.8*	65.8±6.9*	71.3±9.4

Values are mean ± SD. * P < 0.05 versus T1; †P = 0.051 versus T2; ‡P < 0.05 versus T2; by repeated measures of analysis of variance with Bonferroni correction.

Conclusion(s): The beach chair position and induced hypotension decreased cerebral oxygen saturation without impairment of cognitive function.

7AP4-4

Cerebral haemodynamic changes in patients with cerebral tumours during anaesthesia

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Background and Goal of Study: Induction of anaesthesia and emergency is often associated with marked haemodynamic changes. The aim of the study was to compare systemic and cerebral haemodynamic changes during induction with propofol and emergency post sevoflurane anaesthesia between patients subjected to craniotomy for brain tumours and for non neurosurgical operations.

Materials and Methods: 65 patients (ASA I-III, aged 18-75 years) scheduled surgery for intracranial tumours (group T) and 65 patients for osteosynthesis as control group (group C) were enrolled into the prospective study. In addition to standard monitoring, a transcranial Doppler ultrasound was used to continuous measure of cerebral blood flow velocity (Vmca). Anaesthesia was induced with propofol and maintained with sevofluran-fentanyl under spectral entropy monitoring. Time points of measurements: 1 – arrival to the operating room (baseline), 2 – after induction, 3 – end of surgery, 4 – after awakening and extubation. The estimated cerebral perfusion pressure (eCPP) and cerebral blood flow index (CBFI) were calculated offline using an established formulas [1]. Statistical analysis was performed using Student’s t test and χ^2 test. P<0.05 was considered statistically significant.

Results and Discussion: There were no significant differences between the groups with respect to demographic characteristics. Mean blood pressure, Vmca, eCPP and CBFI decreased significantly after induction and increased after awakening in both groups without significant different between them, except MBP decreased 17.1% in group T and 21.2% in group C (p =0.043) after induction. MBP increased 18.2% and 21.1% (p =0.36), Vmca – 43.9% and 48.2% (p =0.5), eCPP – 30.5% and 36.5% (p =0.46), CBFI – 60.0% and 67.4% (p =0.53) respectively when compared the end of surgery and the emergency stages. Vmca and CBFI were significantly higher in the control group in most stages of study.

Conclusion(s): Haemodynamic changes are similar for neurosurgical and for non neurosurgical patients during induction of anaesthesia and emergency period. Recovery period after neurosurgical procedures remains a time of potential danger to patients because systemic and cerebral haemodynamic markedly increase and may cause a bleeding complication.

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7AP4-5

Normobaric hyperoxia does not induce significant electroencephalogram changes in healthy male subjects

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Background and Goal of Study: Hyperoxia can cause slowing and epileptic seizures in the electroencephalogram (EEG) when administered under hyperbaric conditions(1). Also hyperventilation and ensuing hypocapnia induce EEG

slowing and may provoke epileptiform acitivity in patients with epilepsy (2). We aimed to study whether prolonged normobaric hyperoxia without hyperventilation has any effects on EEG.

Materials and Methods: Ten healthy, non-smoking men, aged 21-30 years, body mass index 21-28 kg/m^2, were recruited. Nineteen-channel-EEG was recorded continuously during breathing of 100 % oxygen through a tight 5 cmH_2O continuous positive airway pressure –mask for one hour resulting in a mean end-tidal oxygen concentration of 91.1% (SD 1.8%). EEG-signal was analysed both visually and quantitatively after Fast Fourier Transformation. Total power and main frequency band powers (beta, alpha, theta, and delta) were calculated from the power spectrum, and compared between the baseline (before starting 100% oxygen) and after one hour breathing of pure oxygen. Quantitative EEG variables were analysed with repeated measures analysis of variance with side (left, right), (F3, F4, C3, C4, P3, P4, T3, T4) and time (before and after oxygenation) as within-factors. Variables were log-transformed before analyses to meet the assumption of normality. To avoid multiplicity, Bonferroni correction was applied.

Results and Discussion: A slight reduction in posterior alpha band power and a simultaneous increase in anterior and lateral slow EEG activity occurred during oxygenation, but none of the changes remained significant after adjustment for multiple statistical comparisons. Based on the effects on EEG, normobaric hyperoxic ventilation does not seem to induce harmful electrophysiological effects on the CNS.

Conclusion(s): In healthy subjects, normobaric oxygen, even when administered in high concentrations, does not cause significant EEG slowing or produce any other, possibly harmful, changes in the EEG.

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7AP4-6

Regional anesthesia for carotid endarterectomy decreases incidence of shunt placement

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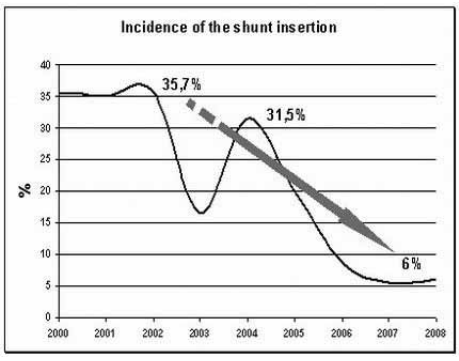
Background and Goal of Study: The choice of anesthesia for carotid endarterectomy (CE) still rest disputable, and GALA-trail unfortunately hasn't solved these issues. We analyzed results concerning shunt insertion during CE.

Materials and Methods: In our Insitute during 2000-2008 CE was performed in 513 pts. All pts were operated by same surgical and anesthesiological team. Surgeons used eversion CE. General anesthesia (GA) (TIVA, propofol+fentanyl) or RA (deep and superficial neck block, 0,75% ropivacaine) were used. Monitoring modalities included: TCD by Spenser devices, apart from patient with absence of ultrasound window; Cerebral oximetry (CO) (Somanetics, INVOS 5100); EEG (Nihon Koden); Stump pressure. In patients operated under RA additional monitoring tool was dynamic neurological control performed by anesthesiologist. Incidence of temporary shunt placement and permanent neurological complications was analyzed. Indications for shunt placement were: 1) decrease of linear velocity of blood flow in MCA by 30 cm/s or more than 50% compared to baseline preclamp values, accompanied with changes in CO and EEG; 2) In group of pts operated under RA = neurological symptoms (hemiparesis, aphasia, decrease of the level of consciousness) combined with results of neuromonitoring.

Results and Discussion: Introduction of RA with possibility of dynamic neurological control induced 4,3% decrease of incidence of placement of temporary shunt (fig.1), without any increase of incidence of permanent neurological deficit (tab.1). Placement of temporary shunt during CE may be difficult on anatomical reason and dangerous concerning specific complications (mainly thromboembolic). So, it is reasonable to keep the incidence of shunt placement as low as possible. Introduction of RA was associated with substantial decrease of incidence of shunt placement without any increase of permanent postoperative neurological deficit.



Conclusion(s): Advantage of RA over GA in carotid artery surgery is at least in a decrease of incidence of placement temporary shunt.

Table 1

	Surgeries, N	Shunts, N/%	Neurological complications, N/%
2000-2005	267	75/28,1	12/4,5
2006-2008	246	16/6,5	10/4,1
Total	513	91/17,7	22/4,3

7AP4-7

Acute peripheral oxygen desaturation does not result in significant decreases in cerebral oxygen saturation

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Background and Goal of Study: Peripheral pulse oximetry allows immediate detection of any hypoxic incident. The FORE-SIGHT absolute cerebral oximeter uses 4 wavelengths to determine absolute cerebral oxygen saturation ($SctO_2$) at the microvascular level. Few data are currently available on cerebral oxygenation during arterial desaturation, as measured by pulse oximetry (SpO2). In this study, we evaluated the effects of SpO2 (and especially SpO2 < 97%) on cerebral oxygen saturation.

Materials and Methods: With IRB approval, pts undergoing orthopaedic day surgery under epidural anesthesia (with propofol sedation) were included. After installation with O2 mask, bilateral SctO2 monitoring was started. When achieving stable conditions, O2 mask was removed. If SpO2 decreased below 90%, O2 was immediately readministered.

Results and Discussion: We compared 18 pts with SpO2 100% (group A) to 18 pts with SpO2 below 97% (m 95.4%; 93-96%) (group B),before removal of supplemental O2. Mean SctO2 was 76.1% (71-80%) in group A and 74.3% (68-79%) in group B. Removal of oxygen decreased mSpO2 to 93.4% (87-96%) (A) and to m89.1% (83-94%)(B). SpO2 decreased below 90% in 6 pts (1:A;5;B). Mean SctO2 decreased to 65.3% (61-72%) in group A and to 66.1% (58-71%) in group B, which was not statistically significant. No pt in group B revealed any SctO2 value below 55%.

Conclusion(s): Hypoxic incidents, when O2 is readily readministered if SpO2 decreases below 90%, do not result in critical decreases in cerebral oxygen saturation.

7AP4-8

The accuracy of neuromonitoring in awake patients undergoing carotid endarterectomy: A meta-analysis

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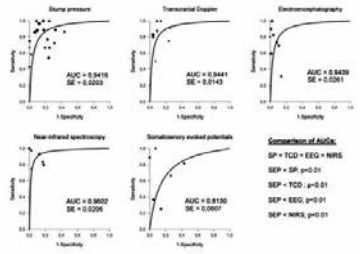
Background and Goal of Study: Several studies evaluated the accuracy of different neuromonitoring devices in patients under regional anesthesia as clinical deterioration provides a good gold standard for the diagnosis of cerebral hypoperfusion. The aim of this meta-analysis is to summarize these results and to compare the accuracy of the different monitoring systems used.

Materials and Methods: We searched 36 databases for studies on carotid endarterectomy under regional anesthesia and the simultaneous use of electroencephalography (EEG), stump pressure measurement (SP), somatosensory evoked potentials (SEP), cerebral oximetry by near infrared spectroscopy (NIRS) or transcranial Doppler sonography (TCD). In addition, a manual search of references cited in published reports and reviews was also performed. The frequency of true-positive, true-negative, false positive and false negative results were abstracted from all selected studies. For statistical analysis we calculated the area under the curve (AUC) of a summary receiver operating characteristic (ROC) curve. The pooled estimates of the sensitivity, specificity, positive and negative likelihood ratio were determined.

Results and Discussion: 37 studies (EEG=8; SP=19; SEP=6; NIRS=6; TCD=9) were identified to met the inclusion criteria; These studies included a total of 4347 patients. The overall shunting rate was 15.4% and varied among the different monitoring devices used. The sROC curves and the corresponding AUCs are shown in figure 1. The AUCs of SP, TCD, NIRS and EEG did not differ significantly, but were all higher than the AUC of SEP (all p<0.01). The pooled estimates for sensitivity, specificity, positive and negative likelihood ratio are shown in table 1.

Conclusion(s): NIRS, Stump pressure, EEG and TCD provide similar accuracy for the detection of cerebral ischemia during carotid artery clamping. Lower accuracy was found for somatosensory evoked potentials.



	EEG	SP	SEP	NIRS	TCD
n	1011	2882	349	398	736
n shunted	250 (24.5%)	358 (12.4%)	72 (20.6%)	55 (13.8%)	92 (12.5%)
Sensitivity	68% (59-76)	84% (80-88)	53% (41-65)	92% (84-96)	86% (77-93)
Specificity	96% (94-97)	85% (84-87)	86% (81-89)	89% (86-92)	90% (87-92)
PLR	12.9 (9.4-17.9)	5.3 (4.8-5.9)	3.7 (1.8-7.5)	10.3 (6.6-16.2)	7.6 (5.8-9.9)
NLR	0.34 (0.26-0.44)	0.19 (0.15-0.24)	0.53 (0.32-0.88)	0.10 (0.06-0.21)	0.17 (0.10-0.28)

7AP4-9

Differences of cerebral circulation for patients undergoing resection of brain tumours or clipping of cerebral arterial aneurysms

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Background and Goal of Study: Sevoflurane (SEVO) has minimal effect on the cerebrovascular system and could be recommended as an ideal hypnotic during neurosurgical procedures. The aim of the study was to determine the differences of cerebral circulation for patients undergoing different brain surgery under sevoflurane anaesthesia.

Materials and Methods: 65 patients (ASA I-III, aged 18-75 yr, Glasgow 15) scheduled for elective brain tumours resection and 65 for cerebral arterial aneurysms clipping surgery were enrolled into the prospective study. Standardised anaesthesia with SEVO was performed for both groups. The mean flow velocity (Vmca) and pulsatility index (PI) in the middle cerebral artery were continuously measured with transcranial Doppler. Data were recorded when patients arrived in operating room (1), after induction (2), after craniotomy (3), after tumour resection or arterial aneurysm clipping (4), at the end of surgery (5), after awakening (6) and 2 hour after operation (7). Estimated cerebral perfusion pressure (eCPP), resistance area product (RAP) and cerebral blood flow index (CBFI) were calculated off-line. Statistical analysis was performed using Student´s t test, χ^2 test and multivariate analysis for repeated measurements. p<0.05 was defined as significant.

Results and Discussion: There were no significant differences between groups regarding demographic data. Heart rate (p=0.002), mean blood pressure (p=0.001), Vmca (p=0.037) and PI (p=0.025) were higher in aneurysm group. Results of the Vmca are shown in table 1. Data are presented as mean (SD).[table1]RAP (p=0.10) and eCPP (p=0.55) were similar between groups. Changes of CBFI during anaesthesia are shown in table 2 and were higher in aneurysm group (p=0.031).

Conclusion(s): Increased systemic and cerebral circulation is associated with subarachnoid hemorrhage after cerebral arterial aneurysm rupture.

7AP5-1

Pre-existing illnesses as pejorative factors influencing the mortality rate after the clipping of ruptured cerebral aneurism in different ages

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Background and Goal of Study: There are few studies showing the influence of aging on the outcome of patients after the clipping of ruptured cerebral aneurism (1). Goal of the study is to determine the influence of pre-existing illnesses and evaluate their prediction power on the outcome of different age groups of patients after the clipping of ruptured cerebral aneurism.

Materials and Methods: We reviewed the data of 253 patients who were operated for cerebral aneurism within 11 days after the rupture. Patients were grouped according to age: group I (G1 =149 patients) ≤ 60 years and group II (G2 = 104 patients) ≥60 years old. There were considered pre- existing CAD, dysrythmia, hypertension or COPD/asthma, as well as H&H, WFNS, Fisher grade or GCS scores on admission. In-hospital and out-of-hospital events for one month after the discharge were recorded. Chi-test and Fisher exact test were used to evaluate the hypothesis that death is associated with a well-defined pre-existing illness. p≤0.05 is considered statistically significant.

Results and Discussion: Although the mortality rate showed no significant difference between groups (G1=12.08% and G2=17.31%, p= 0.23) it was higher in G2. There was no significant statistical difference in H&H, WFNS, Fisher grade or GCS scores between groups on admission and in our patients all of them have predictive power on postoperative mortality in both groups (p<0.05). It is interesting that presence of co-morbidities as hypertension, CAD or dysrythmia have significant impact (p<0.05) on postoperative mortality only in the younger patients (G1).

Impact of the factors on mortality rate

	G 1 (149 pts) p=	G 2 (104 pts) p=
Hypertension	0.008	0.263
CAD	0.021	0.157
Dysrythmia	0.017	0.023
COPD/Asthma	0.067	0.057
H&H	0.0016	0.0056
WFNS	0.001	0.0012
Fisher grade	0.036	0.001

Conclusion(s): Our data show that only in our younger patients (G I) pre-existing diseases as CAD, hypertension or dysrythmia exert influence on the mortality rate after the clipping of ruptured cerebral aneurism and suggest that they could be used as predictors of outcome. However initial neurologic and Fisher grade findings can predict mortality in both groups. Therefore better control of pre-existing diseases might decrease the mortality after the clipping of ruptured cerebral aneurism in younger patients.

Reference:

1 Sedat J,et al. Neurocritical Care 12.2 (2005): 119-23.

7AP5-3

Incidence and influence of seizures following aneurysmal SAH

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Background and Goal of Study: Seizures are well-known complications following aneurysmal subarachnoid hemorrhage (SAH)[1]. The aims of this study were to evaluate the incidence, and the influence of seizures on the prognosis and mortality of SAH.

Materials and Methods: Data of a total of 80 patients (male/female 36/44) with aneurysmal SAH who underwent operative treatments were reviewed. For these, the incidence of seizures and epilepsy were assessed. Epilepsy was defined as two or more unprovoked seizures after hospital discharge. We assessed also Hunt and Hess grade, aneurysm location, Glasgow Outcome Scale (GOS) and mortality. For statistical analysis Chi Square tests were used.

Results and Discussion: In a retrospective study of 80 patients with subarachnoid haemorrhage, 11 (13.75%) had seizures at the onset of bleeding. None had a previous history of seizures. Hunt and Hess grade >3 were significantly more frequent in patients with seizures at the onset of subarachnoid haemorrhage. The location of aneurysm was not significant for the incidence of seizures episodes. Mortality or severe disability at discharge (GOS) were more frequent in these patients, so seizures were a significant predictor of prognosis.

Abstract 7ap4-9 – Vmca changes during anaesthesia with SEVO (cm/s)

Group	1 Vmca	2 Vmca	3 Vmca	4 Vmca	5 Vmca	6 Vmca	7 Vmca
Tumour	52.6 (13.7)	41.0 (11.6)	42.8 (13.1)	43.8 (13.2)	44.3 (14.0)	62.0 (16.6)	57.7 (15.5)
Aneurysm	60.6 (22.1)	52.4 (18.5)	53.3 (18.0)	53.8 (20.1)	56.3 (21.6)	75.0 (26.6)	72.0 (23.8)

CBFI changes during anaesthesia with SEVO (cm/s)

Group	1 CBFI	2 CBFI	3 CBFI	4 CBFI	5 CBFI	6 CBFI	7 CBFI
Tumour	31.0 (10.7)	22.8 10.0)	23.7 (9.8)	25.7 (11.6)	24.9 (10.9)	37.1 (14.4)	27.4 (11.1)
Aneurysm	35.3 (14.6)	28.4 (11.6)	30.8 (10.9)	32.3 (12.5)	34.3 (15.6)	52.3 (28.2)	38.8 (18.0)

Conclusion(s): Seizures occurred in 13,75% of patients with SAH. Our findings indicate that poor Hunt & Hess grade is a significant factor for apparence of seizures and those seizures predict a poor outcome and mortality after SAH.

Characteristic	Pt. No.	Seizures +	Seizures -	p-value
Hunt and Hess				
I & II	52	2	50	NS
III & IV	28	9	19	0.015
Aneurysm location				
ICA	14	2	12	NS
ACA	31	4	27	NS
MCA	27	4	23	NS
VBA	7	1	6	NS
GOS (1-3)		21	9	0.014
Mortality	7(8,7%)	6	1	0.007

Seizures+ - yes; Seizures- - no

Reference:

1 Butzkueven H, Evans AH, Pitman A, Leopold C, Jolley DJ, Kaye AH, et al.: Onset seizures independently predict poor outcome after subarachnoid hemorrhage. Neurology 55 : 1315-1320, 2000.

7AP5-4

Neuroprotection in the therapy of the brain injury

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Background and Goal of Study: Excitotoxicity caused by the excess overshoot of the glutamat is like a starter of the neuronal death at the acute brain injury (ABI). Exitotoxicity can be neutralized by the blockade of NMDA-receptors. Amantadin sulphate being non-competitive antagonist of NMDA-receptors decreases the flow of Ca2+ into the cell, inhibits the violation of the neurons and does neuroprotective action. (1,2) The goal of study: learning the efficiency of amantadin sulphate as neuroprotector in patients with ABI.

Materials and Methods: 32 patients with ABI were observed (26 men and 6 female), the average age – 43±5,3 years. The cause of ABI were: severe head injury -18 patients, subarachnoidal hemorrhage – 14 patients. The level of consciousness on the Glasgo's coma scale (GCS) at the admission consisted 6,2±2,1 points. The following investigations were done: dynamics of the consciousness' level, the duration of carrying out of the artificial pulmonary ventilation (APV), clinical outcome by the Glasgo's outcomes scale (GOS).

Results and Discussion: The patients were prescribed the traditional therapy at the ABI. All the patients were divided into two groups. The 1st one (n=15) were the patients got the traditional intensive therapy, the second one (n=17) were the patients whom the traditional intensive therapy was completed by 400 mgday of amantadin sulphate intravenously dropwise. The positive clinical effect of amantadin sulphate has been revealed from the first day of the treatment. The level of consciousness increased for 14,3% and to the 3rd day it was got the reliable difference ($p \leq 0.001$) in compare with the 1st group. In the 1st one the results were worse. The duration of APV in the main group was also shorten for 15,9%. It is connected with the rapid recovery of consciousness of the patients and the early transference to the self-breathing. The clinical outcome by the Glasgo's outcomes scale was also better in the 1st group.

Conclusion(s): 1. The usage of indirect antagonist of NMDA-receptors of amantadin sulphate in the therapy of the patients with ABI improves the neurological status, the early recovering from coma. 2. Using of the medication allows to shorten the duration of APV of the patients.

References:

1 Ginsberg M.D. Neuroprotection for ischemic stroke: past, present and future. Neuropharmacology 2008. Scientific World Journal 2008; 13; 8: 698-712.

2 Lipton S. Failures and successes of NMDA receptor antagonists: // The Journal of the American Society for Experimental NeuroTherapeutics.- 2004.- Vol. 1.- P. 101-110.

7AP5-6

Distribution of blood glutamate into peripheral tissues is increased by stress response and adrenaline administration, providing neuroprotection following traumatic brain injury

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Background and Goal of Study: Increased concentrations of glutamate (G) in the brain's fluids following traumatic brain injury has been associated with neurotoxicity and unfavorable neurological outcome. Mechanisms that decrease blood G levels, thereby enhancing the brain-to-blood efflux of G, have been shown to improve neurological outcome. The mechanisms of blood G autoregulation include a free-shift of unchanged G to different tissue compartments primarily skeletal muscle, as well as a conversion of excess G to the inactive metabolite 2-ketoglutarate. Blood G levels decrease following stress and administration of blood G scavengers. This study demonstrates enhanced uptake of G into muscle tissue, following infusion of Adrenaline (AD), and decreased uptake following administration of adrenoreceptor antagonists Metoprolol (ME) and Propanolol (PR). These findings provide a partial explanation to the neuroprotective properties of stress and catecholamine administration.

Materials and Methods: 48 Sprague Dawley anesthetized rats were divide into treatment groups: Sham, AD, ME, PR, Pyruvate, Oxaloacetate. Treatments were infused intravenously for 30 min at 1µg/100g/min. Rats were then injected with radiolabeled G 1ml=10µci L-[G-3H] glutamic acid per rat intravenously. Arterial blood samples were collected every 2.5 min for10 min. Rats were sacrificed and the peripheral organs, including skeletal muscle, were removed and weighed, and 0.1 g tissue samples were obtained. Tissue samples were incubated and dissolved in 1 ml solvent, and their radioactivity measured. Radioactivity of muscle tissue, relative to the total body mass was calculated, and groups compared.

Results and Discussion: Muscle tissue accumulated the majority of radiolabeled G from the blood at 10 min following injection (54-69%). Accumulation was significantly increased in the AD group compared with Sham, PR, ME (69% vs. 61%, 55%, 54%, $p<0.001$). Accumulation was decreased in the PR and ME groups compared to Sham (55% and 54% vs. 69%, $p<0.01$). Skeletal muscle plays the most significant role in redistributing excess G from the blood. Redistribution into muscle, is part of the natural decrease of blood G levels that takes place soon after a brain insult, creating a larger driving force for the efflux of excess G from brain into blood. Stress, after injury, is known to activate adaptive responses, among them a catecholamine surge, allowing the body to confront the threat and provide protection.

Conclusion(s): Findings of this study demonstrate the possible neuroprotective role of stress.

7AP5-7

Stress, adrenaline and CRH provide neuroprotection in traumatic brain injury by enhancing the brain-to-blood glutamate driving force

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Background and Goal of Study: Increased concentrations of glutamate (G) in the brain's fluids following traumatic brain injury have been associated with neurotoxicity and unfavorable neurological outcome. Mechanisms that decrease blood G levels, thereby enhancing the brain-to-blood efflux of G, have been shown to improve the neurological outcome. The mechanisms of blood G autoregulation are complex, and include conversion of excess G to the inactive metabolite 2-ketoglutarate as well as a free-shift of unchanged G to different tissue compartments and the blood. Blood G scavengers have been shown to decrease blood glutamate levels, enhancing the brain to blood glutamate driving force. In this study we demonstrate that stress following TBI causes a decrease in blood G levels, providing a naturally occurring mechanism that may beneficial to the suffering brain.

Materials and Methods: Sprague Dawley rats were anesthetized and divided into treatment groups: sham, control, Adrenaline, Noreadrenaline, Corticotropin releasing hormone, Hydrocorticosterone. TBI was inflicted by a free falling rod. Treatment regimens were infused intravenously, and G levels determined 30 min after treatment. Comparisons between different groups was assessed using ANOVA with Bonferroni post hoc testing.

Results and Discussion: TBI was shown to reduce blood glutamate significantly (TBI 190±5 µM/l vs. Sham 162±4 µM/l, $p<0.01$). TBI increased corticosterone levels 2.6 fold, confirming the rats were in stress. CRF exerted a transient effect, decreasing blood Glu level at 30 min to 40% of its basal level. Hydrocortisone was observed to cause no significant changes of the blood G. Administration of adrenaline produced a fast and sustained reduction of blood Glu level to about 70% of the basal level at 30 min, lasting at least 90 min. Administration of noradrenaline did not have a significant effect on blood G. We identified adrenaline as a sympathetic effector which modulates blood G. As the adrenaline-mediated decrease of blood G level is significantly larger than that observed after TBI it is presumed that adrenaline plays a regulatory role in the modulation of blood G after stress. The precise mechanisms by which these effectors affect blood G levels remain to be elucidated but their effects are likely to be exerted at G releasing or pumping organs.

Conclusion(s): We propose that the stress-related release of adrenaline might be part of the endogenous arsenal of weapons used to confront brain injury and to limit in time the deleterious increase of G levels in brain fluids.

7AP5-8

Anesthesic management of complications in endovascular treatment of intracranial ruptured aneurysms: A retrospective review

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Background and Goal of Study: In the past decades we witnessed a rapid advancement in the dynamic field of interventional neuroradiology, including development of new device technologies in endovascular embolization fo acutely ruptured aneurysms and improvements in periprocedural patient management. Subarachnoid hemorrhage as a result of ruptured aneurysm is a devastating disease with high mortality and morbidity and the anaesthesiologist has a crucial role in perioperative and anesthetic management strategies in embolization procedures to prevent complications and minimize their effects if they occur.

Materials and Methods: The authors retrospectively assessed the adverse events of endovascular treatment of a series of 78 intracranial aneurysms at our institution between 2004 and 2009, and the anesthesic management of these complications.

Results and Discussion: Aneurysm rupture complicated 6 procedures (7,6%), with no permanent disabling or dead. Thromboembolic events complicated 5 procedures (6,4%), leaving 1 patients permanently disabled (1,2%). Further 24 (30%) procedures were complicated by arterial spasm, 3 procedures (3,8%) by coil loop protrusion, and 2 procedures (2,5%) by arterial dissection, but all of these patients achieved independent recovery. Overall procedure morbidity-mortality was 1,2%. 75 cases were performed under general anesthesia. Monitoring and sedation were performed in 4 cases, in which 2 of them had to be converted to general anesthesia. When aneurysmal rupture occurred (n=6), the goal was to maintain adequate cerebral perfusion and oxygen delivery, avoid increase intracranial pressure, readily provide brain protection, and a rapid anesthesia emergence for neurologic assessment. If vasospasm occurred (n=24), intravenous nimodipine (infusion of 15 µgrams/kg/h or 5 ml/h) was given to all patients. When thromboembolic events were present (n=5), maintenance of stable mean arterial pressure was mandatory. In addition, intravenous abxicimab (standard bolus of 0.25 mg/Kg and infusion of 4,5 ml in 250 ml of saline with an infusion rate of 34 ml/h) was administered in 3 patients.

Conclusion(s): Despite being a minimally-invasive procedures, adverse events can occur during or immediately after the aneurysm embolization procedures, and some of them can cause significant morbidity or mortality. The anaesthesiologist, along with the interventional neuroradiologist, must be able to recognize and treat any neurologic complications that develop and that might lead to emergency situations during the procedures.

7AP5-9

Anatomo-physiological changes in patients with anoxic brain injury

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Background and Goal of Study: A relationship between Bispectral index (BIS) and probability of recovering consciousness has been reported in patients in a coma state due to severe brain injury(1). Our aim was to validate this probability model in comatose patients of anoxic aetiology and look for anatomo-physiological changes using positron emission tomography (PET).

Materials and Methods: Under IRB approval, a prospective study including severe ischemic brain-injured adult patient who did not regain consciousness after 48h of sedation withdrawal was conducted. Patients underwent EEG recording of BIS and EMG for 30 min (BIS XP;Aspect Medical Systems;Winlog® software) and auditory evoked potentials (AEP) to calculate AAI and EMG for 10 min (AEP monitor AAI/2;Danmeter; RUGLOOP II software). Fluordeoxyglucose-F18 PET images of cerebral metabolism were performed. Patients were followed up for 9 months. Outcomes were evaluated by testing recovery of consciousness and recording Glasgow Outcome Score. Descriptive Statistical analysis and logistic regression were performed.

Results and Discussion: We included 6 consecutive patients with anoxic brain injury. None of these patients recovered consciousness. The analysis showed a high BISmax in all patients and a high BISmean (>60) in 5 patients. AAI values (<15) were low in four patients (63%). The other two patients presented high AAI values, that could be explained by high EMG_BIS and EMG_AAI recordings. The patient with GOS 4 was the one with the highest EMG in both monitors. Our previous predictive model couldn't be validated in this brain injury aetiology. Patients PETscan images presented lower global cerebral metabolism, with higher cortical/subcortical uptake ratios than control healthy subjects.

Anoxic Patients

Patient	Age	Outcome	BIS	EMG_BIS	AAI	EMG_AAI
1	65	Exitus	42.0(97.7-0.5)	31(56.8-20.3)	12.9(84-0)	44.0(99-1)
2	71	Exitus	96.4(97.7-79.1)	38(58.8-21.7)	5.1(14-1)	22.8(50-1)
3	50	GOS 4	89.3(97.7-48.3)	52.8(66-29.9)	56.9(92-18)	78.0(98-16)
4	67	Exitus	67.0(89.4-42.4)	36.6(48.4-21.6)	9.5(18-5)	2.1(7-1)
5	69	Exitus	96.1(97.7-84.1)	46.9(57.8-25.2)	58.6(81-38)	70.4(96-16)
6	53	Exitus	60.5(72.7-42.1)	29(40.1-21.3)	8.8(13-4)	1 (1-1)

Values shown as Mean (range)

Conclusion(s): High BIS values were not predictive of consciousness recovery in anoxic patient aplying our probability model. Low AEP values could fit better with the bad outcome, although the EMG activity could be an important artefact.

Reference:

1 Fabregas N.Anesthesiology 2004;101:43-51.

7AP5-10

Anatomo-physiological changes in severely brain injuried patients

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Background and Goal of Study: A relationship between the Bispectral index (BIS) and the probability of recovering consciousness in severely brain injuried patients in a coma state has been reported(1).Our aim was to validate our previous model of probability recovery of consciousness and look for anatomo-physiological changes in these patients using positron emission tomography (PET).

Materials and Methods: Under IRB approval, a prospective study including critically ill brain-injured adult patient who did not regain consciousness after 48h of sedation withdrawal, was conducted. Patients underwent EEG recording to calculate BIS and EMG activity for 30 min, using BIS XP (Aspect Medical Systems) with the Winlog® software to download data. Fluordeoxyglucose-F18 PET images of cerebral metabolism were performed. Patients were followed up until 9 months after injury. Outcomes were evaluated by testing recovery of consciousness as well as measuring the Glasgow Outcome Score. Age, maximum and median value of BIS (BISmax, BISmed) and EMG (EMGmax and EMGmed) were analysed. Probability of recoverying consciousness based on BISmax(1) was compared to the measurement of recoverying consciousness in this new set of patients.

Results and Discussion: We included 39 consecutive patients: Traumatic brain injury (TBI;n=20); Subarachnoidal Haemorrhage (SH;n=19).The model relating BISmax and recovery of consciousness was able to predict recovery of consciousness in 32/39 patients. Failed prediction: 5 patients died during the first month follow up (extracerebral cause);1 patient,who recovered, had the BIS sensor placed in the side of the injury. The preliminary PET results (6 TBI-9 SH) showed a hypometabolism in basal ganglia and a reduction in the relationship between cortical and grey substance metabolism in patients who didn't recover consciousness

Conclusion(s): The value of BISmax is related to outcome of brain-injured adult patients. Based on our previous model the recovery of consciousness has been adequately predicted in 82% of this new set of patients. Differences in brain metabolism (PET) could be the anatomo-physiological basis of the differences in BIS values.

SH

Outcome	n	Age	BISmax	BISmed	EMGmax	EMGmed
GOS(1-3)	16	55.6±17.5	84.8±15.4	65.55*±22.5	64.3±8.3	42.3±9.4
GOS(4-5)	3	76.3±8.3	78.6±14	52.1±6	62.7±13.2	37.2±5.7

*p≤0.05(mean±sd)

TBI

Outcome	n	Age	BISmax	BISmed	EMGmax	EMGmed
GOS(1-3)	15	51.6±22.1	88.8*±13.3	65.7±19.7	63.2*±6.9	44.2±8
GOS(4-5)	5	63.±21.3	71.7±24.5	55.6±30.8	55.8±5	38.4±7.2

*p≤0.05(mean±sd)

Reference:

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7AP6-1

Incidence of early postoperative arterial hypoxemia after craniotomy for brain tumor surgery

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Background and Goal of Study: In early postoperative phase patients are vulnerable to a variety of factors, especially to hypoxemia(1). Hypoxic insult may develop during early postoperative period especially in the presence of the hypoxemia.

Materials and Methods: 321 adult patients without serious co-morbidities (age 47.82±9.64, Karnofsky ≥60%, ASA 1.56±0.35) scheduled for elective brain tumor surgery were included. They received sevofluran based anesthesia for 2.25-4.5 hours with fentanyl, and 8-12 mg pancuronium. After surgery patients were extubated in the operative room at EtMAC 0.2-0.3 and FiO2=0.5 maintaining spontaneous respiration (EtCO2≤45mmHg, SpO2≥98%) and hemodynamic stability. After extubation they breathed at 40%O2. SpO2, ABG and Tcore were recorded prior extubation and for 30min after. Fisher and Chi-tests were used and p≤0.05 is considered significant.

Results and Discussion: Peroperative hypoxemic events were reverted prior to extubation. Data showed significant decrease of PaO2 in first 20 min after extubation corresponding to movement of the patients to PACU (SpO2≤91% in 54pts breathing 40%O2). ABG obtained at arrival in PACU (10min after extubation) showed PaO2≤90 in 58 patients (18.1%). 11 patients were reintubated and mechanically ventilated. Hypothermia strongly parallels PaO2≤90 in first 10 minutes. It was mostly present in long-lasting interventions (68 lasting over 3.5 hours) and after extubation for more than 10 min despite heating (p<0.05). 7.1% of patients developed insults after surgery. There was no correlation (p=0.245) between ASA and hypoxemia in our patients.

	Pre-extubation	10 min	20 min	30 min
SpO2 (%)	98.03±1.76	93.25±4.13**	95.15±3.74	97.17±2.98
PaO2(torr)	187.6±68.9	88.7±12.4**	93.7±8.9*	105.53±12.9
T0 (0C)	35.16±1.67*	35.14±1.12*	35.98±1.80	36.04±1.76

*p≤0.01, ** p≤0.001

Conclusion(s): Early postoperative hypoxemia after craniotomy was a frequent event. It was more frequent in first 20 min after extubation. Breathing 40%O2 was not sufficient in prevention of hypoxemia in our patients. Data showed correlation between hypoxemia and hypothermia. Moments of moving patients to PACU showed most frequent events of hypoxemia and hypothermia. Influence of ASA on the phenomena was insignificant due the selection of patients with low ASA. We suggest that better control of hypoxemic events and hypothermia will improve the outcome of patients after craniotomy receiving inhalation anesthesia.

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7AP6-2

Incidence and early diagnose of venous air embolism in neurosurgical patients operated on sitting position

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Background and Goal of Study: To review the incidence of venous air embolism (VAE) in neurosurgical patients operated on semi-sitting or sitting position.

Materials and Methods: We analyzed retrospectively all patients who underwent a neurosurgical operation on semi-sitting or sitting position from 2006 to November 2009. Monitoring included a central venous catheter located in right atrium by ECG control (Certodyn®;B.Braun). A 20Mz precordial Doppler probe (Bidop ES-100V II, Hadeco) was placed on the anterior wall chest, its correct position was checked by sound changes on the injection of agitated saline. We recorded type of anaesthesia, intraoperative VAE detection and its consequences.

Results and Discussion: Eighty-six patients (43F/43 M; 49±16 yo) underwent a neurosurgical procedure at 45º (13 cases) or sitting position (73 cases). Remifentanil, propofol (TCI) and rocuroniun were used in all cases. Normocapnia and PEEP (6 cmH_2O) were maintained. Twenty patients (23.2%) were diagnosed of intraoperative VAE by $ETCO_2$ sudden decrease (7 patients), Doppler sound changes (4 patients) or both (9 patients). VAE was confirmed by air aspiration through central line in 12 (60%) cases. Patients who presented VAE were younger (40±14 vs 51±16) and were positioned seated (18 cases vs 2 at 45º). No arterial AE was observed. Air entrance could be stopped by neurosurgeons manoeuvres, it was not necessary to change patient position and all operations could be completed. In 3 patients, hemodynamic instability and mild desaturation occurred during the VAE. Fifteen VAE patients could be extubated in the OR at the end of the procedure. Only one patient developed a moderate postoperative pulmonary oedema attributable to the VAE.

Conclusion(s): VAE was diagnosed in almost 25% of patients operated on sitting position. All cases could be intraoperatively managed with surgeons' manoeuvres and air aspiration through central line. Early diagnose of VAE is mandatory to limit its consequences; specific monitoring becomes a standard in this type of surgery.

7AP6-5

Effect of a subanesthetic dose of intravenous ketamine on hemodynamic response to skull-pin placement

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Background and Goal of Study: Insertion of cranial pins for stabilization of the head can result in a marked hypertensive response due to pain caused by the procedure and may adversely affect intracranial dynamics(1).

Materials and Methods: Efficacy of a sub anesthetic dose of intravenous ketamine (0.5 mg/kg) before pinning was studied in a prospective, double-blind, randomized trial of 100 patients. The subjects were divided into two groups of 50. Patients of reference group received 4-5 min prior to procedure intravenous fentanyl, (protocol 4ηg/kg). Patients of the other group received intravenous ketamine (0.5 mg/kg) at the same time before procedure. Heart rate (HR) and invasive mean blood pressure (MBP) were recorded before and after pin insertion for 15 minutes. 2-tail Student test and Hi – test were used and p < 0. 05was considered significant.

Results and Discussion: Significant stability of MBP and HR was observed in the ketamine group compared to fentayl group. (P =.0105). Minimal increase of HR (82.56±11.01, p= 0.272) was observed in the ketamine group as well as only 27% of patients showed increase of MBP over 10% of baseline. In fentanyl group there was observed less stability of MBP (73% of patients showed decrease in MBP < 20% under baseline), heart rate showed no significant difference to values before pin insertion (68.14±7.41 to 74.61±3.02, p=0175). We also observed a significant difference between groups in percentage of patients who showed deviations of MBP (p = 0.0089) over 10% for ketamine and below 20% for fentanyl group from their base lines. Difference in variations of heart rate between groups were not significant (p=0.12).

Conclusion(s): Our data showed that in our patients sub anesthetic dose of intravenous ketamine (0.5 mg/kg) administered 4-5 min before pin insertion provides better hemodynamic stability that similar use of fentanyl (4ηηg/kg). We suggest that ketamin may be safely used to attenuate the autonomic response to pain stimulus raised from the procedure of pin insertion in neurosurgery.

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7AP6-6

The influence of steep Trendelenburg position and CO_2 pneumoperitoneum on cerebral hemodynamics during robotic prostatectomy

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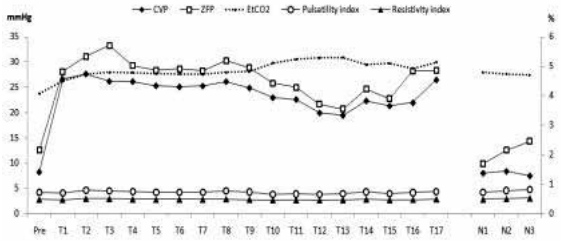
Background and Goal of Study: The steep (40 degrees) Trendelenburg position optimizes surgical exposure during robotic prostatectomy. The goal of the current study was to investigate the combined effect of this position and CO_2 pneumoperitoneum on the cerebral hemodynamics during these procedures.

Materials and Methods: In 12 consecutive patients who underwent robotic endoscopic radical prostatectomy under general anesthesia, the waveforms of the invasive arterial blood pressure, central venous pressure, and transcranial Doppler were recorded at 50 Hz, together with the $EtCO_2$ at 0.2 Hz. Based on the pressure- and flow-velocity waveforms, the zero-flow pressure (ZFP) (ref 1), pulsatility index and resistivity index (ref 2) were determined at 10 minutes interval from 5 minutes before institution of Trendelenburg position to 30 minutes after resuming the supine position.

Results and Discussion: The CVP and ZFP increased significantly (p<0.05) after institution of the Trendelenburg position, but the gradient between both parameters remained stable (p>0.05) over the course of the operation. The Pulsatility Index and Resistivity Index did not change significantly (p>0.05) over the course of the operation. The EtCO2 increased significantly (p<0.05) during Trendelenburg position, compared to baseline. Although the combination of steep Trendelenburg position and CO_2-pneumoperitoneum induced a significant increase of the ICP and ZFP and $EtCO_2$, there was no supplemental

increase of the ZFP above the ICP, even after prolonged head-down position of three hours. Also, the pulsatility index and resistivity index did not increase significantly over the course of the operation.



Conclusion(s): This indicates that the cerebral microcirculation and the cerebral autoregulation remain preserved in this clinical setting.

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7AP6-7

Neurological complications following liver transplantation

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Background and Goal of Study: Neurological complication (NC) is a major source of morbidity and mortality following orthotopic liver transplantation (OLT). The aim of this study was to evaluate the incidence and features of NC occurring after OLT in adult cirrhotic recipients and to assess the relation between these events and specific predictive variables.

Materials and Methods: We retrospectively reviewed the medical records of 100 consecutive adult cirrhotic patients who underwent liver transplantation at the Catholic University in Rome. The patients were stratified into two groups based on the presence (NC group) or absence (non-NC group) of NC. Data were collected as preoperative, intraoperative and postoperative variables. Preoperative variables included patient demographics, etiology of liver failure, MELD score, hepatic encephalopathy (HE), plasma creatinine, plasma sodium and osmolarity. Intraoperative variables included duration of surgery, transfusion requirements, reperfusion syndrome, use of venovenous bypass (VVBP), changes of plasma sodium and osmolarity. Postoperative variables included blood levels of immunosuppressive medication, renal failure, myocardial infarction, sepsis, graft disfunction. Statistical analysis was performed using the χ^2 - statistic and the two-tailed *t* test. Anesthesia regimen was standard for all patients and VVBP during the anhepatic stage of OLT was used according to hemodynamic parameters.

Results and Discussion: Neurological complications developed in 28 (28%) of 100 patients. Encephalopathy (35.7%) and seizure (28.5%) were the leading complications. One patient had central pontine myelinolysis (CPM). Length of hospital stay was significantly prolonged in patients with NC (52±8.52 vs 35.22±3.81) (p = 0.04). We observed preoperative HE in 16 (57%) patients of NC group and 14 (19%) patients of non-NC group (p =0.02). It is likely that patients suffering from preoperative HE may be more vulnerable to perioperative insults and the neurotoxicity of the immunosuppressive medication.

Conclusion(s): Conclusions: NC occurred in almost one third of patients after OLT. In our series only preoperative HE represents a predictor of postoperative NC.

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7AP6-8

Use of xenon for anaesthesia during intracranial aneurysms clipping

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Background and Goal of Study: The experience of Xenon (Xe) anaesthesia in neurosurgery is quite limited. The known neuroprotective features of Xe should open up a prospective option for its use during cerebrovascular surgery. The aim of this study was to evaluate the effectiveness, tolerance and adverse effects of Xe as basic anaesthetic during the main stage of vascular neurosurgery.

Materials and Methods: The study was approved by LEC. Xe was used in 8 pts (M=4, F=4, age 37-63, ASA II-III, WFNS I-II) during intracranial aneurysms clipping from cephalotrypesis until haemostasis. In 4 cases mild hypothermia was used (tcore 320C). Operation's main phase lasted 60-105 min. Hemodynamic, gas and metabolic monitoring was performed. Anaesthesia was maintained using a closed-circuit anaesthesia system "AxeomaTM" (Alfa-Impex Oy, Finland). Premedication and induction were standard, additional ondansetron was given. Until the end of trepanation and after the haemostasis the anaesthesia was maintained with Isoflurane. During the main stage of the operation anaesthesia was maintained with 50% of Xenon and Isoflurane (0.2-0.3 MAC).

Results and Discussion: During Isoflurane administration the BP of all patients decreased by 15-20% from baseline. When Xenon anaesthesia was started the BP parameters stabilized and remained stable throughout the operation. The HR, SatO2 and metabolism did not change. The AEP index corresponded to deep level of anaesthesia and patients with mild hypothermia showed BS at 20-75% during Xenon anaesthesia. Brain condition after dura mater incision was estimated by surgeons as "satisfactory". Patients operated under normothermia conditions were extubated in the OR. The wake up time was 15 minutes, when Isoflurane was flushed out to 0-0.1 MAC level. There was BP increase and tachycardia in 1 case and beta-blockers were administered. Patients operated with hypothermia were transferred to ICU and extubated after 2 hours. No uncomfortable postoperative pain or PONV were observed.

Conclusion(s): The acquired data showed the possibility of combined Isoflurane and Xe anaesthesia during intracranial aneurysm clipping. The applied method ensured stable hemodynamics, did not affect on the postanaesthesia recovery and the incidences of undesired effects of Xe were reduced. For a more detailed analysis of the viability and safety of Xenon in neuroanesthesiology a greater number of observations is needed. A method to evaluate the expected neuroprotective effects of Xenon should also be considered for the future studies.

Local and Regional Anaesthesia

8AP1-1

A clinical study on the minimum effective volume of 0.5% ropivacaine for ultrasound-guided lateral popliteal sciatic nerve block

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Background and Goal of Study: To determine a minimum effective volume of 0.5% ropivacaine for ultrasound-guided lateral popliteal sciatic nerve block.

Materials and Methods: 23 patients undergoing food and ankle surgery were received lateral popliteal nerve block using ultrasound guidance. The volume of the injected solution was varied for consecutive patients using the up-and-down staircase method according to the response of the previous patient(initial volume:18ml;up-and-down steps:2ml). Successful nerve block was defined as complete loss of pinprick sensation in both tibial and common peroneal nerve distribution with concomitant inability to perform plantar or dorsal flextion of the foot 30min after injection.

Results and Discussion: The minimum effective volume of 0.5% ropivacaine resulting in complete block of the sciatic nerve in 50% cases(ED50) was 13.0ml(CI95:11.3~14.9ml).

Conclusion(s): The minimum effective volume of 0.5% ropivacaine for ultrasound-guided lateral popliteal sciatic nerve was 13.0ml.

References:

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8AP1-2

Effect of temperature of ropivacaine on onset time and anaesthetic quality in an ultrasound guided axillary plexus blockade. Comparison of ropivacaine 0.75% in three different temperatures (7°C, 21°C, 37°C)

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Background and Goal of Study: Ultrasound-guided peripheral nerve block of the brachial plexus provides a safe and efficient anaesthesia for upper extremity surgery. Different injection techniques and mixtures of local anaesthetics were used to improve anaesthetic quality and decrease onset time. Few data are available regarding the influence of temperature of local anaesthetics on onset time. In the current study, we investigated the effect of three different temperatures of ropivacaine solutions on onset times, time of readiness for surgery and quality of axillary plexus brachialis block.
Materials and Methods: Having obtained informed consent, 60 patients scheduled for elective surgery of the upper limb received ultrasound-guided axillary plexus brachialis block with 30 ml ropivacaine 0.75% in one of three different temperatures (7°C, 21°C and 37°C). Time to readiness for surgery (pin prick test), onset time of sensory (cold sensation), motor block (Bromage-Scale) and patient comfort during injection (numerical verbal scale – NVS) were recorded.
Results and Discussion: There were no differences between the three groups with regard to demographic variables, type of surgery and quality of anaesthesia. Time to readiness of surgery was significantly shorter in group 37°C (17.5 min ±4) than in groups 21°C (22.1 min ±5) and 7°C (27.8 min ±4) (p=0.007). The difference between Group 21°C and 7°C was also significant (p=0.001). Onset of sensory and motor blockade was similar in groups 37°C and 21°C with a significant difference to group 7°C. Success rate was 95% in all groups without adverse side effects. There was no difference in patient comfort.

Anthropometric data and block quality

	Group 37°C	Group 21° C	Group 7°C
Age, yr	41±16	48.4±13	48.4±13
Sex M/F	10/9	10/9	9/10
ASA I/II/III	10/9/0	13/5/1	10/7/2
Time of readiness for surgery, min	17.5 ±4	22.1 ±5	27.8 ±4
Success rate, n (%)	18 (95)	18 (95)	18 (95)
Patient comfort - NVS	3 ±1	3 ±1	3 ±1

Conclusion(s): The temperature of ropivacaine affects the onset time of sensory and motor blockade and the time of readiness for surgery without any loss of anaesthetic quality in ultrasound guided axillary plexus blockade.

8AP1-3

Use of ultrasound-guided block in shoulder surgery

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Background and Goal of Study: The aim of the present study was to verify if ultrasound technique for execution of interscalene brachial plexus block could reduce the sensory and motor block onset time, the local anesthetic dosage and the incidence of complications compared with the standard neurostimulation technique.
Materials and Methods: Forty patients, ASA I and II between the age of 18-60 years undergoing artroscopy shoulder surgery were randomized to receive an ultrasound-guided block (US) or neurostimolation block (NS). Once they have been sedated and monitorized, the blocks were made with levobupivacaine 0.5%. Motor and sensory block, pain and analgesic consumption were additional outcomes. Statistical comparison of each group was analyzed using Student's t-test. The results of both groups were compared through the Fisher's f-test. Statistical significante was assumed at p<0.005.
Results and Discussion: The patients of US group have received a lower volume of local anesthetic (12-15 ml vs 25-30ml). The surgical onset time was 20±5 min for NS group and 14±3 min for US group. The duration of each block was of 12±2 h (US group) against 10±2 h (NS group). Furthermore, in the US group there was a significant reduction of incidence of complications, such as the Horner Syndrome and the phrenic nerve's block (7 vs 1) (p<0,005).
Conclusion(s): Both techniques of execution of interscalenic brachial plexus block are safe concerning the absence of mayor complications. The ultrasound-guided block, thanks to direct visualization of the anatomic district, results to be more advantageous regarding the reduction of the local anesthetic dose and of the complications. It could be most adequated technique for the traumatized patients and it could be also be used for the patients during antiaggregant therapy.

8AP1-6

Which of the ultrasound-guided blocks provides better analgesia after gynecological laparoscopic surgery, posterior or subcostal transversus abdominis plane block?

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Background and Goal of Study: Somatic pain management after laparoscopic gynecological surgery (LGS) using ultrasound (US)-guided posterior transversus abdominis plane (pTAP) block may sometimes be insufficient because analgesic involvement rate of umbilical region is reported to be 50 % [1]. US-guided subcostal TAP (sTAP) block is expected to provide more sufficient analgesia after LGS especially for peri-umbilical region's pain[2]. To evaluate the effectiveness of the two TAP blocks after LGS, postoperative analgesia after pTAP block and after sTAP block were retrospectively compared.
Materials and Methods: With IRB approval and informed consent, patients who underwent LGS for the last 12 months under general anaesthesia and had either US-guided pTAP or sTAP block bilaterally were included in this study. The patients who had local anesthetics for the block over 80 ml and under 40 ml were excluded. The degrees and the regions of pain which required analgesics within 3 hrs after surgery were obtained from postoperative records and were compared between the groups (unpaired-t test and chi-square test, significant when $p < 0.05$).
Results and Discussion: Fourteen patients were included in the data analysis. Ten patients had pTAP block (pTAP gr) and 6 had sTAP block (sTAP gr). In all cases during surgery, 3 trocars were inserted through abdominal wall on umbilical and bilateral lower abdominal regions. Mean concentration (%) and volume (ml) of the used local anaesthetic (ropivacaine) were 0.287 and 59.0 in pTAP gr and 0.239 and 61.7 in sTAP gr, respectively. Within 3 hrs after surgery, 3 patients in each group requested analgesics due to abdominal wall pain. All of the 3 in pTAP gr and 1 in sTAP gr complained pain on umbilical region and 2 in sTAP gr on lower abdominal region. Mean visual analogue scale(cm)was 3.1 in pTAP gr and 2.5 in sTAP gr. None of the above data was significant between the groups
Conclusion(s): Although some patients in each group complained partial abdominal somatic pain, both pTAP and sTAP blocks can provide equal postoperative pain relief after LGS.
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8AP1-7

Intraneural injection during ultrasound-guided subgluteal sciatic nerve block: Comparison between ropivacaine and mepivacaine

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Background and Goal of Study: Intraneural injection of local anaesthetic may occur during peripheral nerve blocks. Since ultrasound permits visualization of the nerve tissue, needle and anaesthetic spread in real time, intraneural injection could be detected. However, information on the incidence and effects of intraneural injection during ultrasound-guided peripheral nerve blocks is scarce. We previously reported that during ultrasound-guided sciatic nerve block, intraneural injection of mepivacaine occurred with faster onset and no change in the duration of the blockade. In the present study, we sought to compare the effects of intraneural injection of ropivacaine and mepivacaine for an ultrasound-guided sciatic nerve block.
Materials and Methods: After IRB approval and informed consent, 132 patients undergoing arthroscopic knee surgery were divided into two groups to

receive different local anaesthetics according to estimated operation time. They received the subgluteal approach to the sciatic nerve block under ultrasound guidance with 1.5% mepivacaine or 0.5% ropivacaine. A short bevel 100-mm, 21-gauge block needle was inserted inline approach and was advanced slowly under real-time ultrasound guidance until it made contact with the nerve. A local anaesthetic solution was then injected to produce a circumferential spread. The ultrasound video was recorded and used later to examine if the anaesthetic was injected intraneurally. Sensory and motor blockade was evaluated for 30 min after completion of the block. Duration of the block and any neurological complications were also examined. Student's t-test, Mann-Whitney's U test, and chi-square test were used for statistical analysis.
Results and Discussion: Eleven patients were excluded because ultrasound video obtained did not show a clear image. The incidence of intraneural injection was similar for both anaesthetics (14.8% with mepivacaine and 11.7% with ropivacaine). Onset of sensory blockade was significantly faster in patients with intraneural injection than those without in both anaesthetic groups. Faster onset of motor blockade in patients given intraneural injection was observed only with mepivacaine. Duration of the blockade was similar for patients with and without intraneural injection of both anaesthetics. No postoperative neurological complications were observed in either group.
Conclusion(s): Intraneural injection occurs with similar frequency regardless of anaesthetic used. There may be differences in the effects of intraneural injection on the onset of blockade among anaesthetics.

8AP1-10

Modeling of needle approaches to the spine under 4D multiplanar ultrasound guidance

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Background and Goal of Study: Two-dimensional (2D) ultrasound scanning is emerging as the gold standard for nerve localization in the field of regional anaesthesia. 2D imaging has been used to help identify the anatomy of the lumbar spine and epidural space and assist in needle-guidance and catheter insertion. Our aim was to model a needle approach to the neuraxis using four-dimensional (4D) ultrasound to investigate whether 4D imaging has any potential to improve the accuracy of needle guidance.
Materials and Methods: We placed a lumbar spinal model (Adam Rouilly, UK) in a membrane-covered water bath. We used an HD11 XE™ ultrasound machine with a V8-4 probe (Philips Medical Systems, Bothell, USA). The model was visualized initially in 2D mode then, when a satisfactory image was obtained, in 4D mode. The model was approached with a 20G spinal needle inserted to mimic a paramedian approach.
Results and Discussion: Using the rendered volume mode, viewed initially from a lateral perspective, the needle was advanced until bony structures obscured the initial view. Using image rotation processing, the image was rotated on the x-axis; this allowed visualization of the oblique saggital window into the neuraxial structures. The needle tip could be visualized again and the needle advanced towards the neuraxis. By altering the 4D display, the volume view could be seen simultaneously with short & long axis views and the plan (overhead) view without moving the probe. The 4D technology allows a wide "slice" of tissue to be reconstructed in a volume mode which can convey an impression of volume and distance. Both these features enhance visualization of the needle by the operator and may prove valuable in preventing overshoot of the needle towards the target; potentially an important benefit when the target is neuraxis or peripheral nerve. We have also shown that it is possible in volume mode to rotate an image of the vertebrae to better view a needle tip aimed at neuraxis.

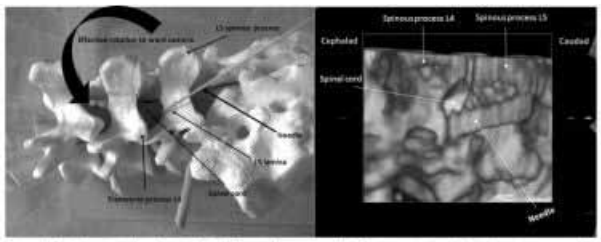

Figure 1 (left): Spine rotated in the x axis left side down to demonstrate effect of image rotation. (right): Volume image rotated on x axis showing needle tip advancing over lamina towards spinal space.

Conclusion(s): 4D ultrasound can give a more complete visualization of bony structures, and allows for rotation of an image in real time. This may facilitate the visualization of needle tip when advancing towards the neuraxis and may give more information than 2D alone.

8AP1-11

4D multiplanar ultrasound guidance of catheter insertion in an in-vitro model: A feasibility study

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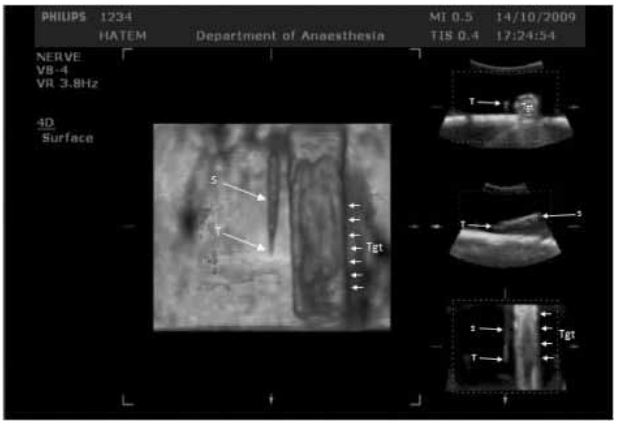
Background and Goal of Study: The potential for four-dimensional multiplanar (4D) ultrasound in the field of regional anaesthesia has just emerged. This technique allows the operator to observe the needle and catheter insertion in three orthogonal planes (transverse, longitudinal, plan) simultaneously during insertion. This could increase the practitioner confidence, patients' safety and success rate of the technique. We conducted this study on a water bath model to evaluate the feasibility of catheter insertion using 4D multiplanar ultrasound guidance.
Materials and Methods: A 20G catheter was placed using ultrasound guidance next to a target (plastic tube) in a membrane covered water bath at 4cm distance from the surface. We used an HD11 XE ultrasound machine with a V8-4 transducer (Philips Medical Systems, USA). A Tuohy needle was advanced until the needle tip was seen approaching the target in all three planes, in addition to the volumetric view. The catheter was inserted at this point. The advancing catheter was followed by moving the ultrasound probe along its length. The catheter was seen in all four views on the side of the target during advancement.



Results and Discussion: The catheter and target were adequately seen simultaneously in all axis views. We were able to maintain the visualization of the catheter tip beside the target throughout its entire course. 4D imaging allowed us to verify the catheter location. The short axis view allowed us to confirm the catheter position lateral to the target during advancement. In a clinical setting this is important when assessing catheter migration away from the nerve. The plan view was also useful to confirm the position of the catheter in this respect. The volumetric image of this view provided additional spatial information that operators found useful. Although we think this quality of image is difficult to reproduce clinically with the current technology; clinical use would benefit from further advancement in this technique.
Conclusion(s): We were able to demonstrate the feasibility of catheter insertion using 4D multiplanar ultrasound guidance. Further work needs to be carried out to investigate the potential clinical utility of this technology for catheter insertion.

8AP2-1

Comparison of different concentration of ropivacaine in spinal anesthesia for vascular surgery

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Background and Goal of Study: Plain ropivacaine 0,5% vial has been recentely introduced and recommended for intrathecal use. The aim of this randomized study was to compare clinical efficacy and safety of 15 mg plain ropivacaine in different concentration given intrathecally in patients scheduled for vascular surgery (saphenectomies, femoro-popliteal by-pass and peripheral aneurysms).
Materials and Methods: 38 ASA III patients (mean age 65.5±8.0 years) were scheduled after obtaining written informed consent. All patients had a history of arterial hypertension and other cardiovascular disorders pharmacologically treated. They were divided into two groups A(19 patients) and B (19 patients)

receiving respectively ropivacaine 0,75 % 15 mg in a bolus of 2 ml and ropivacaine 0,5 % 15 mg in a bolus of 3 ml. Profile of spinal block (onset and recovery times) and quality of anesthesia (Bromage 0-3 score and pinprick test) were recorded (1). Pulse rate (HR), mean arterial pressure (MAP), cardiac output (CO), left ventricular contractility (dP/dt), systemic vascular resistance (SVR) and global end-diastolic volume (GEDV) were monitored by the PiCCO System Pulsion in order to evaluate their variations (2). ANOVA test was applied for statistical analysis.

Results and Discussion: The median times to onset of complete regression of sensory (140 vs 240 sec; p<0.001) and motor block (175 vs 320 sec; p<0.001) were longer in group B. The quality of sensory and motor block was superior in the group A. The prinpick test at S2 level was similar in both groups. The Bromage scale showed a profile of 2-3 score in group A compared to 1-2 score in group B. 5 patients of group B received additional anesthesia with continuous infusion of propofol 3mg/kg/h because of the poor efficacy of the spinal block. Cardiovascular parameters were not influenced in both groups.

Conclusion(s): Spinal anesthesia produced with 15 mg plain ropivacaine 0,75% in a volume of 2 ml is effective and safe in ASA III patients. The concentration of 0,75% gives a complete spinal block in high risk patients without side effects and cardiovascular modifications. A concentration of 0,5% fails to determine an adequate anesthesia level required for vascular surgery and did not offer any advantage in terms of comfort, safety and rapid recovery.

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2 Buhre W, Weyland A, Kazmaier S et al. J Cardiothorac Vasc Anesth 1999; 13: 437-440.

8AP2-2

The advantages of paramedian approach for spinal anesthesia of elderly patients in urology surgery

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Background and Goal of Study: Spinal anesthesia is often difficult in elderly patients. Paramedian approach has been used as an alternative in case of failure to achieve the classic median approach. The goal of this study is to determine which of approaches should be preferred as first choice of spinal anesthesia in elderly patients.

Materials and Methods: In this study we have included 68 patients ASA II – III older than 70 years that had prostate surgery under spinal anesthesia. Patients were divided in two groups: The Median Group M=34 patients and the Paramedian Group PM=34 patients. In both groups the lumbar punction is done with the patient in sitting position in the level L3-L4 with G25 needle. For every patient we considered the : average age, success in achievement with the first punction, time of procedure, number of punctions, repositioning of the needle, venous punction and failure. Data are expressed in SD ±, percentages are calculated Chi2 and others using student's T test.

Results and Discussion: Average age was 78±2.3. In M group success in first attempt was 41% (14) and in the PM group was 88% (30) (p=0.001). Average time of procedure in M group was 4± 3.2 minutes and in the PM group was 2±1.2 minutes (p= 0,047). In M group average number of punctions was 2±21 (1-8) in PM group only in one case anesthesia was achieved with 2 punctions. The average of needle repositioning in M group was 8 (0-11) and in PM group was 1 (0-3) (p=0,037). In 4 cases of M group we did venous punction and none in the PM group. In two cases of M group spinal punction was impossible so we did it with PM approach.

Conclusion(s): Paramedian approach is the most preferred approach for spinal anesthesia in elderly patients. It has more success rate and less technical difficulties than the median approach.

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8AP2-3

A comparison of levobupivacaine versus racemic bupivacaine in percutaneous nephrolithotomy with spinal anesthesia

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Background and Goal of Study: Percutaneous nephrolithotomy (PCNL) is a minimally invasive procedure for the management of kidney stones. Regional anesthesia is increasingly used for this patients. The aim of this study was to compare effects of levobupivacaine with racemic bupivacaine on time of onset and resolution of sensory and motor blocks, hemodynamics, discharge time and surgeon and patient satisfaction in PCNL with spinal anesthesia.

Materials and Methods: After ethics committee approval and obtaining informed consent from 57 ASA 1-2 patients scheduled for the PCNL were studied and allocated in two groups: Group L (0.5% levobupivacaine, n=25) and Group B (0.5% bupivacaine, n=32). Local anesthesic volume was adjusted according to patients' height (12.5 mg, 15 mg, 17.5 mg mg for those <160 cm, 160-170 cm, >170 cm, respectively). Hemodynamics were recorded at the baseline (T0) and every 5 minutes thereafter throughout the procedure. Bromage Scale and pinprick test were used to evaluate the motor and sensory blocks, respectively. A visual analogue scale was used for evaluation of patient satisfaction. Surgeons' satisfaction was evaluated regarding the anesthesia (0=unacceptable to 4=excellent). Progression to T4 was accepted as appropriate sensory block and two dermatome regression of sensory blocks were recorded. Progression and recovery of motor block times were recorded as Bromage 3 and 2, respectively.

Results and Discussion: Groups were comparable in terms of demographic features, systemic disease and baseline hemodynamic measurements. When compared with Group L, progression of sensory block to T4 (15.8±7.1 min *vs* 9.7±5.8 min, p=0.01) and to maximum level (17.6±7.6 min *vs* 13.9±6.0 min, p=0.039) was faster in Group B. There were no significant differences in sensory block regression time between the two groups (p>0.05). Bromage 3 was achieved faster in Group B than Group L (7.8±4.5 min *vs* 10.9±5.9 min, p=0.02). Bromage 2 was achieved faster in Group L than Group B (135.9±37.0 min *vs* 139.2±47.8 min, p=0.04). The frequency of hypotension was higher in Group L than Group B (36% *vs* 13%, p=0.036). There were no significant differences in patients' and surgeons' satisfaction rates and discharge time between the groups.

Conclusion(s): In conclusion, when compared with levobupivacaine, bupivacaine had a faster onset time of sensory and motor blockade and a longer duration of motor blockade in patients undergoing PCNL with spinal anesthesia. Interestingly, hypotension was more frequent with levobupivacaine than bupivacaine in these patients.

8AP2-4

Postoperative analgesia in thoracic surgery: A comparison between continuous paravertebral nerve block and continuous wound infiltration with OnQ pain relief system

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Background and Goal of Study: Thoracotomy is one of the most painful surgical stimulus practiced. Inadequate management of post-thoracotomy pain is often associated with postoperative pulmonary and cardiac complications[1]. Because of the difficulty in pain control, many approaches have been suggested[2]. The aim of the present prospective randomized double-blind study was to compare two analgesia techniques: continuous paravertebral block versus continuous wound infiltration with OnQ Pain Relief System.

Materials and Methods: After obtaining informed consent, 52 patients, ASA physical status I-III, undergoing thoracotomy for elective lobectomy, were enrolled. Patients were randomly assigned to two groups in which postoperative analgesia was performed by continuous paravertebral infusion of bupivacaine 0.25%, through an elastomeric pump set at a rate of 0.1 ml/Kg/h (group A) or by continuous wound infiltration of bupivacaine 0.25% at a fixed infusion rate of 4 ml/h with OnQ Pain Relief System (group B). Both infusions were started at the end of surgery, before wound closure, and continued for 48 hours in the postoperative period. General anaesthesia was standardized. In the recovery room, patients were provided with intravenous morphine patient-controlled analgesia. Visual analogue scale at rest (VASr) and when coughing (VASi), rescue patient-controlled analgesia morphine consumption, hemodynamic, time to ambulation and side-effects were evaluated within 48 h. The analysis were conducted on absolute values and on time-related measurements. Mann-Whitney and Chi-squared test were used as appropriate. Analysis of variance (ANOVA) with intervals as repeated measures was used on time-related measurements. A value of $P<0.05$ was considered as significant.

Results and Discussion: The two groups were comparable regarding to patients characteristics, type of surgery, time to ambulation and side-effects; postoperative hemodynamic profile was stable in all the patients. Total morphine consumption was significantly lower in group A than in group B (13.1±8.8 mg versus 19.1±10.9 mg, respectively; p= 0.05). Absolute pain scores were low in both groups; patients in group A reported lower VASr and VASi values during the postoperative 48 hours compared with group B (p<0.001).

Conclusion(s): Continuous wound infiltration of local anesthetics is not an effective alternative to paravertebral analgesia after thoracotomy.

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8AP2-5

Intrathecal hyperbaric articaine vs. hyperbaric bupivacaine-fentanyl for day-case open inguinal hernia repair

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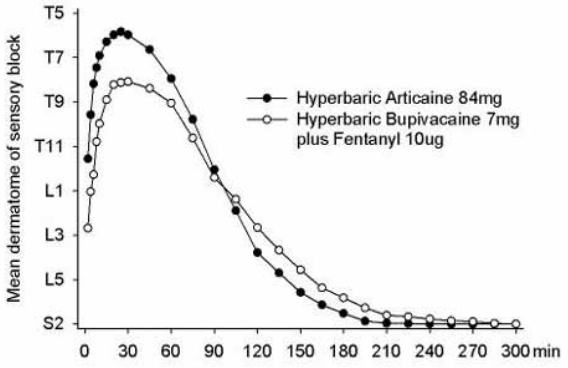
Background and Goal of Study: We recently demonstrated the feasibility of hyperbaric articaine in spinal anaesthesia for open inguinal hernia repair (1). Now we compared it with our routinely used mixture of low-dose hyperbaric bupivacaine plus fentanyl.

Materials and Methods: We randomised 80 patients to receive spinal anaesthesia with either 2.1 ml articaine (A) 40 mg/ml (Ultracain D ohne Adrenalin®) plus 0.7 ml glucose 300 mg/ml or 1.4 ml hyperbaric bupivacaine (Bicain Pond®) plus fentanyl 10 µg (B) for ambulatory open herniorraphy. With the patient in exact horizontal position, the spinal anaesthetic was injected through a 27-G pencil point needle, after which the patient was turned supine. A research assistant, blinded to the study groups, tested the sensory and motor block at predetermined intervals until recovery. The cephalad spread of analgesia was aimed at Th10 and the operating table was tilted 10 degrees head up or down as required. The patients were telephoned and interviewed on day 1 and 7 postoperatively.

Results and Discussion: In 13 patients (3 in A and 10 in B) it was necessary to tilt the operating table >10 degrees to reach Th10, and these patients were excluded. Despite this Th10 analgesia was not reached in four B patients. Analgesia at Th10 was reached in 4 min (median, range 2-20) in A and in 10 min (2-25) in B, p<0.001. The sensory block remained at Th10 for 75 min, but recovery was faster in A (median 165 min) than in B (median 195 min), p<0.005. A complete bilateral motor block was observed in all A patients but only 50 % of those in the B group, p<0.001. The time to motor recovery was similar in both groups (A, median 105 min, B 90 min). None of the patients reported neurological symptoms.



Conclusion(s): Intrathecal hyperbaric articaine 84 mg produced faster analgesia, a more intense motor block and faster sensory recovery than hyperbaric bupivacaine 7 mg plus fentanyl 10 µg. The duration of motor block was short enough for efficient ambulatory surgical activity in both groups. There were no transient neurological symptoms in either group.

Reference:

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8AP2-6

Comparison of unilateral and bilateral spinal anesthesia with hyperbaric bupivacaine 7.5 mg+fentanyl 25µg for inguinal hernia repair

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Background and Goal of Study: Selective spinal anesthesia with small doses of hyperbaric bupivacaine is widely used for inguinal hernia repair, providing fast onset, effective sensory blockade and haemodynamic stability. This study compared unilateral and bilateral spinal anesthesia with hyperbaric bupivacaine 7.5mg + fentanyl 25µg for inguinal hernia repair.

Materials and Methods: 40 ASA I-III patients undergoing inguinal hernia repair randomly received unilateral (n=20) or bilateral (n=20) spinal anesthesia with hyperbaric bupivacaine 7.5mg + fentanyl 25µg. In bilateral group patients were turned supine immediately after spinal injection and in unilateral group lateral decubitus position was maintained for 15 minutes. Sensory (pinprick) and motor block (Bromage score), haemodynamic data, time to first analgesic and voiding were recorded. Statistics: t-test, Mann-Whitney, Fisher´s exact test (p<0.05 signifcant)

Results and Discussion: Groups were comparable with respect to demographic and intraoperative haemodynamic data. Sensory block on operative side was T7(T10-T4) and T8(T11-T5) in unilateral and bilateral group (p=0.33). Bromage score on operative side was 0/1/2/3:0/0/2/18 in unilateral and 0/1/2/3:1/4/5/10 in bilateral group (p<0.05). Complete motor block regression required 95±27 min and 80±23 min in unilateral and bilateral block, respectively (p=0.02). Time to first analgesic was 237±104 min and 321±126 min (p=0.25) and time to first voiding 430±94 min and 519±109 min (p=0.18) in unilateral and bilateral group, respectively. Patients satisfaction with type of anesthesia was similar between groups.

Conclusion(s): Unilateral spinal anesthesia with hyperbaric bupivacaine 7.5mg + fentanyl 25µg for inguinal hernia repair provides similar sensory block but more profound and longer lasting motor block on the operative side than bilateral spinal anesthesia.

8AP2-7

Effectivity of epidural fentanyl to provide intraoperative analgesia. Comparison of epidural and intravenous administration

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Background and Goal of Study: Despite the widespread use of epidural fentanyl (EF), its site of action remains controversial. Some authors support a predominant action at the dorsal horn of the spinal cord, while others advocate a supraspinal effect in the brain (vascular absorption). It has been suggested that it depends on the mode of administration: bolus or infusion. The study goal was to evaluate if epidural bolus administration was more effective than intravenous', requiring lower doses to maintain intraoperative analgesia. A secondary aim was to assess if the epidural administration offered a faster weaning, better postoperative analgesia, and is (or not) associated with more adverse events.

Materials and Methods: 30 patients undergoing colonic surgery by midlaparotomy were enrolled in a prospective, randomised, double-blinded study. An epidural catheter was placed at T9-T10. Propofol, cisatracurium and remifentanyl were used for induction. Anaesthesia was maintained with perfusion of propofol adjusted to maintain BIS values between 40-60, cisatracurium and boluses of fentanyl. The administration of fentanyl boluses was done either by the epidural or intravenous route, according to patient randomisation. The first bolus (2mcg/kg diluted to 25 mcg/ml) was given 10 min before incision. Successive boluses (same dose, volume and route) were given when mean arterial pressure or heart rate increased over 20 % of basal values.We recorded doses of fentanyl (mcg/kg/h) and propofol (mg/kg/h), time from discontinuing propofol until extubation (min), time of analgesia request in recovery room (VAS>3) and adverse events for 24 h. χ-square, Student's-t and U-Mann-Whitney tests were used for statistical analysis.

Results and Discussion: There were not differences between groups regarding demographic data and duration of surgery. Doses of fentanyl required to maintain intraoperative analgesia were 1,08±0,76 mcg/kg/h in the EF group and 2,64±1,00 mcg/kg/h in the IF group (p<0,001). No differences regarding propofol requirements. Median time to extubation was 7 (range 4-18) and 20 min (7-34) for the EF and IV groups respectively (p<0,003). Time of analgesia request was prolonged in the EF group, median of 4hrs (2-16), versus IF group, 2hrs (1-5) (p<0,03). No significant differences were observed regarding the incidence of adverse events.

Conclusion(s): EF is more effective as intraoperative analgesic than IF, allowing a faster extubation and a longer period of time without pain in the recovery room. Safety seems to be similar in both groups.

8AP2-8

Unilateral spinal anesthesia with hypobaric bupivacaine for high risk trauma patients with femur fractures

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Background and Goal of Study: Spinal anesthesia is common for victims with femur fractures but possible hypotension due to sympathetic blockade can be extremely dangerous in high risk patients. Unilateral spinal anesthesia (uSA) has potential less risk of hypotension but shorter duration. We investigate potential advantages and disadvantages of uSA in high risk trauma patients with femur fracture.

Materials and Methods: 60 patients with femur fractures (ASA III) were randomly allocated in 2 groups to receive hypobaric (2 ml isobaric 0,5% bupivacaine+4 ml twice-distilled water) for unilateral (Group 1) or isobaric (3-3,5 ml 0,5%) bupivacaine for bilateral (Group 2) spinal anesthesia. After spinal anesthesia epidural catheter was placed for postoperative analgesia. In case of first signs of sensitivity recovery epidural catheter was used for extension of anesthesia – patients received 4 ml 0,5% isobaric bupivacaine. The difference between groups in incidence of hypotension and/or bradicardia, inadequate anesthesia and needs in additional epidural anesthesia due to short duration of spinal block were compared with analysis of proportions: Fisher's test, Relative Risk (RR), Number Needed to Treat (NNT), Number Needed to Harm (NNH).
Results and Discussion: Both groups had similar characteristics for sex, age, surgery, and duration of surgery. Significant different in hypotension and/or bradycardia was observed (two-tailed Fisher's p=0,012): 1 from 30 patients in Group 1 and 9 from 30 patient in Group 2, RR = 9 (95%C.I. 1,21-66,75), OR=12,43 (95%C.I. 1,47-363,05), NNT=3,75. In uSA Group number of patients who needed in additional epidural anesthesia was significantly greater: 9/30 vs. 2/30 (p=0,042), RR=4,5 (95%C.I. 1,06-19,11), OR=6 (1,05-61,03), NNH=4,3. Using uSA considerably reduces risk of hypotension and/or bradicardia in high risk trauma patients with femur fractures but due to shorter duration of blockade often requires additional anesthesia. It can be suggested for potential long-term surgery. Epidural or subarachnoid catheterization solves this potential problem.
Conclusion(s): uSA with hypobaric bupivacaine for high risk trauma patients with femur fractures reduces risk of hypotension but requires epidural or subarachnoid catheterization for additional anesthesia in case of long-term surgery.
Acknowledgements: "Partners in Health" and Prof. V.V. Vlassov for Summer School "Reseasch effectiveness in biomedicine".

8AP2-9

Does epidural anaesthesia decrease desaturations frequency during postoperative period?

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Background and Goal of Study: Postoperative desaturation can lead to severe hypoxaemia and even tissue hypoxia with cardiological and neurological complications. Using opioids is one of the most important risk factors of postoperative desaturation. During postoperative period oxygen therapy schould be used in order to protect against desaturation. The aim of this study was to evaluate the dsaturation frequency during the postoperative period.
Materials and Methods: 58 patients after elective open abdominal aortic aneurysm (AAA) repair, without any respiratory diseeases, ASA II-III, age 46-80, were observed in the ICU during 72 hours after the extubation. All of them had the same protocol of oxygen therapy during sponatneous breathing. Saturation was measured continously and all the incidents of desaturation (saturation below 93% for 4 mins) were noted. In the prospective, randomized study the patients were divided into two equal groups: A-after the operation epidural anesthesia was used for pain relief, B- the patients were given opioids iv for pain relief.
Results and Discussion: Desaturation was observed among 26(89%) patients in group A, and 27(93%)in group B. There was no significant differneces among the group(p=1,0).The severe hipoxaemia (saturation below 84%) was observed in group A among 7(24,13%) patients, in group B- 10(34,48%) patients. There was no significant differences among the group (p=0,3868). The median of number of desaturation incidents in group A was 10, in group B-8,9, there was no signifacant differences among the group (p=1,0). The median of desaturation time in group A was 197 min, in group B 157 min, there was no significant differences among the groups (p=0,720). Although the oxygen therapy was used incidents of desaturation was obsereved in almost 90% of patients. The patients in group B were given opioids and the frequency of desaturation and severe hypoxaemia was a little higher than in group A, but there was no significant differences among the group.
Conclusion(s): 1.Epidural anaesthesia does not protect against postoperative desaturation. 2.Oxygen therapy does not exclud postoperative desaturation and hipoxaemia.

8AP2-10

Relation between the direction of Whitacre needle bevel and mean local anaesthetic dose [mlad] of subarachnoid ropivacaine 0.75% for vaginal hysterectomy

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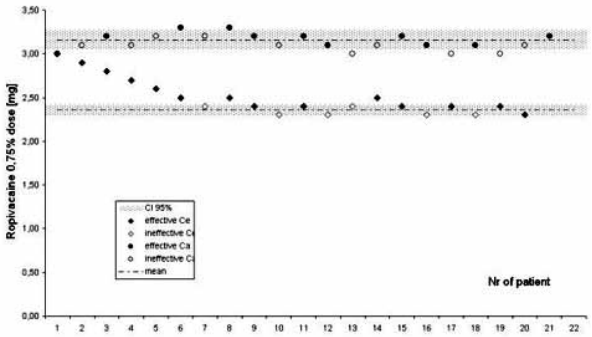
Background and Goal of Study: The influence of bevel direction of a pencil point needle on intrathecal anaesthesia is not well established.[1] In a previous study[2] in Caesarean Section a determinant factor of the Mean Local Anaesthetic Dose in intrathecal anaesthesia was the direction of the needle hole. In this study we test this hypothesis in gynecological procedures.
Materials and Methods: The study was approved by the Scientific Council of our Hospital. Forty two women ASA I-II scheduled for elective Vaginal Hysterectomy (VH) were randomly allocated in two groups after informed consent. We used a needle through needle combined spinal-epidural technique (16G Tuohy/26G Whitacre) in left lateral position at L_{2-3} interspace, with loss of resistance to air. The Whitacre needle bevel was randomly directed caudad (group Ca) or cephalad (Group Ce). The dose of Rc 0,75% was given according to the Dixon and Massey up-and-down method[3]. The first dose was 3 ml in both groups and fentanyl 15 μg was added to the solution. If the dose was ineffective [VAS greater than 10/100, no spread of dermatomal level of block to temperature up to T8 and duration of anaesthesia for less than 120 min after the injection] the dose of the next patient increased by 0.05 ml and vice versa. Statistical analysis was performed using the Dixon and Massey method with one tailed t-test and P<0,01 considered significant.
Results and Discussion: A patient in group Ce was rejected, because of dural tap. In Group Ca the mean dose(SD) was 23.73(1.5)mg and in Group Ce 17.69(0.67)mg. The difference was statistically significant with P<0.001.



Conclusion(s): When intrathecal anaesthesia is used for VH, namely surgical analgesia for 120 min up to the T8 level, different doses of local anaesthetic should be chosen according the bevel direction of Whitacre 26G needle. Vice versa, when different doses are compared, the bevel direction should be taken into account.
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8AP3-1

Does a second local anaesthesia infiltration in thyroid surgery reduce early and late nociceptive pain?

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Background and Goal of Study: Moderate pain after thyroid surgery (TS) may last up to 48 hours. A single wound infiltration immediately after TS demonstrated a pain reduction within 24hours (1, 2). Two wound infiltrations immediately before and after TS have not been investigated so far. In this study, the impact of a second local anaesthesia was evaluated up to two days postoperatively.
Materials and Methods: The study was designed as a prospective randomized double-blind placebo-controlled trial. During general anaesthesia 8-10ml lidocaine 1% with epinephrine 5μg/ml was infiltrated before skin incision in all patients. After wound closure, patients of the verum group (v) received 8-10ml l-bupivacaine 0.5% infiltration (LA) and patients of the placebo group (p) 8-10ml NaCl 0.9%. Patients were anaesthetized according to the preference of the attending anaesthetist. Pain scores were recorded immediately after surgery depending on the patients ability to score pain, after 5-8hours,on the first and second day using a verbal 11-point numeric rating scale.
Results and Discussion: A total of 50 patients were enrolled in one of the two groups. No differences in baseline characteristics were identified between both groups. The need for analgesia such as opiates, metamizol or paracetamol was not different between the groups. But in the v group maximum pain was reduced immediately after surgery, even two days after. Mean pain was significantly diminished immediately after surgery until the 5-8hours period. Discussion: The pre-

sented data of this soft-tissue pain model of thyroid surgery demonstrate, that immediately post surgical administration of LA ameliorates nociception up to 48 hours after the intervention. The antinoceptive effect at the second postoperative day clearly outlasts the LA effect of the second infiltration during wound closure.

Verbal Numeric Rating Scale-Pain Assessment

VAS	P - Group	V-Group	p value (non-parametric test)
VAS max, 0-4hours	2+/–2.1	0+/–2.1	p<0.01
VAS max, 5-8hours	2+/–1.95	1+/–1.6	p<0.01
VAS max, 1. p.o. day	2+/–2.0	1+/–1.7	p=0.01
VAS max, 2. p.o. day	1+/–2.16	0+/–1.7	p=0.03

mean +/– standard deviation, p.o.: postoperative, max: maximum

Conclusion(s): As mechanism of action, it may be hypothesized, that neural blockade prohibits peripheral and/or central nociceptor sensitization processes.

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8AP3-2

The effect of preoperative oral administration of passiflora incarnata on anxiety level before spinal anaesthesia

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Background and Goal of Study: The aim of the study is to investigate the effect of preoperative oral administration of Passiflora incarnata on anxiety, sedation and haemodynamics in patients undergoing elective inguinal herniorrhaphy under spinal anaesthesia.

Materials and Methods: Under local ethics committee approval, 60 patients, aged 25-55 years, ASAI-II who were scheduled for elective inguinal herniorrhaphy under spinal anaesthesia were enrolled in this prospective, randomized, double-blind study. Exclusion criteria were included anxiety disorders, difficulty of cooperation, history of cigarette smoking or alcohol, contraindications for spinal anaesthesia. The patients' state (STAI-S) and trait (STAI-T) anxiety scores were measured by using State-Trait Anxiety Inventory (STAI). Sedation level was measured by using Observer's Assessment of Alertness/Sedation (OAA/S) score. Psychomotor function of the patients was assessed with the perceptive accuracy test (PAT) and finger tapping test (FTT). Thirty minutes before spinal anaesthesia, baseline haemodynamic parameters and all of the tests were measured, then patients were randomly assigned into two groups: Passiflora incarnata 700mg/5ml syrup was given to the patients in GroupP (n=30), and the same volume (5mL) of drinking water was given in GroupC (n=30). Tests were repeated just before spinal anaesthesia. Spinal anaesthesia was then performed with the patient in the sitting position, using three mL of 0.5% hyperbaric bupivacaine. Statistical analyses were performed using Student's t-test, Man Whitney-U test, Fischer exact or Chi-Square test. Repeated measurements were compared with analysis of variance.

Results and Discussion: There was a statistically significant difference between two groups for the increase in STAI-S score obtained just before spinal anaesthesia when compared to the baseline (-0.73±3.44 in Group P, 1.76±2.71 in Group C, p=0.004). There was no statistically significant difference in both groups for PAT and FTT values, when compared to the baseline (p=0.138, p=0.151 in GroupP; p=0.565, p=0.172 in GroupC). A significant difference was not found between two groups for the demographics, characteristics of sensory and motor block, haemodynamics, sedation score and side effects.

Conclusion(s): It was concluded that the preoperative administration of Passiflora incarnate aqueous extract via oral route reduced the preoperative anxiety level of the patients before spinal anaesthesia without changing sedation level, psychomotor function tests or haemodynamics.

8AP3-3

The effects of music, white noise and operating room noise on perioperative anxiety in patients under spinal anesthesia

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Background and Goal of Study: Non-pharmacological methods such as music and white noise may decrease sedative requirements and anxiety in patients undergoing surgical procedure under regional anesthesia. In this study, we aimed to compare the effect of music, white noise and operating room noises on anxiety in patients who already administered fixed dose of midazolam (i.v) infusion under spinal anesthesia.

Materials and Methods: 80 patients who were 18-60 yr old, and ASA I-II, undergoing general surgical, urological and orthopedical procedures under spinal anesthesia were randomly assigned to operating room noise (Group O), white noise (Group W) or intraoperative music (Group M). Spinal anesthesia was performed with hyperbaric bupivacaine 0.5% 10-15 mg. After spinal anesthesia, midazolam (25 µg/kg, iv) bolus and infusion (0.5 µg/kg/min) was administered to all patients during intraoperative period. The hemodynamic and respiratory parameters and OAA/S (Observer's Assessment of Alertness/Sedation Scale), STAI-TA/SA tests (State-Trait Anxiety Inventory-trait/state) were measured at preoperative, intraoperative and recovery period. Patient satisfaction was also recorded. Data are presented as mean ± SD. Comparison were considered significant if $P< 0.05$.

Results and Discussion: Demographic data, hemodynamic and respiratory parameters, OAA/S values were not significantly different at any time among the groups ($P>0.05$). Preoperative STAI-TA values were not significantly different among the three groups($P>0.05$). At 5 min before surgery, the STAI-SA value was significantly less in Group M than the other groups' values ($P<0,05$). At the recovery period, the STAI-SA values were significantly less in Group M as compared with the other groups ($P<0,05$). Patient satisfaction was best in Group M. In the operating room, uncomfortable noise may contribute to anxiety. Music and white noise decreased anxiety in our study. We showed that the white noise decreased the anxiety, but this reduction is less than as compared with music.

Patient satisfaction

Patient satisfaction (%)	Grup O (n=25)	Grup W (n=25)	Grup M (n=25)
Poor	0 (0%)	0 (0%)	0 (0%)
Fair	23 (92%)	4 (16%)	0 (0%)
Good	2 (8%)	*18 (72%)	2 (8%)
Excellent	0 (0%)	3 (12%)	*23 (92%)

*: P<0.05

Conclusion(s): In conclusion, we suggest that patient-selected music is decreases perioperative anxiety and contributes the patient satisfaction during perioperative period in addition to the pharmacological methods, because it's simple, non-invasive and cheap method.

8AP3-4

Different anesthetic techniques for arteriovenous fistula formation: Preliminary data of early and late occlusion rates

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Background and Goal of Study: Arteriovenous fistula (AVF) creation may be performed under general (GA), regional (RA), or local anesthesia (LA). RA offers sympathetic blockade that may improve surgical conditions by increasing venous diameter and improving blood flow to the fistula site. We hypothesized that regional anesthesia technique used at the time of surgery would be associated with the lowest AVF occlusion rates after surgery.

Materials and Methods: Following REB approval we reviewed data collected prospectively from patients undergoing primary AVF creation from Jan 2008 to Dec 2008. Demographic data, and surgical characteristics including AVF occlusion rates at 6-weeks and 3-months after surgery were collected from electronic patient records, and hemodialysis database. Based on anesthetic technique patients were divided into 3 groups: GA, RA, and LA. Chi-square and Fishers Exact tests were used for categorical data, and ANOVA for continuous data.

Demographics and surgical characteristics of patients undergoing arteriovenous fistula creation with three different anesthetic techniques.

	GA(n = 25)	RA(n = 26)	LA(n = 34)	P value
Age (yrs)	57±17	63±20	57±18	0.43
Male n, (%)	16 (64)	13 (50)	20 (59)	0.59
ASA class	3 [2, 4]	3 [3, 4]	3 [2, 4]	0.94
Duration of surgery, min	77±25	77±33	69±24	0.48
Hospital LOS, days	0[0, 16]	0[0, 1]	0[0, 30]	0.53

GA, general anesthesia; RA, regional anesthesia; LA, local anesthesia; LOS, length of stay. Data expressed either as mean ± SD, median [range], or number of patients (%).

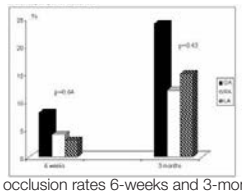

Figure Arteriovenous fistula occlusion rates 6-weeks and 3-months after surgery. Data expressed as percentage of patients GA, general anesthesia, RA, regional anesthesia, LA, local anesthesia

Results and Discussion: A total of 85 patients underwent primary AVF creation. 25(30%), 26(30%), and 34(40%) patients received general, regional or local anesthesia respectively. Demographic data and surgical characteristics were similar between the groups. Although AVF occlusion rates were higher in GA group (24%) compared to RA (12%) and LA (15%) groups at 3-months, this difference did not reach statistical significance.
Conclusion(s): Preliminary results suggest a trend towards lower AVF occlusion rates with RA and LA at 3-months follow-up. Larger sample size is required to either support or refute this hypothesis.

8AP3-5

High volume local infiltration analgesia (LIA) with IV or intraarticular ketorolac+morphine versus epidural analgesia after total knee arthroplasty

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Background and Goal of Study: The recently introduced concept of local infiltration analgesia in total knee arthroplasty is a promising technique regarding postoperative pain management and accelerated patient mobilisation. In this study we compared local infiltration analgesia to standard epidural analgesia. Moreover we studied if locally injected ketorolac and morphine has a specific local effect compared to the same drugs given intravenously.
Materials and Methods: In this prospective, randomized, double-blinded trial we assigned 99 patients undergoing unilateral total knee arthroplasty (TKA) into three groups. Group EDA got epidural analgesia for 48 hours after surgery. Group LIA was treated with local infiltration analgesia and 150 ml of a mixture containing 150mg ropivacaine, 0.5mg epinephrine, 30mg ketorolac, 5 mg morphine added to saline were injected by the surgeon. Group LIAiv got also local infiltration analgesia, but here 30mg ketorolac and 5 mg morphine were injected intravenously. The next day 142.5mg ropivacaine plus 30mg ketorolac were injected intraarticularly via a catheter in group LIA. Group LIAiv got also ropivacaine, but 30mg ketorolac were injected IV.
Results and Discussion: Patients in group EDA had lower verbal pain scores in PACU ($p = 0.004$), but the time to discharge from the PACU was longer ($p = 0.007$). Patients getting local infiltration analgesia had significantly lower pain scores from 24 hours after surgery until discharge from the hospital, they had superior knee function, were mobilised faster and discharged earlier from hospital ($p < 0.0001$). Patients randomized to group LIA had lower cumulated morphine consumption during the first 72h compared to LIAiv ($p = 0.002$).
Conclusion(s): Local infiltration analgesia is superior to epidural analgesia after TKA regarding pain scores from 24 hours after surgery, knee function, mobilisation and length of hospital stay. Local administration of ketorolac and morphine has a specific local effect and beneficial effects are not due to systemic absorption.
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8AP3-6

Intraoperative complications and anesthesia technique in renal transplantation: A comparison of regional and general anesthesia techniques

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Background and Goal of Study: Both regional (RA) and general anesthesia (GA) techniques are currently being used for renal transplantation. However, it is not clear whether one of these techniques is superior to the other one, in terms of frequency of introperative complications. Therefore, this retrospective study was undertaken to compare RA and GA regarding the occurrence of intraoperative complications during renal transplantation.
Materials and Methods: We used our database to do a retrospective study of patients, who underwent renal transplantation under general or regional (epidural or combined spinal-epidural) anesthesia between May 1998 and January 2008, in Baskent University Hospital. The data included demographic features, intraoperative transfusions, amount of administered intraoperative crystalloid and colloids, intraoperative hemodynamics, and preoperative laboratory values. Intraoperative complications such as hypotension (more than 20% decrease from the baseline), hypertension (more than 20% increase from the baseline), arrhythmia, hypoxemia (oxygen saturation < 90%), and need for transfusions were collected using anesthesia and patient charts.
Results and Discussion: Of the 287 patients, who were included in the final analyses, 178 (62%) received RA. Overall, 76 patients (27%) had at least 1 intraoperative complication. The most commonly noted intraoperative complication was hypertension (n=41, 14%), followed by hypotension (n=29, 10%), bradycardia (n=7, 2%), need for transfusions (n=1, 0.3%), and hypoxemia (n=1, 0.3%). Patients who received regional anesthesia were not significantly different from those who received general anesthesia in terms of demographic features, systemic disease, and etiology of renal disease ($p>0.05$ for all). Compared with patients who received RA, intraoperative complications occurred more frequently in patients who received GA (20% *vs* 38%, $p=0.001$). Comparing with RA, intraoperative hypertension was more common during GA (6% *vs* 28%, $p<0.001$). The frequency of intraoperative bradycardia was higher with RA than GA (7% *vs* 0%, $p=0.047$). Length of stay in the hospital were similar for both anesthesia techniques ($p>0.05$).
Conclusion(s): Our result demonstrate that the frequency of intraoperative complications were higher with GA than RA during renal transplantation. Although these complications were mostly mild and did not have a negative impact on the outcomes of these patients, it is important to take all preventive measures to avoid any complication, even the mildest ones.

8AP3-7

Regional anaesthesia and neurofibromatosis type I – Retrospective analysis

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Background and Goal of Study: Neurofibromatosis type 1 (NF1) is a common inherited autosomal-dominant disorder with an incidence of 1:3000. With variable severity, lesions may involve all the physiologic systems (airway, respiratory, cardiovascular, musculocutaneous, peripheral and central nervous system). Anaesthetic management should consider the multiple clinical presentation of the disease. The aim of this study was to describe a five-year experience of regional anaesthesia in NF1 patients in a tertiary hospital.
Materials and Methods: Retrospective analysis of electronic records of patients with NF1 who underwent surgery, between January/2004 and January/2009. Demographic data, physical status (ASA), NF1-related disorders, preoperative CNS imaging, type of surgery, type of regional anaesthetic technique and perioperative complications were collected.
Results and Discussion: Twenty six patients with NF1 were scheduled for a total of 58 surgical procedures. Neuraxial anaesthesia was performed in 4 patients (6%) – 2 lumbar epidural blocks (LEB); 2 spinal blocks (SB) – and combined technique (balanced with lumbar epidural) in 1 patient. Non-elective surgery was done in 3% of cases. All patients submitted to regional anaesthesia had clinical and radiologic exclusion of intracranial and spinal lesions. Case 1: Male, 61y, ASA II, with scoliosis, BMI:21 kg/m2, submitted to bilateral inguinal hernia repair, under SB with 0,5% hyperbaric bupivacaine (15 mg) – unsuccessful blockade, requiring conversion to general anaesthesia and systemic analgesia. Case 2: Male, 73y, ASA hypertension and left branch block, BMI: 28 kg/m2, submitted to bilateral inguinal hernia repair, under SB with 0,5% hyperbaric bupivacaíne (10 mg) and fentanyl (0,02 mg) – uneventful. Case 3: Female, 27y, ASA II, nulliparous, BMI:29 kg/m2, labour analgesia with LEB with boluses of 0,2% ropivacaíne (total dose: 40 mg) – uneventful. Case 4: Female, 23y, ASA II, nulliparous, BMI: 24 kg/m2, labour analgesia with LEB with boluses of 0,25% laevobupivacaíne (total dose: 37,5 mg) – uneventful. Case 5: Male, 73y, ASA II, history of epilepsy, submitted to radical prostatectomy under combined technique with balanced general anaesthesia and LEB with 0,75% ropivacaine continuous infusion (total dose: 112,5 mg) and epidural morphine (3 mg) – uneventful.
Conclusion(s): Despite technical difficulties due to related disorders, regional anaesthesia can be safely performed in NF-1 patients, even in labour analgesia, if imagiological exclusion of central nervous system lesions is assured.

8AP4-1

Stimulation and inhibition of calcitonin gene-related peptide (CGRP) release from skin nociceptors in mouse, rat, and man

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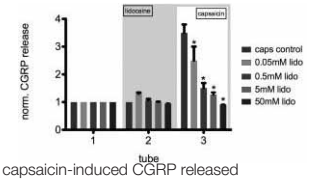
Background and Goal of Study: Activation of cutaneous nociceptive terminals induces release of neuropeptides such as CGRP. The amount of released CGRP correlates with the nociceptor activation. Quantitative assessment of this release in the presence or absence of potential analgesic drugs may be predictive of efficacy. We investigated the effects of lidocaine (lido) on capsaicin (caps)-induced CGRP-release in rat and murine skin and caps-induced CGRP-release in human skin.
Materials and Methods: After IACUC, skin was harvested from Sprague-Dawley rats (250 to 350 g) or C57/BL6 mice (20-25g) after CO2 asphyxation. The skin was processed through a series of 3 base molds (BM) in 750 µl artificial

interstitial fluid (AIF) each. Lido and/or caps was added at different time points and concetrations. After transferring the skin to the new BM, the AIF sample from the previoust BM was pipetted to a Microcent tube and stored at –80°C pending analysis. After IRB approval, human skin was treated as described above. CGRP concentration in the vacufuged AIF samples was measured commercial enzyme immunoassays (SPIbio, France).CGRP concentrations were normalized to the baseline CGRP as measured in BM 1. Data was averaged and analyzed with a 2-way ANOVA (p<0.05).

Results and Discussion: In rat skin, we found a dose-dependent CGRP-release in response to caps. Fifty µM caps induced a 1.7-fold CGRP-release as compared to baseline, whereas 100 and 200 µM capsaicin lead to a 3.5- and 3.9-fold increase, respectively. Lido blocked the CGRP-release normally induced by 100 µM caps in a dose-dependent manner.[figure1]In mice, the caps-evoked CGRP-release was significantly lower as compared to rats, but could also be dose-dependently blocked by lido. In human skin, we also observed a statistically significant caps-induced CGRP-release of up to 150%.



Effects of lidocaine on capsaicin-induced CGRP released

Conclusion(s): The addition of caps induced robust CGRP-release from murine, rat, and humans skin. There seems to be a difference in maximum inducible CGRP-release in the three investigated species, which might be due to innervation density or differences in skin composition such as fat content. Lido, a widely used local anesthetic, blocked the caps-induced CGRP-release in a dose-dependent manner.

8AP4-2

The effect of regional and general anaesthesia on activation of beta-herpesviruses and immune response in patients undergoing general or regional anaesthesia

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Background and Goal of Study: The goals of this study were to investigate the effect of general and regional anaesthesia on the activation of the beta-herpes viruses and the immune response in patients undergoing long lasting reconstructive surgery with the presence of latent and active viral infections.

Materials and Methods: 25 patients (10-65 yrs of age), underwent major reconstructive microsurgical procedures. For 11 patients GA and for 14 patients regional anesthesia (spinal and brachial blocks simultaneously) was applied. Surgical trauma was similar in both groups. Operating time was 4-7 h. Peripheral blood samples for the detection of latent/persistent and active viral infection and peripheral blood CD_4^+, CD_8^+, CD_{38}^+, and CD_{16}^+ positive cells were taken before the surgery and at the 14th day after.

Results and Discussion: Before surgery 24 out of 25 patients had latent/persistent beta-herpes viruses' infection. CMV in 7/25 (28.0%), HHV-6 in 12/25 (48.0%), HHV-7 in 23/25 (92.0%). Active viral infection was detected in 6 of 24 (25.0%) patients: HHV-6 in one and HHV-7 in five cases. In both groups of patients (RA and GA), the frequency of latent/persistent and active beta-herpesviruses infection was similar. In GA group after surgery active viral infection was detected in 7 cases, 3 of them showed active viral infection before the surgery, but in 4 cases – reactivation of the viruses had been observed. In GA group patients with reactivation of viruses, immune response showed tendency to increase number of activated lymphocytes and specific effector cells (CD_8^+, CD_{38}^+) In RA group after surgery active viral infection was detected in 4 cases, 3 of them showed active viral infection before the surgery, but in 1 case the reactivation of beta-herpes viruses (HHV-7) was after surgery Active HHV-7 infection, which was revealed in one patient prior to surgery, was not detected after surgery. In RA group patients with latent viruses before and stayed latent after the surgery, immune response showed statistically significant increase of activated lymphocytes CD_{38}^+ cells (p<0,05) and tendency to increase number of NK cells in postoperative period. Also patients of the first group had tendency to decreased T helper subset (CD4+) in peripheral blood after surgery.

Conclusion(s): Long lasting major reconstructive surgery may cause activation of beta-herpes viruses In patients with latent viral infection before surgery general anaesthesia could lead to suppression of cellular immune response after surgery in comparison with regional anaesthesia.

8AP4-3

Levobupivacaine induces vasorelaxation in rat thoracic aorta strips

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Background and Goal of Study: Many authors have shown that the effects of local anaesthetics on vascular tissue were different. It was shown that ropivacaine produced contraction, whereas bupivacaine induced relaxation (1). The aim of this investigation is to examine *in vitro* the direct effects of levobupivacaine on isolated thoracic aorta rings. And whether this effect is influenced by the nitric oxide (NO) pathway.

Materials and Methods: Rat thoracic aortic rings with intact endothelium were isolated and suspended for isometric tension recording. Before the beginning each experiment, the functional state of the endothelium was verified by observation of the relaxation to acetylcholine (ACh, $2x10^{-6}$M) on a ring pre-contracted with phenylephrine (PhE, $4x10^{-7}$M). Dose-responses curves were established with concentrations of 10^{-6} to 10^{-4}M levobupivacaine (n = 5). To assess the endothelium dependant levobupivacaine response via NO system, intact rings were pre-treated with a specific inhibitor of NO synthesis: $N^{\omega\omega}$-nitro-L-arginine methyl ester ($_L$-NAME), then two levobupivacaine concentrations (10^{-5} and 10^{-4}M) were tested (n = 4). Values are expressed as mean ± SD. Student's t-test was used for statistical analysis. P< 0.05 was considered significant.

Results and Discussion: Levobupivacaine produced dose-dependent vasorelaxation effect in PhE pre-contracted endothelium-intact thoracic aortic rings. The relaxation observed was 12.5 ± 0.8%, 27.1 ± 4.5%, 46.3 ± 5 and 88.5 ± 8% (P<0.05) respectively at 10^{-6}, 10^{-5}, $5x10^{-5}$ and 10^{-4}M. These results were in agreement to those reported by BarisKaner et al with bupivacaine in human umbilical artery (1). However, the same authors have also shown a vasoconstriction action of ropivacaine. Pretreatment with $_L$-NAME (10^{-4}M) decreased the levobupivacaine-induced vasorelaxation in PhE pre-contracted endothelium-intact rings. This relaxation reduction was 54.7 ± 2.5% (from 29.7 ± 4% to 13.5 ± 2.5%) and 39.6 ± 1% (from 89 ± 8% to 53.8 ± 5.7%) respectively for 10^{-5}M and 10^{-4}M of levobupivacaine concentrations (P<0.05). Similar effect of $_L$-NAME was also reported in vasorelaxation induced by ropivacaine in guinea pig aorta (2).

Conclusion(s): Levobupivacaine induces a dose-dependent vasorelaxation in aorta rings with intact endothelium pre-contracted with PhE. The via NO system participate, in part, in this levobupivacaine action.

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8AP4-4

Inflammatory and apoptotic changes of the meninges and the spinal cord after epidural injection of ropivacaine, methylprednisolone or contrast material in the swine

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Background and Goal of Study: Pain management frequently involves epidural injections and epidurographic imaging with contrast material. The histological and neurotoxic *in vivo* consequences of a single epidural injection of local anaesthetics, corticosteroids, or contrast material remain poorly characterized.

Materials and Methods: Ten male adult pigs were subjected to epidurography-guided epidural injection of normal saline, ropivacaine, methylprednisolone acetate and iopamidol at different vertebral interspaces under general anesthesia. Twenty days later, the animals were re-anaesthetized and euthanized and biopsies were harvested from the epidural space, the meninges and the underlying spinal cord. The sections were histologically examined and the neuronal tissue was stained with anti-caspase-3 antibody.

Results and Discussion: Of the total 60 sections studied, vasculitis and mild subarachnoid edema were observed in 6 sections, 3 of which were in the iopamidol group. Another finding was subtle and confined lymphocytic infiltration in the outer layer of the spinal cord, which was identified in 5 sections (3 in the iopamidol group). Lymphocytes were of the cytotoxic type (T-lymphocytes) in 4 of the sections and mixed B- and T-lymphocytes in the remaining one. Overall, sections with lesions were significantly more frequent in the iopamidol group compared to the other groups (p=0.001). Positive staining for caspase-3 was limited to <5% of neurons with all substances used.

Conclusion(s): A single epidural injection of ropivacaine and methylprednisolone acetate does not result in inflammatory or apoptotic changes in the meninges or the spinal cord. However, contrast material can lead to sustained local inflammatory and immune reactions in the meninges and the spinal cord.

8AP4-5

Influence of thoracic epidural anesthesia on Il-6 and LBP blood level in liver resections

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Background and Goal of Study: Thoracic epidural anesthesia (TEA) influences stress response and cytokine release in liver surgery. Il-6 blood level reflects inflammatory response to surgery, especially regarding ishaemic-reperfusion injury. Lipoprotein binding protein (LBP) blood level is increased due to hypoxia related increased permeability of gut mucosa during portal triad clamping (PTC). The aim of our study was to determine if TEA may influence inflammation and gut permeability during liver resections.
Materials and Methods: Prospectively, 22 patients sheduled for liver resections were randomised in 2 groups, TEA (N=13) and control group (N=9). Anesthesia was induced with propofol, fentanyl and vecuronium, and maintained with 1-1,5 vol% isoflurane in 40% oxygen. TEA group received 10 ml of 0,5% ropivacaine epidurally. Blood samples to determine cytokine and LBP levels were taken after the induction, before and after PTC and after the operation. Differences between samples were statistically compared by t-test and considered significant at p>0,05.
Results and Discussion: Il-6 levels significantly increased after release of PTC in all patients in correlation with the duration of PTC. Il-6 levels were higher in TEA group in blood samplies after PTC release. LBP levels were lower in TEA group at the end of operation. These results were not statistically significant. Increase of Il-6 level may indicate emphasised inflammatory response in patients with TEA anesthesia. Lower LBP levels in TEA group suggest better preserved gut mucosa integrity during hypoperfusion.

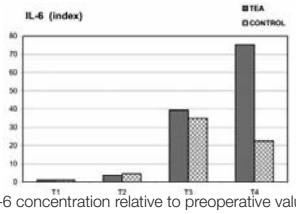

Figure 722a Index of IL-6 concentration relative to preoperative values. T1: preoperative levels; T2: before clamping of portal triad; T3: after release of the clamping; T4 the first postoperative day.

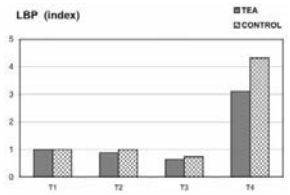

Figure 722b Index of LBP concentration relative to preoperative values. T1: preoperative levels; T2: before clamping of portal triad; T3: after release of the clamping; T4: the first postoperative day.

Conclusion(s): Conflicting results may reflect multiple roles of Il-6 in inflammatory process. Further investigations on larger population are necessary to elucidate the role of Il-6 as an inflammatory mediator or protective factor, and the role of TEA in inflammatory response to surgery.

8AP4-6

Stress response management during major abdominal surgery: Epidural vs. remifentanil

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Background and Goal of Study: It has been argued that the stress response to surgery might be harmful. Epidural analgesia and large doses of opiates attenuate this response. Remifentanil undergoes rapid metabolism and could be used to manage this undesirable response. The aim of this ongoing study is to assess the effect of remifentanil on the stress response during major abdominal surgeries in comparison with epidural analgesia.
Materials and Methods: This randomized controlled prospective study evaluated so far, 30 patients free of metabolic disease or corticoid therapy who underwent elective major abdominal surgery. The study population was divided in 2 groups: 19 patients had epidural (group E) and 11 patients had Remifentanil (group R) during surgery. The E group was induced with 200 mg of lidocaine and 50 mg bupivacaine via the epidural catheter; maintenance dose was 25 mg/h of bupivacaine. The R group was induced with 1 mcg/kg of remifentanil over 1 minute; its maintenance dose was 0.3 mcg/kg/min. In both groups, all patients had general anesthesia. Epidural analgesia was used to control postoperative pain. Fasting Blood Sugar FBS, Cortisol and ACTH were measured before the induction of anesthesia, 1 hour after starting and at the end of the surgery. Data was analyzed using student test.
Results and Discussion: In both groups (E vs. R), preoperative data were comparable: demographic data, as well as the levels of FBS (113.1 vs.111.3 mg/dl), Cortisol (34.4 vs. 35.7 mcg/dl) and ACTH (15.1 vs. 16.2 pg/ml) were similar. One hour after the surgical incision, the levels of FBS (124.5 vs. 148.7 mg/dl) (p=0.94) and ACTH (119.4 vs. 63.2 pg/ml) (p=0.12) increased; however, a slight comparable decrease in Cortisol (30.0 vs. 31.2 mcg/dl) was observed in both groups (p=0.92). By the end of surgery, the level of FBS and all hormones increased comparably in both groups: FBS (154.7 vs. 165.1 mg/dl), Cortisol (36.5 vs. 41.1 mcg/dl) and ACTH (167.0 vs.117.9 pg/ml), the difference was statistically not significant. The levels of ACTH increased more in the E vs. R group (p=o.25). As for the vital signs, we detected more stable heart rate in the E vs. R group. The Mean Blood Pressure decreased more in the R group after induction but was comparable in both groups during surgery. There was no difference in blood loss in both groups.
Conclusion(s): Our results showed that remifentanil is as effective as Epidural in attenuating the stress response during major abdominal surgeries. This preliminary result awaits further confirmation by larger studies.

8AP4-7

Can anesthetic technique influence cancer recurrence in patients with pancreatic carcinoma scheduled for radical tumor resection?

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Background and Goal of Study: Retrospective analyses of patients with prostatic and breast cancer indicated that when regional anesthesia was administered cancer recurrence was less likely [1,2]. This observation was explained by decreased requirements for general anesthetics and perioperative opioids as well as a lower stress level achieved by utilisation of regional analgesia. In this context the influence of peridural anesthesia on the prognosis of patients with pancreatic cancer was evaluated.
Materials and Methods: Following IRB approval records of 100 patients undergoing radical pancreatic tumor resection at our institution between October 2005 and August 2008 were included in this retrospective observational study. General anesthesia (GA: thiopental, sufentanil, cisatracurium, sevoflurane) was combined in 71 patients with thoracic peridural anesthesia (tPDA: continuous infusion of ropivacaine 0.375-0.75%, 6-19 ml/h) at the discretion of the attending anesthesiologist. Moreover, 23 of these patients received significant dosages of peridural sufentanil (>20µg). Patients with incomplete tumor resection as well as perioperatively deceased patients (within 60 days) were not included. Statistics: Kaplan-Meier estimator/log-rank test, multivariant analyses
Results and Discussion: The mean follow-up of patients was 17 months, whereas the 5-year-survival rate was 17 %. The majority of patients was diagnosed at an advanced tumor stage (90 % T3 or T4, 76 % N1). The Kaplan-Meier estimator of the survival function shows a probability of surviving more than 46 months of 24% without differences between GA and GA+tPDA (p=0.5). However, in a subgroup of patients intraoperative peridural application of more than 20 µg of opioids was significantly associated with a reduced overall survival in univariate analysis ($p < 0,025$). At multivariate analysis this was confirmed as an independent adverse prognostic factor. In patients with pancreatic carcinoma scheduled for surgical resection administration of tPDA in addition to general anesthesia does not improve long term survival. In contrast, peridural administration of significant doses of sufentanil may be associated with a decrease in prognosis.
Conclusion(s): Therefore, prospective studies needed to validate these retrospective data should account for the type of cancer. Accordingly, effects observed in malignancies with rather good prognosis may not be confirmed in more aggressive types of cancer.
References:
1 Anesthesiology 2006; 105: 660-664.
2 Anesthesiology 2008; 109: 180-187.

8AP4-8

Proinflammatory cytokines following colorectal surgery depend on the type of anesthesia and surgery

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Background and Goal of Study: After major surgery, immune response is triggered. T helper 1 (T_H1) cells are activated by interleukin-12, and express a panel of proinflammatory cytokines, including TNF, IL-1 and IL-2, that activate macrophages to enhanced antimicrobial activity, MCP1 and IL-7, that stimulate neutrophils and lymphoid progenitor cells respectively. The inflammatory response that occurs after surgery is related to systemic inflammatory response syndrome (SIRS) and can lead to multiple organ dysfunction syndrome (MODS). Laparoscopic surgery is related to a reduction in the inflammatory response, postoperative pain, ileus and hospital stay. It is also documented that patients under combined anesthesia (general anesthesia + thoracic epidural anesthesia) show a reduction in the inflammatory and metabolic response likely due to the neuraxial block and better pain management compared with general anesthesia alone. Some authors have found the anti-inflammatory effects of the local anesthetics to be responsible for these results. We hypothesize that serum cytokine levels are affected by the type of anesthesia (general vs combined anesthesia) and surgery (laparoscopic vs open surgery) after colorectal surgery.
Materials and Methods: A prospective observational preliminary study was designed to describe cytokine serum levels changes in a group of high risk patients (ASA=III) scheduled for colorectal surgery (n=20). There were three groups: laparoscopic surgery (n:6), open surgery with general anesthesia (n:7) and open surgery with combined anesthesia (n:7). The surgical technique was decided by the responsible surgeon while the anesthesia type was randomized by a group of anesthetists. We measured TNF, IL-1,IL-2, IL-12, MCP1 and IL-7 serum levels five times: before surgery, 1 hour, 4hours, 24 hours and 48 hours after surgery. Non-parametric test was used for the statistic analysis.
Results and Discussion: The measured cytokine levels have shown significant differences in the analyzed samples. Patients undergoing laparoscopic surgery and combined anesthesia show reduced levels of proinflammatory cytokines IL-2, IL-7 and IL-12 ($p<0.05$) compared to patients under open surgery with general anesthesia. MCP-1 levels are significantly reduced after laparoscopic surgery but not under combined anesthesia. Regarding IL-1 and TNF we have not found significant differences.
Conclusion(s): Both laparoscopic surgery and combined anesthesia have lessed the inflammatory response following colorectal surgery compared with open surgery under general anesthesia.

8AP4-9

Peridural anaesthesia during cancer-surgery of renal cell carcinoma does not influence long-term survival

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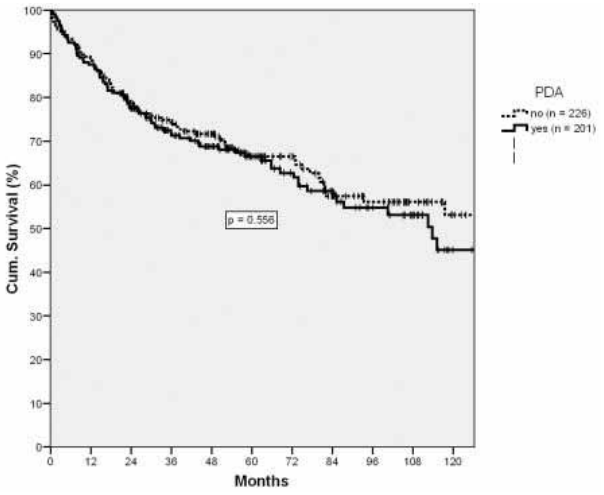
Background and Goal of Study: Recently, results of studies demonstrated significant reduction in mortality, resulting in a better long-term survival in patients that received peridural anaesthesia (PDA) during tumor-removal for different cancer entities, malignant melanoma, prostate carcinoma (1) and colon cancer (2). The goal of this study was to determine the effect of PDA on long time survival of patients with renal cell carcinoma (malignant epithelial carcinoma of the kidney).
Materials and Methods: We conducted a retrospective study using databases of the Giessen Tumor Documentation System (GTDS) and an anesthesia information management system (NarkoData, IMESO). We included patients that underwent surgery (total nephrectomy) between 1998 and 2007 in the urological clinic at the university hospital Giessen (n = 427). The resulting dataset was analyzed using Kaplan-Meier survival curves, grouping patients by treatment with PDA or without. We also checked other influencing factors as ASA-classification, histological tumor-grading, age and gender for their prognostic value.
Results and Discussion: Altogether, we included 427 patients (261 male, 166 female), 201 of which received EDA whereas 226 did not. Divided by their tumor's histological grading, there are 83 patients with G1, 283 with G2 and 56 with G3/G4. 230 Patients were in stage I, 46 in stage II, 86 in stage III and in stage IV were 65. The overall five-year survival was 67% in both groups, ten-year survival around 50% (fig. 1). The Log Rank test for equality returned a p-value of 0.556.
Conclusion(s): We did not observe any difference in long-term survival between the group of patients with and without PDA. We could not identify any subgroup in which a positive effect of additional epidural anesthesia could be shown. This is in contrast to previous studies showing a positive effect of PDA but confirms a recent study by Ban et al. failing to demonstrate a difference when looking at patients after radical prostatectomy (3).



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1 Biki B, Mascha E, Moriarty D.C., et. al. Anesthesiology 2008, 109:180-187.
2 Christopherson R, James KE, at. al. Anesth Analg. 2008 Jul;107(1):325-332.
3 Ban C. H. Tsui, Saifudin Rashiq, Donald Schopflocher, et al. Can J Anesth 2010; 57: 2.

8AP4-10

Electrocardiographic (ECG) changes during continuous intravenous application of bupivacaine in neonatal pigs

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Background and Goal of Study: T-wave elevation in the ECG during intravascular application of a bupivacaine test dose is caused by epinephrine (1). However, there are reports where T-elevation was caused by local anaesthetics alone (2). Aim of this study was to investigate ECG changes with larger doses of intravascular applied bupivacaine using two different injection rates.
Materials and Methods: Thirty neonatal pigs up to 6 week of age (median weight 5.1 kg, range 4.5-6.2 kg) were anaesthetised with sevoflurane, endotracheally intubated and artificially ventilated. Under steady conditions bupivacaine was infused through a central venous catheter at rate of 4 mg/kg/min (group 1, bupivacaine 0.125%) and 16 mg/kg/min (group 2, bupivacaine 0.5%). ECG was continuously printed and analyzed later on for alterations in heart rate (HR), ventricular de-/repolarisation and arrhythmias at 1.25, 2.5 and 5 mg/kg bupivacaine applied.
Results and Discussion: Sinus rhythm persisted in all pigs. Neither a higher degree AV-block nor a complete bundle branch block nor premature atrial nor ventricular contractions were observed. QRS morphology changed in various forms: Most often a decrease in R and an increase in S-wave was found. Changes in heart rate and T-wave elevation are given in Table 1.

Table 1. Effects of bupivacaine infusion on T-wave and heart rate. Results are given as median (range).

Bupivacaine infused	1.25 mg/kg		2.5 mg/kg		5 mg/kg	
	group 1	group 2	group 1	group 2	group 1	group 2
T-elevation [yes/no]	6/9	0/15	12/3	0/15	14/1	12/3
Δ HR [bpm]	–5 (-23-0)	0 (0-0)	–11 (-26--2)	–2 (-13-0)	–26 (-45-0)	–10 (-33-0)
Δ HR [%]	–4 (-14-0)	0 (0-0)	–8 (-16--1)	–1 (-11-0)	–20 (-29-0)	–6 (-28-0)
Infusion time [s]	19	5	37	9	75	19

Infusion time: The time needed to fill the catheter with bupivacaine was 1.3 s for both infusion rates and is neglected.

Conclusion(s): Higher doses of intravenously applied bupivacaine may cause T-wave elevation. However, it is not a reliable indicator for the early detection of an inadvertent intravascular applied local anaesthetic. With a slower injection technique T-elevation can already be detected at lower bupivacaine doses administered.

References:
1 Mauch J et al. Br J Anaesth 2009.
2 Tanaka M et al. Anesth Analg 2001.

8AP5-1

Influence of the lumbar opening pressure and the composition of cerebrospinal fluid (CSF) on postdural puncture headache (PDPH) in patients receiving a spinal saddle block

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Background and Goal of Study: PDPH continues to be a problem after spinal anaesthesia, though its pathophysiology is still unclear. This prospective, controlled, single-centre study investigated the influence of the lumbar opening pressure as well as the composition of CSF on the incidence and the quality of PDPH in patients receiving a spinal saddle block.
Materials and Methods: This trial was performed according to the guidelines of our local ethic commission, and was registered at the International Standard Randomised Controlled Trial Number Register (ISRCTN: 19393727). Spinal puncture was performed under aseptic conditions using a standard midline approach. A 27-gauge Quincke type spinal needle (Spinocan ®, B. Braun, Melsungen, Germany) was introduced with a perpendicular bevel direction into the subarachnoid space at the L3–L4 interspace, which was also used as zero reference level. The lumbar CSF opening pressure was measured with a cylindrical synthetic water spinal manometer (Mediplast, Malmø, Sweden) after the pressure had been stabilized with minimal fluctuation for at least two minutes. All patients received 1.0 mL hyperbaric bupivacaine 0.5%. CSF glucose concentration and osmolarity were analysed. One week after the operation, the occurrence of PDPH was assessed via a telephone interview according to the criteria of the international headache society. For statistical analysis, the SAS System (release 9.2, SAS Institute Inc, Cary, NC, USA) was used.
Results and Discussion: 145 patients (63.5 % male, age: median: 50.1 years [range: 18 – 83], height: 173.3 cm [149 – 200], weight: 83.4 kg [49 – 170]) were included in the study. PDPH occurred in 13 patients (9.0 %, severity: visual analogue scale (VAS 0 – 10 points) 6.0 points [2 – 8], duration: 4.0 days [0.5 – 5]). Symptomatic patients had a lower CSF glucose concentration (symptomatic: 52.0 mg / dL [41.0 – 59.0] vs. asymptomatic: 55.0 mg / dL [42.0 – 96.0], p=0.0060). There was a positive correlation of CSF pressure and severity of headache (p = 0.055) as well as duration (p = 0.0533). All patients showed identical values concerning the opening pressure (39.5 cm H2O [22.5 – 50.0]) and CSF osmolarity (285.0 mosmol / kg H2O [237 – 313]).
Conclusion(s): Patients developing PDPH had a lower CSF glucose concentration. Severity and duration of the symptoms were positively correlated with the lumbar opening pressure.

8AP5-2

Cervical epidural pressure measurement: Comparison in the prone and sitting positions

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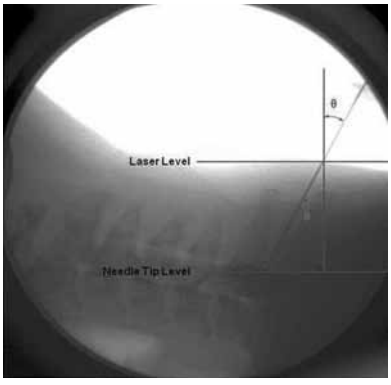
Background and Goal of Study: The hanging drop technique is commonly used for identifying the cervical epidural space, using the negative pressure within this space. However, whether or not the epidural space exhibits negative pressure has been a subject of debate. We designed this study to measure the cervical epidural pressure (CEP) and to test the hypothesis that there is a difference in the CEP between the prone and sitting positions.
Materials and Methods: Thirty-two patients were randomly allocated to either the prone or sitting group. We measured and compared CEPs in two groups using a closed pressure measurement system under fluoroscopic guidance.

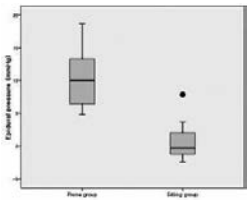


Results and Discussion: All of the CEPs in the prone group were consistently positive (median, 10 mmHg; range, 4.8 to 18.7; mean ± SD, 10.5 ± 4.4) in contrast to the sitting group (median, – 0.3 mmHg; range, -1.3 to 2.0; mean ± SD, 0.5 ± 2.8). The CEP in the prone group was significantly higher than that in the sitting group ($P < 0.01$).

Association between Cervical Epidural Pressure and Covariates

variable	ANCOVA	
	F value	P value
Neck flexion angle	0.689	0.415
Body position	9.457†	0.005
Neck flexion angle x body position	0.041	0.841

†F value shows the strength of association of body position and cervical epidural pressure by ANCOVA regression analysis.



Conclusion(s): The CEP is significantly higher in the prone position than in the sitting position. Even in the sitting position, the CEP is not consistently negative. These results suggest that the hanging drop technique might not be appropriate for identifying the cervical epidural space in either the prone or sitting position.

8AP5-4

Comparison of fascia iliaca compartment block with conventional sedation to facilitate the positioning of patients with fractured neck of femur for spinal anaesthesia

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Background and Goal of Study: Spinal anaesthesia is commonly practiced in orthopaedic anaesthesia with over 75% of anaesthetists choosing it as their preferred technique for operative repair of femoral neck fracture[1]. Whilst neuraxial blockade may provide excellent perioperative analgesia, patient positioning may cause significant pain in this predominately elderly population. This prospective, randomised controlled trial compared the use of fascia iliaca compartment block (FICB) with a conventional sedation regime when positioning patients in a lateral position for spinal anaesthesia.
Materials and Methods: Forty patients scheduled to undergo surgery for femoral neck fracture were randomly allocated to receive FICB (with 2mg/kg 1% lignocaine) or intravenous sedation (0.2mg/kg iv ketamine & 0.025mg/kg iv midazolam). Visual analogue pain scores (VAS) were recorded at rest & on movement before the intervention and again at either 10 min post block or 5 min post sedation. If VAS >4 on movement at this point, a period of 5 min was allowed before movement (FICB group) or a further 10mg ketamine administered (sedation group). VAS was then assessed on movement to a lateral position, after which spinal anaesthesia was administered. Mann Whitney U test was applied to test the statistical significance of the results.
Results and Discussion: Thirty-nine patients completed the study; one patient was withdrawn from the FICB group due to new onset arrhythmia. The average age of the 39 patients was 78 years. Complete FICB occurred within 10 min in 15/19 patients & in 15 min in the remaining four. Additional ketamine 10 mg was required in 7/20 patients in the sedation group. The pain scores were similar before FICB or sedation. FICB was associated with better pain control with a significantly greater improvement in pain scores (p<0.01).

Pain scores in the two groups before & after intervention (Mean (SD))

	FICB (n=19)	Sedation (n=20)
Pain scores pre-intervention	9.03 (1.22)	8.70 (1.94)
Pain scores after intervention	5.53 (2.38)	7.63 (1.93)
Difference in VAS after intervention	-3.447 (2.88)*	–1.08 (2.64)

(*p<0.01 compared to sedation group)

Conclusion(s): Positioning for spinal anaesthesia may cause significant pain and distress. The use of FICB significantly reduces pain scores, which may allow for improved positioning and overall patient satisfaction.

Reference:
1 Sandby-Thomas M et al. A national survey into the perioperative anaesthetic management of patients presenting for surgical correction of a fractured neck of femur. Anaesthesia 2008: 63;250–8.

8AP5-5

Effect of the transversus abdominis plane block on pain after laparoscopic inguinal hernia repair

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Background and Goal of Study: The transversus abdominis plane (TAP) block is a new locoregional analgesia technique proposed to treat pain after abdominal surgery.1-3 We investigated the effect of TAP block on pain after laparoscopic inguinal hernia repair.

Materials and Methods: With IEC approval and informed consent, 30 patients scheduled for preperitoneal laparoscopic inguinal hernia repair were included in this randomized double blind study. General anaesthesia (sevoflurane in O2:air) was used in all patients. After the induction of anaesthesia patients were randomly allocated in two groups (n=15 in each group): TAP block using McDonnell's technique1 with 20 ml of levobupivacaine (LEVO) 0.375% Adr 1/200000 75 µg clonidine at each side or 20 ml saline (SAL) Adr 1/200000 75 µg clonidine at each side. Postoperative analgesia was standardized: iv piritramide titration the first h in the recovery room, then paracetamol 1 g/6 h and diclofenac 75 mg/12 h if necessary. Pain scores (100 mm VAS) at rest and during mobilisation during the first two postoperative days, consumption of piritramide, paracetamol, and time to first paracetamol request were recorded. Data (mean±SD) were analyzed by ANOVA, or Student t-test; $P < 0.05$ = statistically significant.

Results and Discussion: All analgesic parameters were better in the LEVO group, but differences between groups did not reach statistical significance: pain scores at rest (Table) were lower (P = 0.1), piritramide consumption was less (1,7 ± 0.6 mg vs. 3.6 ± 0.9 mg, P = 0.1), and time to first paracetamol request was longer (11 ± 13 h vs. 7 ± 12 h, P = 0.1) in the LEVO group as compared the SAL group.

Pain scores at rest after laparoscopic inguinal hernia repair

Time	1 h	2 h	3 h	4 h	24 h	48 h
Saline	38 ±23	24 ± 22	28 ± 31	18 ±21	16 ± 15	17 ± 24
Levobupivacaine	31 ± 20	15 ± 18	12 ± 11	12 ± 11	8 ± 7	8 ± 11

Data = mean ± SD

Conclusion(s): Our results suggest that TAP block does not improve significantly parameters of analgesia after laparoscopic inguinal hernia repair. These findings may be due to insufficient power of our study given low pain scores reported in the SAL group and the great variability in pain scores reported in both groups. The lack of significant differences may also be due to the occurrence of pneumoperitoneum in several patients, associated with pain not supposed to be relieved by TAP block.

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2 JG McDonnell et al., Anesthesia Analgesia 2008,106:186-91.
3 J Carney et al., Anesthesia Analgesia 2008,107:2056-60.

8AP5-6

Effects of epidural levobupivacaine and bupivacaine on the bispectal index during the awake phase and sevoflurane requirement during the general anesthesia

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Background and Goal of Study: The aim of this study was to compare the effects of use of equivalent doses of levobupivacaine and bupivacaine in combined epidural/general anesthesia on awake period bispectral index (BIS) value and on volatile anesthetics requirements during general anesthesia for lower extremity operations.

Materials and Methods: After obtaining approval from the local ethical committee, ASA I-II, 66 patients 18-65 years old were included in the study and randomly divided into three groups following epidural catheter insertion. The Group C received injection of 5 mL 0.9% saline, followed by infusion of 10 $mL.h^{-1}$ saline; the Group L 5 mL 0.25% levobupivacaine followed by 10 $mL.h^{-1}$ 0.25% levobupivacaine infusion, Group B 5 mL 0.25 % bupivacaine followed by 10 $mL.h^{-1}$ 0.25% bupivacaine infusion through the epidural catheter. Vital signs and BIS values were evaluated before and after blockage at 15.,20.,25. and 30. min. Levels of sensory and motor blockage were evaluated 30 min after the injection, and standard general anesthesia induction and maintenance was performed according the BIS values. The minimum alveolar concentration (MAC) of sevoflurane at 5 min intervals during the first hour of the operation, extubation, eye opening and the first analgesic times were recorded. Data were analyzed with One-Way ANOVA (followed by the Tukey post *hoc* test), Mann-Whitney U, Kruskall-Wallis, Wilcoxon's signed rank, Fisher's Exact and χ^2 tests.

Results and Discussion: The Demographic data were similar among the groups. While control BIS values of groups were not different, the difference was significant at all measurement times in Group C and Group B (p=0.034, p=0.035, p=0.032) and Group L (p=0.001, p=0.001, p=0.013, p=0.001) in the awake period. However BIS values in Group L were significantly lower than the values of Group B at 15th min following epidural injection (p=0.012). The MAC values of sevoflurane was higher for all measurement times after 20 minutes of the operation in Group C compared to Group L (p=0.019, p=0.001, p=0.003, p=0.005, p=0.000), compared to Group B at 30th and 50th min (p=0.016, p=0.029), and at 35th min in Group B compared to Group L (p=0.045).

Conclusion(s): As a result, it was concluded that levobupivacaine and bupivacaine caused a comparable level of decrease in BIS on awake period but, during general anesthesia epidural levobupivacaine caused higher level of decrease in sevoflurane requirement compared to bupivacaine.

8AP5-7

Impact of propofol anaesthesia on electrocardiographic (ECG) changes during intravenous application of a bupivacaine test dose containing epinephrine and during high dose bupivacaine infusion – A study in neonatal pigs

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Background and Goal of Study: Under sevoflurane anaesthesia intravenous injection of a small dose of local anaesthetics (LA) with epinephrine results in increase in heart rate and T-wave amplitude in the ECG (1). These signs play an important role in the early detection of inadvertent intravascular administration of LA in routine paediatric anaesthesia care. Furthermore high doses of plain bupivacaine as well cause T-elevations (2). Aim of this study was to elucidate whether propofol affects these ECG alterations.

Materials and Methods: Thirty neonatal pigs (median weight 5.2 kg, range 4.6-6.2 kg) were randomized into two groups. After inhalation induction and endotracheal intubation, anaesthesia was maintained with sevoflurane (group 1) or sevoflurane + propofol 10mg/kg/h (group 2). Under steady condition a test dose of 0.2 ml/kg bupivacaine 0.125% + epinephrine 1:200'000 was injected in a cannulated ear vein. Thirty minutes later bupivacaine 0.125% was continuously infused through a central venous line at a rate of 4 mg/kg/min. ECG was continuously printed and analyzed later on for changes in heart rate and T-elevation at 1.25, 2.5 and 5 mg/kg bupivacaine infused. Data are presented as median (range).

Results and Discussion: The ECG of one pig in group 2 could not been analyzed because of technical problems. Results are shown in Table 1 and 2. In neonatal pigs propofol neither suppresses tachycardia nor T-wave-elevation caused by an intravenous injected bupivacaine test dose containing epinephrine nor suppresses T-elevation caused by a high dose bupivacaine infusion.

Table 1: ECG alterations after injection of 0.2 ml/kg bupivacaine 0.125% + epinephrine 1:200'000

	Group 1 (n=15)	Group 2 (n=14)
Δ heart rate [bpm]	83 (26-125)	104.5 (80-117)
Δ heart rate [%]	53 (22-119)	97.5 (72-127)
T-elevation [yes/no]	14/1	14/0

Table 2: Effects of bupivacaine infusion on T-wave and heart rate

Bupivacaine infused	1.25 mg/kg		2.5 mg/kg		5 mg/kg	
	Group 1	Group 2	Group 1	Group 2	Group 1	Group 2
T-elevation [yes/no]	6/9	10/4	12/3	14/0	14/1	12/2
Δ heart rate [bpm]	–5 (-23-0)	–3 (-25-0)	–11 (-26--2)	–7 (-35--2)	–26 (-45-0)	–18 (-50--10)
Δ heart rate [%]	–4 (-14-0)	–3 (-17-0)	–8 (-16--1)	–7 (-26--1)	–20 (-29-0)	–19 (-39--9)

Conclusion(s): Propofol does not affect ECG signs of early or late inadvertent intravascular administration of local anaesthetics.

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8AP6-1

Prospective randomized comparison of interscalene plexus block and general anaesthesia for ambulatory arthroscopic shoulder surgery

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Background and Goal of Study: Shoulder surgery is painful (1). Ambulatory surgery requires suitable anaesthetic techniques to accomplish high patient acceptance and optimal workflow (2). Interscalene plexus block (IPB) may be superior compared to general anaesthesia (TIVA) but may cause workflow delays. We compared the efficacy, postoperative pain, PACU performance and patient's satisfaction of IPB and TIVA for ambulatory arthroscopic shoulder surgery.
Materials and Methods: After IRB approval and written informed consent 102 patients randomly allocated to IPB or TIVA were enrolled. IPB patients received ropivacaine 0,75% for the nerve block; TIVA patients were anaesthetised with propofol/alfentanil. Postoperative pain medication was standardized. We compared: (1) anaesthesia induction times, (2) time to discharge from PACU (modified Aldrete Score >12), (3) pain scores, (4) patients satisfaction. Statistics: student T test and x^2-test, $p<0.05$.
Results and Discussion: Demographic data and duration of surgery were comparable. IPB was complete or satisfactory in all patients. Anaesthesia induction time and time to approval were comparable. A significant difference between groups was found in terms of time to PACU discharge ability (fig. 1). Postoperative pain scores were significantly higher in the TIVA group (fig. 2) without differences in patient satisfaction (IPB: 9,7±0,6 vs. TIVA: 9,7±0,5).

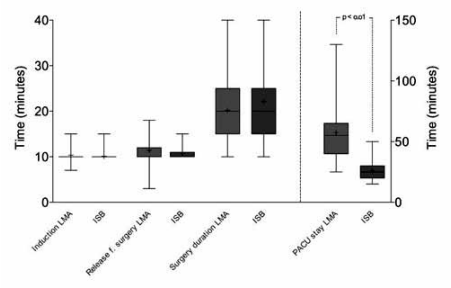

Table 1: Pain score and patient satisfaction

		IPB (n=51)		TIVA (n=51)	
NRS post OP	Score	n	%	n	%
	8-10	0	0	1	2#
	3-7	0	0	42	82#
	0-2	51	100	8	16#
NRS at discharge	3-7	0	0	42	82#
	0-2	51	100	9	18#
Satisfaction (mean)	1-10	9.7±0.6		9.7±0.6	

IPB = interscalene plexus block, TIVA = total intravenous anaesthesia, NRS = numeric rating scale, # = p<0.05

Conclusion(s): IPB was successfully applied in all patients. Postoperative pain and time to discharge was lower in IPB compared to TIVA without differences in induction time. Thus, IPB for outpatient shoulder surgery may be superior compared to TIVA.

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8AP6-2

Continuous popliteal sciatic nerve block for postoperative pain control at home: A prospective study in patients undergoing hallux valgus repair

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Background and Goal of Study: The aim of the study was to examine the efficacy of the global satisfaction of patients with reference to pain score (VAS) and management of the disposable infusion pump.
Materials and Methods: 250 patients were enrolled in 18 months. Before surgery the patients received a single-injection popliteal sciatic block using mepivacaine 1.5 % 30 mL followed by perineural catheter positioning to ensure postoperative continuous sciatic block, obtained with ropivacaine 0.2% 5 mL and patient-controlled analgesia with 3 mL boluses (max every 30 minutes). Oral paracetamol 1 gr was given as rescue dose. Patients were discharged home 8 h after surgery with the disposable infusion pump and were provided an evaluation questionnaire, recollected after 72 h. Patients were asked to record pain score at rest and after movement, side effects and overall satisfaction score.
Results and Discussion: The removal of perineural catheter was simple and painless of 236 patients while 4 patients reported a difficult removal. The pain score was low (VAS 3-4) at rest and after movement for 240 patients. In 3 patients the catheter was not in the right position and it was necessary to hospitalize them, in 7 patients it was recorded at home and they used the paracetamol as dose rescue. Only 3 patients recorded side effects as headache and tiredness.
Conclusion(s): Continuous popliteal sciatic nerve block assured a good postoperative analgesia and a good management to house of the disposable infusion pump, reducing the number of the hospitalizations and the sanitary cost. The degree of satisfaction of the patients was elevated and all of them would do again the same anaesthesia and the same treatment of the pain.

8AP6-3

Pulse transit time is an early predictor of successful axillary block

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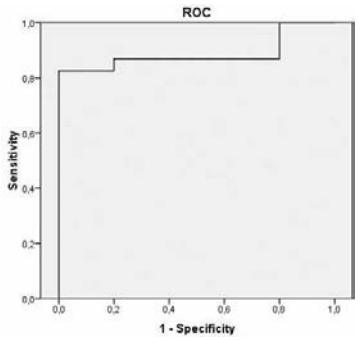
Background and Goal of Study: Success rate of axillary block (AB) depends on technical and anatomical factors. It can take up to 30 min to determine if an AB is successful. Early objective assessment of AB can save time. AB is known to influence vasomotor tone, it causes loss of sympathetic vasoconstriction of arteries resulting in longer pulse transit time (PTT). We investigated if PTT can be an objective, reliable and early predictor of AB.
Materials and Methods: Patients undergoing hand surgery under AB were included. Exclusion criteria: cardiovascular diseases, tremor, neuropathy and upper limb malformation. Besides ECG, a plethysmosensor was placed on both indexfingers, innervated by the median nerve. Used local anesthetics (LA) were ropivacaine, mepivacaine and prilocaine. The time between the R-wave of the ECG and the top of plethysmogram was used to calculate PTT in Matlab. PTT was monitored 2 min before induction of the AB until a minimum of 15 min after or until patient was transported for operation. PTT of the contra lateral arm (reference value) was subtracted from the arm with the AB. The sensitivity and specificity of PTT were calculated using a ROC analysis.
Results and Discussion: Characteristics of 28 patients are shown in Table 1. The mean PTT difference increased from 12ms at baseline to 23ms at 4 min in successful block. ROC analysis revealed a significant (p=0.008) increase 4 min after injection of the LA with a sensitivity of 83% and specificity of 100% with an AUC of 0.9 (Figure 1). The onset time varied probably because of the site of injection in the axillary sheet and use of different LA's.

Table 1. Patient characteristics

Variable	Mean (sd)
Number	28
Age (yr)	40.1 (14.4)
Sex (m/f)	16/12
Weight (kg)	75.1 (13.9)
Height (m)	1.77 (0.10)
BMI (kg/m2)	24.0 (3.4)
ASA (I/II)	19/9
SBP (mmHg)	131.3 (16.1)
DBP (mmHg)	77.1 (12.0)
Success rate	82% (23 of 28)



Conclusion(s): PTT can be used as a reliably, early and objective method in assessing an AB. Although ultrasound guided placement increases the success rate, there is still need for fast assessment of AB. In our view calculating PTT by making use of a standard ECG and normal plethysmogram is an attractive method to objectively assess AB.

8AP6-4

Single block or continuous sciatic nerve block for postoperative relief after total knee arthroplasty? A prospective, randomized, double blind study

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Background and Goal of Study: The goal of this prospective, randomized, double blind study was to value if the add of the continuous sciatic nerve block to the continuous lumbar plexus block improve the quality of postoperative analgesia after total knee arthroplasty compared to single sciatic nerve block.
Materials and Methods: With Ethical committee approval and written informed consent, 15 ASA physical status I-II, 40 – 81 yr-old patients undergoing total knee arthroplasty were enrolled. All the patients received both lumbar plexus catheter and sciatic stimulating catheter before general anesthesia. At the end of surgery after neurological test to avoid surgery sciatic injury all the patients received 20 ml of 0,75% levobupivacaine in lumbar catheter and 15 ml of 0,37% levobupivacaine in the sciatic catheter. At this point by using of computer-generated number sequence, patients were randomly allocated into two groups. The first group received 7 ml/kg of 0.06% levobupivacaine (L group =8). The second group received the same volume of saline solution (S group =7). Vas score was measured each 6 hours for 48 postoperative hours. We also recorded the morphine self-administration though PCA and the ability to walking at the end of observation.
Results and Discussion: No differences in anthropometrics parameters were found between the two groups. VAS score resulted lower at 30, 36, 42 postoperatively hours in the L group compared the S group as well as the morphine consumption. This difference was statistically significant (P<0.05). At the end of the 48 hours total amount of morphine administrated in the S group was 11,7±7,7 mg compared with only 1,3±1,25 mg in the L group (P<0.05). The ability to walking after 48 hours resulted 28±4 mt for the patients belong to the L group against only 18±12 mt in the S group (P<0.05).
Conclusion(s): This preliminary study showed that the add of the continuous sciatic nerve block to the lumbar plexus block decrease the morphine requirement improving postoperative relief after total joint arthroplasty compared to the single sciatic nerve block. Moreover seems to allow a better rehabilitation even if a largest study is required to confirm this preliminary data.

8AP6-5

Continuous psoas compartment block versus continuous femoral block in elderly patients with hip fractures

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Background and Goal of Study: To compare, in a randomized study, the efficacy of two analgesia regimens in control of postoperative pain in patients with hip fractures.
Materials and Methods: We allocated 73 patients, 57 female and 16 male with hip fractures in two groups. In group A(n=37) patients received analgesia with a continuous psoas compartment block in group B (n=36) with a continuous femoral block. The average age was 76yrs (68-95). 42 patients had an intra capsular fracture and 31 patients had an extra capsular fracture. In group A psoas compartment block was performed using the posterior approach in the L4 vertebra level, before surgery. The compartment was identified by a nerve stimulator. A loading dose of 20 ml of 0.25% levobupivacaine was given and a catheter placed and secured. In group B a femoral block was performed using also a nerve stimulator, the loading dose was 20ml of 0.25% levobupivacaine and a catheter inserted and secured before surgery. Both groups received spinal anaesthesia for surgery with levobupivacaine 5.0 mg/ml 2.5ml. In the PACU patients in both groups received continuous infusion of 5ml/h of 0.625% through the catheter for 24h. In the ward was prescribed pethidine im. on request, as rescue analgesia Pain score measured in visual analogue scale, need for rescue analgesia, nausea/vomiting, haemodynamic parameters, and complications of the block or the catheter were recorded for 24 hrs.
Results and Discussion: The psoas compartment and the femoral nerve were successfully located in all the cases. Pain score was very low in both groups and there is no statistical significant difference. 3 patients of group B asked for supplement analgesia. Vomiting happened in 5 patients of group A and in 2 patients of group B. No complications were observed like motor block, local haematoma or infection, inadvertent arterial puncture, epidural spread, direct nerve damage and cardiovascular or neurological toxicity. In 2 patients of group B there was an accidental removal of the catheter, in the ward.
Conclusion(s): The continuous psoas compartment block and the continuous femoral nerve block were found to be of the same efficacy in the management of postoperative pain in elderly patients with hip fractures while femoral block seems to be more preferable as it is less invasive procedure.

8AP6-6

Comparison of efficacy of different concentration and volumes of levobupivacaine in axillary brachial plexus blockade

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Background and Goal of Study: The purpose of this study was to compare the effect of same dosage but different concentrations and volumes of levobupivacaine used for axillary brachial plexus block on onset, duration and quality of sensory and motor block in patients who were planned to undergo forearm and hand operations.
Materials and Methods: After obtaining approval from the Ethical Committee, a total of 69 patients between 18-65 years old with ASA I-II score were included into the study. The patients were randomized and divided into 3 equal groups. The patients underwent axillary brachial plexus blockade with standard technique using nerve stimulator. The patients in Group 1, Group 2 and Group 3 were administered 45 mL of levobupivacaine (5 mg/mL), 30 mL of levobupivacaine (7.5 mg/mL) and 30 mL of levobupivacaine (7.5 mg/mL) + 30 mL of 0.9 % NaCl solution, respectively. Vital signs were recorded at certain intervals before and after the block. Sensorial and motor block were tested at 5 min intervals in the dermatomes and muscles innervated by musculocutaneous, radial, ulnar and median nerves. The onset and durations of sensorial and motor block, first pain sensation in the operation site together with first analgesic requirement, total analgesic consumption in the 24 hr and side effects were also recorded. Data were analyzed with Mann-Whitney U, Kruskall-Wallis, Wilcoxon's signed rank and χ^2 tests.
Results and Discussion: The Demographic data were similar among the groups. Compared to Group 3, sensory block of median and radial nerves initiated earlier in Group 1 and 2 (p=0.029, p=0.029 and p=0.003, p=0.036 respectively) whereas motor block of radial nerve initiated in Group 3 significantly later than Group 2 (p=0.009). The mean onset of sensory blocks in the distribution of 4 nerves was 10.1, 10 and 17 min in Group 1, Group 2 and Group 3 respectively. Although there was no statistically significant difference in motor block recovery time and consumption of analgesic drugs within 24 hours among groups, sensory recovery time in Group 1 was earlier than the other groups (p=0.001, p=0.002) and it was later in Group 2 than group 3 (p=0.013). Time to first pain was significantly shorter in patients in Group 1 compared with other groups (p=0.001, p=0.001).
Conclusion(s): As a conclusion, decreasing the concentration and increasing the volume of levobupivacaine without changing its dosage prolongs the duration of sensory block and analgesia; although it delays the onset of sensory and motor block in axillary brachial nerve blockage.

Pharmacology

9AP1-1

The effects of isoflurane on human sperm motility and vitality in asthenospermia in vitro

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Background and Goal of Study: Our previous study have shown that isoflurane increased reversibly the apparent motility and vitality of human sperm at the concentrations of 1.4~5.6 vol%. In this study, we investigated the effects of short exposure to isoflurane on human sperm motility in asthenospermia in vitro.
Materials and Methods: Normal semen samples(n=10) and abnormal semen samples(n=10) were collected from donors after a 3 day period of abstinence. Every semen sample was divided into 15 0.1 ml aliquots, then the 15 aliquots

were allocated to three equal groups. After 0.1 ml semen was added into the culture capsules, the five aliquots of each group were exposed to 0 (as control), 5, 10, 15 and 20 µl isoflurane (not contact directly with semen and the corresponding vol% of isoflurane is 0,1.4, 2.8, 4.2 and 5.6 respectively),and then the culture capsules were sealed immediately. The test was performed at 25° and the motility and vitality of sperm were analysed by computer-assisted sperm analysis at 0.5 h, 1 h and 2 h respectively.

Results and Discussion: [circ1]A significant increase in motility and vitality of spermatozoa in asthenospermia was observed at 0.5h and 1h of exposure to 1.4 ~ 5.6 vol% isoflurane compared with control. No significant difference in sperm motility and vitality was seen between the three groups at 2 h of exposure. Normospermia treated with 1.4 ~ 5.6 vol% isoflurane showed a significant increase in the motility and vitality of sperm at 0.5 h, 1 h and 2 h; [circ2]The extent of increase in motility and vitality in asthenospermia at concentration of 5.6 vol% isoflurane was higher than that in asthenospermia at concentration of 1.4 ~ 4.2 vol% at 0.5 and 1 h of exposure. In contrast, no such significant differences among the three groups was seen in the normospermia. [circ3] The increasing amplitude of motility.

Conclusion(s): Isoflurane increased sperm motility and vitality not only in normospermia but also in asthenospermia at the concentration of 1.4 ~5.6 vol%. In addition, the increasing amplitude of motility and vitality in asthenospermia were higher than that in normospermia at 0.5h of exposure to 5.6 vol% isoflurane.

9AP1-2

Ketamine and remifentanil interactions on the minimum alveolar concentration of sevoflurane in the rat

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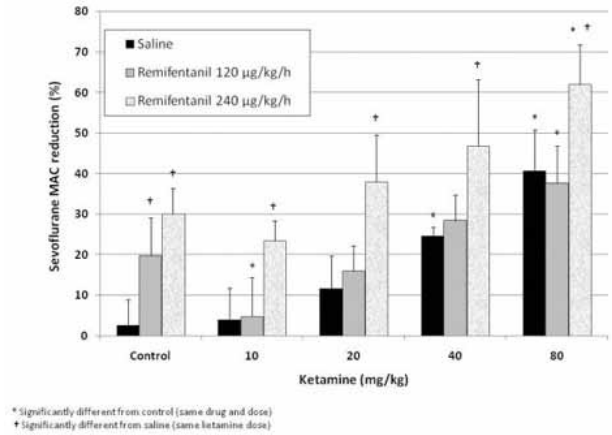
Background and Goal of Study: Our aim was to determine the effect of different doses of ketamine alone or combined with remifentanil on the Minimum Alveolar Concentration (MAC) of sevoflurane in rats.

Materials and Methods: After institutional animal care committee approval, ninety male Wistar rats (15 groups; n=6 per group) were anaesthetized with sevoflurane. MAC was determined twice: baseline and after ketamine administration (10, 20, 40 and 80 mg/kg) or saline (control) intraperitoneally. Ten further groups of rats received the same doses of ketamine or saline combined with a constant rate of infusion of remifentanil at 120 or 240 µg/kg/h (low and high doses, respectively). 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: Ketamine dose-dependently reduced the MAC by 4±8%, 12±8%, 25±2% and 41±10% at 10, 20, 40 and 80 mg/kg, respectively. Similarly, remifentanil dose-dependently reduced the MAC by 20±9% and 30±6% with the low and high dose, respectively. The reduction of the MAC produced by any dose of ketamine was not potentiated by the administration of the low dose of remifentanil. Furthermore, the low dose of ketamine inhibited the MAC reduction produced by the low dose of remifentanil. When the high dose of remifentanil was given, a similar increase of the effect of ketamine on MAC reduction was observed (average: 22±3%).



Conclusion(s): Results suggest relevant interactions between ketamine and remifentanil on the MAC of sevoflurane. These interactions were highly dependent on the dose of both drugs. Although high doses of both drugs resulted in a potentiation of the MAC reduction, interestingly, low doses of ketamine actually blocked the effect of low doses of remifentanil on the MAC. Therefore, appropriate selection of doses of ketamine and remifentanil should be considered in order to reduce the requirements of inhalant anaesthetics and their side effects.

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9AP1-3

St. John´s wort decreases the plasma concentrations of oral S-ketamine

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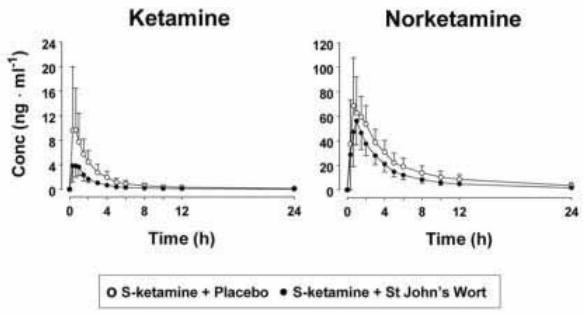
Background and Goal of Study: Ketamine is an intravenous anaesthetic and analgesic agent but it can also be used as an oral adjuvant in the treatment of cancer and chronic non-malignant pain (1). Due to its oxidative metabolism by cytochrome P450 3A (CYP3A), ketamine is prone to pharmacokinetic (PK) drug interactions (2). This study was aimed to investigate the effect of St. John´s wort (SJW) on the PK and pharmacodynamics (PD) of oral S-ketamine.

Materials and Methods: In a randomized cross-over study with two phases, 12 healthy subjects ingested SJW or placebo for 14 days. On day 14, one hour after the last dose of the pretreatment, they were given an oral dose of 0.3mg/kg os S-ketamine. Plasma concentrations of ketamine and norketamine were measured for 24 h and PD variables for 12 h.

Results and Discussion: Compared to placebo, SJW decreased the mean area under the plasma concentration-time curve ($AUC_{0-\infty}$) of S-ketamine by 51% (P<0.001) and decreased the peak plasma concentration (C_{max}) of S-ketamine 43% (P=0.001). Mean C_{max} of norketamine (the major metabolite of S-ketamine) was decreased by 18% (P=0.01) and mean $AUC_{0-\infty}$ by 32% (P<0.001) by SJW. The pharmacological response to S-ketamine was similar during placebo and SJW. There was a statistically significant linear correlation between the self reported drug effect and C_{max} of S-ketamine (r=0.91; p<0.001). The observed PK changes are in good agreement with the known inducing effects of SJW on hepatic and intestinal CYP3A4 and intestinal P-glycoprotein/MDR1 drug transporter (3).



Conclusion(s): SJW greatly decreases the exposure to oral S-ketamine in healthy volunteers. An increase of the dose of S-ketamine may be necessary when treating patients with clinical pain.

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9AP1-4

Potential adverse effects of inhalation anaesthetics-immune function and tumour

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Background and Goal of Study: Inhalation anaesthetics are frequently used for general anaesthesia of cancer patients. Some anaesthetics could have a significant influence on cytostatic or cytotoxic drug metabolism and enhanced toxic reaction; it's very important to select an appropriate anaesthetic drug during the treatment of cancer patients. There are some reports that inhalation anaesthetics enhanced metastases in mice due to impaired immune response (1). This study was carried out to find whether different inhalation anaesthetics might enhance or decrease cisplatin induced cytotoxicity on tumour cells and to investigate their effect on immune function of mice-bearing Echrlich ascites tumour cells (EAT).

Materials and Methods: Mice were divided into eight experimental groups, each group comprised ten EAT bearing mice; $2 \cdot 10^6$ EAT cells were injected intraperitoneally (*ip).* Cisplatin was also injected *ip* at dose of 5 mg kg^{-1} started on the third day after tumour cell inoculation and after that 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 50:50. The following variables were analyzed: the total number of cells in the peritoneal cavity, differential count of cells present in the peritoneal cavity, and determination of lymphocyte/polymorphonuclear leukocyte ratio (L/P) activity in peripheral blood.

Results and Discussion: Sevoflurane and especially halothane decreased the number of living EAT cells in peritoneal cavity lavage. Repeated anaesthesia with isoflurane had a stimulatory effect on EAT cells proliferation. As expected, cisplatin decreased the number of EAT living cells in peritoneal cavity. Combined treatment of mice with cisplatin and all three mentioned anaesthetics increased a number of living tumour cells in peritoneal cavity compared to cisplatin treatment of mice alone.

Conclusion(s): These results suggest that inhalation anaesthetics may protect tumour cells from cytotoxic effect induced by cisplatin due to increased immunological response in peritoneal cavity. However, L/P activity in peripheral blood was immunosupresed. According to these results we conclude that there is a different sensitivity between cells in peritoneal cavity of mice and immunological cells presented in peripheral blood.

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9AP1-6

Immunomodulatory properties of water-soluble, trifluorinated molecules

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Background and Goal of Study: Volatile anesthetics have been shown not only to provide protection against ischemia-reperfusion injury in humans (1) but also to modulate inflammatory processes (2). We investigated in an in vitro model of acute lung injury (ALI) whether halogenated volatile anesthetics have protective effects due to hydrophobic properties or due to characteristics in their halogenations. As marker of inflammatory response we measured Monocyte Chemotactic Protein-1 (MCP-1) and Chemokine (C-X-C motif) ligand 1 (CXCL-1) which are known to play crucial roles in the inflammatory orchestration upon infection and injury.

Materials and Methods: Rat alveolar epithelial cells (AEC) and human blood microvascular cells (HMVEC) were exposed to phosphate-buffered saline (negative control) or LPS 20µg/ml for 6 hours (positive control). Conditioning of the cells was performed with sevoflurane (2.2 vol%), diethylether and different molecules carrying either a trifluorinated carbon group (CF3 group) or methyl group in comparable concentrations. Expression of rat-MCP-1 and Human CXCL1 protein were analyzed by ELISA. Viability was observed using Fluorescence DNA Quantitation. Cytotoxicity was evaluated by measuring lactate dehydrogenase in supernatants. Chemotactic activity of supernatants regarding neutrophil recruitment was assessed.

Results and Discussion: Application of diethylether provoked an increase of MCP-1 and CXCL-1 levels in cells stimulated with LPS. Mediator levels of cells stimulated with LPS were in a dose-dependent manner significantly decreased by exposure to molecules with CF3-group(s). The decrease was most pronounced using hexafluoroisopropanol having two CF3-groups (CF3-group concentration dependence). This decrease in LPS-injured cells regarding MCP-1 and CXCL-1 levels could not be shown for their non-fluorinated counterparts (same time course, same concentrations). Cytotoxicity could be excluded. Chemotactic response was attenuated by molecules carrying a CF3-group.

Conclusion(s): These results show that the immuno-modulatory effects on epithelial and endothelial cells is not limited to volatile anesthetics, but associated to molecules containing at least one CF3-Group. The effect has been shown for both animal and human cell lines. A hydrophilic pharmaceutical formulation containing molecules having at least one CF3-group may therefore be beneficial for treating patients suffering from an inflammatory process.

References:

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2 De Conno E et al; Anesthesiology 2009 Jun; 110:1316-1326.

9AP1-7

The nitroglycerine-induced nitric oxide release was enhanced by propofol and midazolam not by sevoflurane in rats

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Background and Goal of Study: Previously, we demonstrated that both propofol and sevoflurane anesthesia decreased the extracellular concentration of nitric oxide (NO) products in the rat striatum using in vivo microdialysis study (1). In another experiment, we found that systemic administration of nitroglycerine (NTG), known as NO donor, increased the NO release in the brain. NO is known as an important neurotransmitter in the central nervous system (2). In the current investigation, we studied the effect of propofol, midazolam and sevoflurane anesthesia on the extracellular concentration of NO products modulated by NTG in the rat striatum.

Materials and Methods: Male Sprangue-Dawley rats, weighing 280-320 g, were used. Microdialysis probe was inserted into the right striatum and perfused with modified Ringer solution (2 microl/min) after recovering from the surgery. Samples were collected every 15 min and directly injected into an online analytical HPLC system. The rats were freely moving before anesthesia and after the emergence. After 3 consecutive measurements for determining baseline values, propofol (10, 30 and 100 mg/kg), midazolam (3, 10 and 30 mg/kg) and NTG (2 and 5 mg/kg) were administered, intraperitoneally. Sevoflurane was inhaled at the concentration of 1 and 3% during 45 min.

Results and Discussion: Propofol, midazolam and sevoflurane anesthesia itself decreased NOx in a dose dependent manner. Systemic administration of NTG significantly increased NOx. NTG-induced NO release was enhanced by the low dose propofol (10 and 30 mg/kg) anesthesia, whereas, larger dose of propofol (100mg/kg) administration failed to increase the concentration of NOx. Midazolam anesthesia also showed the same biphasic effect. Whereas, sevoflurane anesthesia (both 1 and 3% inhalation) showed no significant change in NO release induced by NTG.

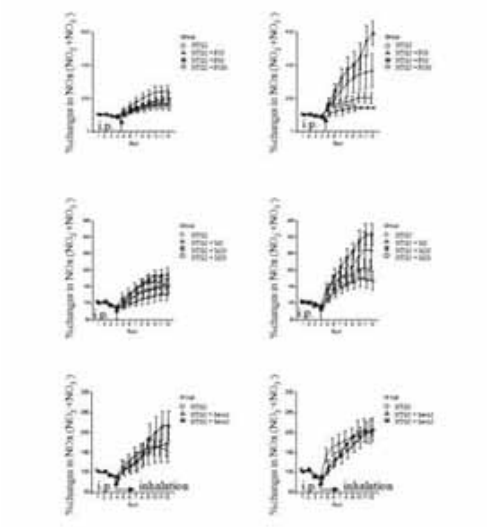

Figure. The effect of propofol (upper), midazolam (middle) and sevoflurane anesthesia (lower) on the nitroglycerine-induced change in the extracellular concentration of NO products. NTG2 and NTG5: nitroglycerine 2 and 5 mg/kg i.p., respectively. P10, P30 and P100: propofol 10, 30 and 100 mg/kg i.p. M3, M10 and M100: midazolam 3, 10 and 30 mg/kg I.p. Sevo1 and Sevo3: 1 and 3% sevoflurane inhalation during 45 min. Data are expressed as mean ± SE.

Conclusion(s): The results of current investigation demonstrated that NTG increased NO release in the rat brain and simultaneous administration of propofol or midazolam showed a biphasic effect on the NTG-induced NO release. This property might be a common property of intravenous anesthetics.

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9AP1-8

Dobutamine prevents apoptosis of cultured jurkat T lymphoma cells by inducing a heat shock protein 70

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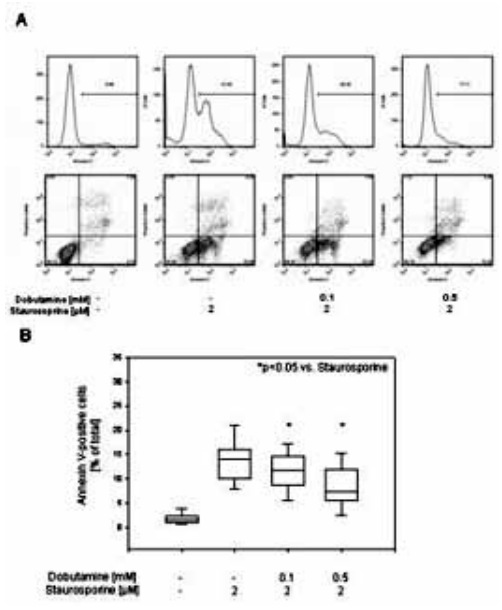
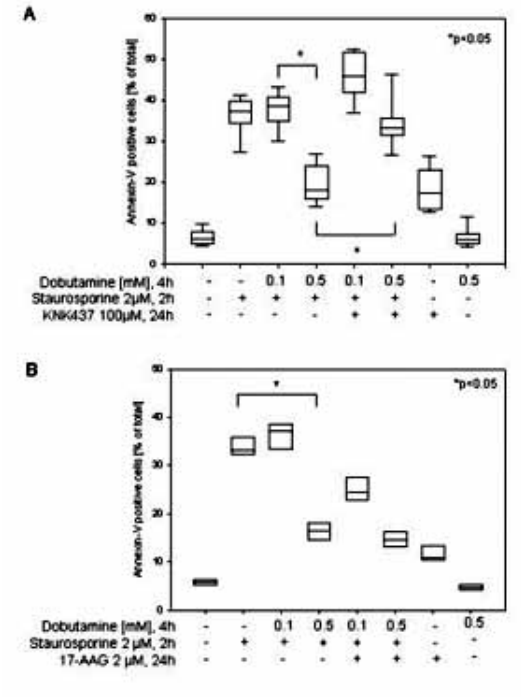
Background and Goal of Study: Dobutamine (D) exhibits cyto-protective effects while applied before subsequent stress (1). D prevents Jurkat T cells from staurosporine (S)-induced apoptosis. The underlying molecular mechanism is unclear. Since D inhibits the activation of nuclear transcripton factor κB (NF- κB) and induces a heat shock response (HSR) (2,3), we hypothesized that the cyto-protective properties of D are mediated via an induction of the HSR.

Materials and Methods: Human Jurkat T cells were treated with D (100 or 500µM, 4h), apoptosis was induced by staurosporine (S [2µM, 2h]) and assessed by flow cytometry after staining with annexin V-FITC and propidium iodide. After pre-treating the cells with KNK437 [100µM, 24h], an inhibitor of Hsp70, or with 17-AAG [2µM, 24h], an inhibitor of hsp90, the cells were treated with D and S under the same conditions. The amount of annexin-V positive cells is shown. Differences were tested with one-way ANOVA on ranks followed by nonparametric Student-Newman-Keuls testing.

Results and Discussion: Treatment with D attenuated dose-dependently the S-induced increase of annexin-V positve cells (see Fig.1). Pre-incubation with KNK437 abolished the anti-apoptotic effect of D significantly (Fig.2a). Pre-incubation with 17-AAG did not abolish the anti-apoptotic effects of D pre-treatment (Fig.2b).





Conclusion(s): Dobutamin exhibits cytoprotective properties. Pre-incubtation with KNK437 abolished D mediated anti-apoptotic properties. In contrats, pre-incubation with 17-AAG does not reduce the anti-apoptotic effect of D. We therefore conclude that the cyto-potective properties of D in vitro are mediated by an induction of Hsp70.

Acknowledgements: This project is supported by the Research Grants Programme of the European Society of Anaesthesiology.

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9AP2-1

Exposure to oral oxycodone is increased by simultaneous inhibition of CYP2D6 and 3A4 pathways, but not by inhibition of CYP2D6 alone

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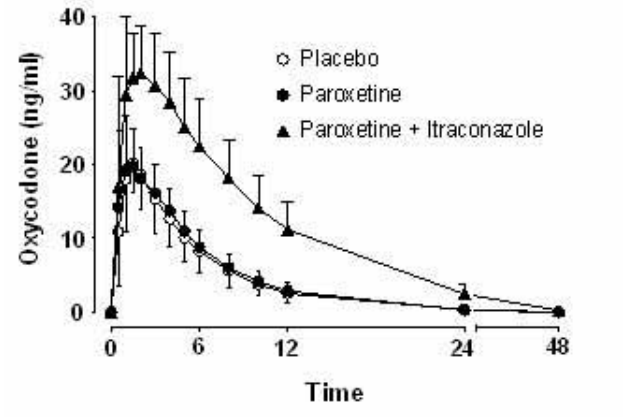
Background and Goal of Study: Oxycodone is an opioid analgesic, which is mainly metabolized by the hepatic cytochrome P450 (CYP) 2D6 and 3A4 isoenzymes. As both of these CYP enzymes can be inhibited by other drugs, the pharmacokinetics of oxycodone is prone to drug interactions. This study was aimed to investigate the effect of the inhibition of CYP2D6 alone with paroxetine or both CYP2D6 and CYP3A4 with paroxetine and itraconazole on the pharmacokinetics of oral oxycodone.

Materials and Methods: We used a three-phase cross-over study design in eleven volunteers. Volunteers were given oxycodone 10 mg orally after pre-treatments with placebo, paroxetine or paroxetine + itraconazole for five days. Plasma concentrations of oxycodone and its oxidative metabolites were measured for 48 h. Drug effects were evaluated by using visual analogue scales and cold pain test. Statistical comparisons were done with ANOVA.

Results and Discussion: The area under plasma concentration-time curve (AUC) values for oxycodone and its metabolites are summarized in Table 1 and Figure 1. Although paroxetine substantially reduced the formation of CYP2D6 dependent metabolite oxymorphone, it had no effect on oxycodone. Paroxetine-itraconazole pre-treatment increased the AUC of oxycodone 2.9-fold (P<0.001). However, only minor changes in opioid action were noted. The formation of secondary metabolite noroxymorphone was ceased when both the CYP2D6 and the CYP3A4 pathways were inhibited.

	Placebo	Paroxetine	Paroxetine+Itraconazole
Oxycodone	7.5 ± 2.4	8.0 ± 1.8	20.8 ± 5.7*
Noroxycodone	7.8 ± 3.2	11.7 ± 3.8*	6.3 ± 1.9
Oxymorphone	0.21 ± 0.17	0.10 ± 0.07†	0.22 ± 0.15
Noroxymorphone	1.6 ± 1.0	0.5 ± 0.5*	0.1 ± 0.2*

Mean ±SD.* P < 0.001,† P<0.05, AUC (µg•min/ml)



Conclusion(s): Since the inhibition of CYP2D6 with paroxetine did not change the exposure to the oral oxycodone, clinically relevant drug interactions with oxycodone and CYP2D6 inhibitors are unlikely. The concomitant inhibition of both CYP2D6 and CYP3A4 results in a profound increase in exposure to oral oxycodone.

9AP2-2

The pivotal role of α7acetylcholine receptors in the resistance to non-depolarizing muscle relaxants during immobilization

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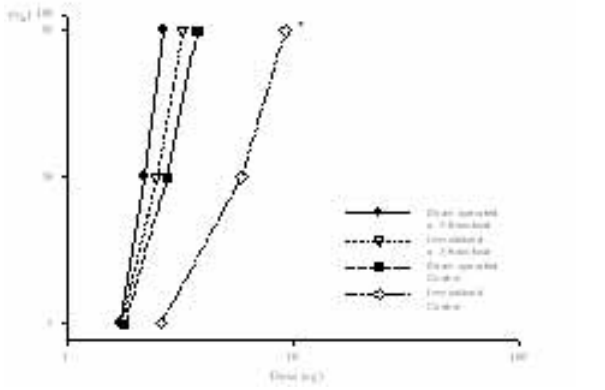
Background and Goal of Study: Three isoforms of the nicotinic acetylcholine receptors have been described in muscle: 2α1βδε, 2α1βδγ and α7AChRs. The mature neuromuscular junction is composed of εεAChRs only. During immobilization, γAChRs and α7AChRs appear in the peri and extrajunctional areas. Immobilization leads to resistance to the NDMRs. We tested the hypothesis that α7AChRs play the pivotal role in the resistance to NDMRs (rocuronium).
Materials and Methods: Male C57BL/6J mice were used for wild type(WT, n=10), and α7KO mice (n=10). In both groups, the left leg was sham operated and the right leg was immobilized by pinning at the knee and ankle joint. Aftert 14 days, the neuromuscular responses to incremental doses of rocuronium, during sciatic nerve stimulation of the tibialis muscle were studied, with the sham immobilized side serving as control. Electrical stimuli of 0.2 msec duration were applied to sciatic nerve at 2 Hz for 2 sec every 30 sec. The percent depression of T1 relative to base-line was transformed to logit scale and the logarithm of the cumulative dose by linear regression analysis to determine the effective dose of rocuronium(5, 50, and 95% twitch depression).
Results and Discussion: The dose-response curve to rocuronium was significantly shifted to right in the immobilized side of WT mice compared to the contralateral side. In contratst, no differences in EDs were observed between the immobilized and contralateral side in the α7KO mice.



The Effective Dose of Rocuronium

	Control mouse		α7 KO mouse	
	sham operated	immobilized	sham operated	immobilized
ED95	3.8 ± 2.9	9.3 ± 5.8*†‡	2.7 ± 0.8	3.3 ± 1.8
ED50	2.8 ± 1.6	5.9 ± 3.0*†‡	2.2 ± 0.5	2.5 ± 1.1
ED5	1.8 ± 0.4	2.6 ± 0.5*†‡	1.7 ± 0.3	1.7 ± 0.4

Values are presented as mean ± SD. *;p<0.02 compared with sham operated control mouse. †; p<0.01 compared with sham operated α7 KO mice. ‡; p<0.01 compared with immobilized α7 KO mice.

Conclusion(s): These results suggest that the α7AChRs which increase during immobilization plays the key role in the resistance to rocuronium in the wild type mice. In the absence of α7KO mice, this resistance is not manifest during the prolonged immobilization because of the α7AChRs.

9AP2-3

In vitro release of bupivacaine from solvent-free biodegradable pellets

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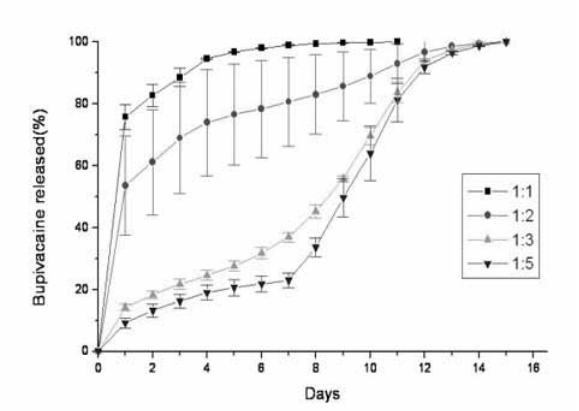
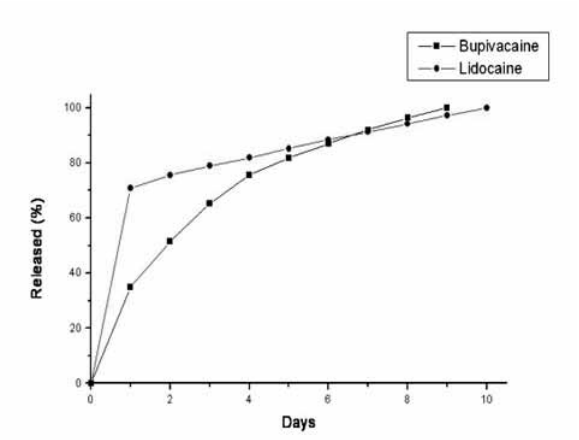
Background and Goal of Study: This study proposes a solvent-free method of manufacturing biodegradable bupivacaine pellets. The final goal of this research was to develop a single-shoot local anesthetics for postoperative pain control.
Materials and Methods: To fabricate a biodegradable pellet, polylactide-polyglycolide (PLGA) copolymers were pre-mixed with bupivacaine with four different ratios (bupivacaine : PLGA = 1:1, 1:2. 1:3, or 1:5). The mixture was then compression molded and sintered to form a pellet with a height of 3 mm and a diameter of 1 mm. An elution method was utilized to characterize the in-vitro release characteristics of the bupivacaine over a 15-day period. The release characteristic of this delivery system was also compared with the result of lidocaine pellets under the same fabrication parameters.
Results and Discussion: The HPLC analysis showed that the pellets can prolong the total effectively release period of bupivacaine from the beads by using lower anesthetic to polymer ratio (1:5). Bupivacaine pellets had slower released rate than lidocaine pellets during the first 5 days.





Conclusion(s): By adopting this hot compressing technique, we will be able to fabricate biodegradable bupivacaine pellets for long-term drug delivery.b

9AP2-5

Propofol attenuates oxidative DNA damage and apoptosis in lymphocytes from patients undergoing surgery and intravenous anaesthesia

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Background and Goal of Study: One study showed absence of genotoxicity of propofol (prop) in white blood cells[1]. Surgery is often associated with a temporary perioperative immunological alteration. Some anaesthetics seem to contribute to an *in vitro* lymphocytopenia, which may be caused by apoptosis, but little is known about this effect with prop. As an antioxidant compound, prop could decrease DNA damage and apoptosis in patients undergoing surgery. This study aimed to evaluate the effects of intravenous anaesthesia with prop on DNA (strand breaks and base oxidation) as depicted by the alkaline comet assay, and whether this anaesthetic could protect against apoptosis in T lymphocytes.
Materials and Methods: The Ethical Committee of the Institution approved the protocol used in the study. All patients answered a questionnaire about their lifestyle, health status and previous exposure to pollutants and signed the informed consent. Patients suffering from any disease, smokers, alcoholics and those who were under medication or received radiation were excluded. The prospective study included 10 female and 10 male adult ASA physical status I patients submitted to othorhinolaryngological surgery, lasting at least 2 h, with intravenous anaesthesia with fentanyl, a target-controlled infusion of prop and rocuronium bromide. Blood samples were collected at three time points: before anaesthesia (T_1), at 120 minutes of surgery (T_2), and at the following day of surgery (T_3). Tail intensity was considered to estimate DNA damage, coded slides

were used and a blind analysis was done. Lymphocytes were phenotyped as $CD4^+$ and $CD8^+$ and stained with Annexin-V and 7-AAD to detect apoptotic cells by flow cytometry.

Results and Discussion: Patients enrolled in the study were young adults (27.5±10.5) with normal body mass index (22.9±3.1). DNA damage and apoptosis were analyzed using the Friedman test. In relation to DNA strand breaks and pyrimidine oxidation, no significant differences were observed among the three time points (P>0.05), but there was a decrease in oxidized purines at T_2 in comparison to T_1 (P=0.009). There was no change in the percentage of apoptosis in $CD8^+$ (T cytotoxic) lymphocytes (P=0.08), however there was a decrease in early apoptosis in $CD4^+$ (T helper) at T_2 and T_3 comparing to T_1 (P=0.01).

Conclusion(s): In conclusion, intravenous anaesthesia with prop protects both oxidative DNA damage and apoptosis in lymphocytes from patients undergoing elective surgery.

Acknowledgements: FAPESP.

Reference:

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9AP2-6

Influence of repeated inhalation anaesthesia on the number of blood cells and serum biochemical parameters of mice

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Background and Goal of Study: The toxicity of inhalation anaesthetics is related to the metabolite rate and highly reactive metabolit products. Study compared the influence of repeated sevoflurane, halothane and isoflurane anaesthesia on the number of peripheral blood cells and biochemical parameters of Swiss albino mice.

Materials and Methods: Study was performed in accordance with the Guidelines for the Care and Use of Laboratory Animals, approved by the Ethical Committee of Medical School. Control, sevoflurane, halothane and isoflurane groups of mice were exposed to repeated anaesthesia 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 50:50. The samples of blood from axillary vein of mice were analysed with standard laboratory methods.

Results and Discussion: Data (mean±SD) are shown in the Table 1.Repeated anaesthesia with halothane induced significant increase (p<0,05) of the rate of mononuclear cells compared with sevoflurane, and serum bilirubin (p<0.005) compared with control group of mice. Activity of liver enzymes were changed, halothane increases AST, ALT and LD levels. Isoflurane increased urea levels after repeated exposure (p<0.05 compared with all groups) but creatinine levels were significantly reduced.

Conclusion(s): Repeated inhalation anaesthesia induced changes in laboratory findings of mice.

9AP3-1

Effect of flumazenil during recovery from sevoflurane/ remifentanil anaesthesia when administered to healthy unpremedicated patients

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Background and Goal of Study: To investigate the hypothesis that 0.3 mg flumazenil administered to healthy unpremedicated patients at the end of deep surgical remifentanil/sevoflurane anaesthesia would precipitate recovery. Flumazenil antagonizes the hypnotic/sedative effects of benzodiazepines on γ-aminobutyric acid (GABA) receptors. However, endogenous benzodiazepine ligands (endozepines) were isolated in mammalian tissues of individuals who had not received benzodiazepines.

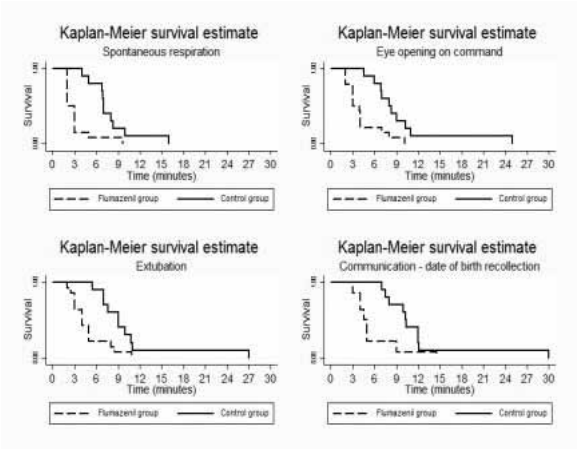
Materials and Methods: Twenty four healthy unpremedicated patients scheduled to receive elective surgery requiring general anaesthesia were randomly allocated to receive either a single dose of 0.3 mg flumazenil (n=14) or placebo (n=10) intravenously at the end of the surgical procedure just before the discontinuation of the volatile anaesthetic. After study drug administration, the authors compared various recovery parameters in the flumazenil and control groups.

Results and Discussion: Time to spontaneous respiration, eye opening on verbal command, extubation and time to date of birth recollection was significantly shorter in the flumazenil group compared to the control group (p<0.05). Moreover, comparison of the Kaplan-Meier survival estimates between the two groups suggested earlier emergence from anaesthesia in the flumazenil group (p<0.001). Flumazenil inhibition of endozepines in patients who had not received benzodiazepines has been proposed in order to elucidate the analeptic role of flumazenil.

Recovery parameters

Time (min) until:	Flumazenil group	Control group	p value*
Spontaneous inspiration	3.12±2.06	7.9±3.29	0.0003
Eye opening on command	4.22±2.45	9.59±5.75	0.0012
Extubation	4.85±2.57	10.39±6.1	0.0015
Date of birth recollection	5.68±3.13	11.92±6.62	0.0012

Data are means± SD. * Mann-Whitney test



Conclusion(s): Administration of a single dose of 0.3 mg flumazenil to healthy unpremedicated patients at the end of sevoflurane/remifentanil anaesthesia results to earlier emergence from anaesthesia and significantly expedites recovery. This could redefine the role of flumazenil in general anaesthesia implicating endozepine-depended mechanisms.

9AP3-2

Intranasal application of xenon – Describing the pharmacokinetic in experimental animals and the increased pain tolerance within a placebo-controlled experimental human study

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Abstract 9AP2-6 – Table 1. Laboratory findings after repeated anaesthesia with inhalation anaesthetics

	Control	Sevoflurane	Halothane	Isoflurane
Erythrocytes (number x1012/L)	9.09±0.77	9.68±0.61	8.29±1.6	8.79±0.87
Hemoglobin (g/L)	126.56±10.76	136.3±7.4	123.2±22.3	127.35±13.42
Leucocytes (number x109 /L)	4.72±1.2	5.46±3.12	3.34±1.64	3.94±2.32
Mononuclear cells (%)	69.61±5.03	65.22±9.01	83.67±11.57#	73±13.96
Polymorphonuclear cells (%)	30.39±5.03	34.78±9.01	16.33±11.56#	27±13.96
Serum bilirubin (μmol/L)	9.07±1.26	10.58±2.69	12.83±1.95*	13.88±4.88
Aspartate aminotransferase (U/L)	144±31.27	144.75±29.74	189±60.34	140.25±34.06α
Alanine aminotransferase (U/L)	42.75±4.63	56.25±6.02	58.5±13.01*	48±6.64
Lactate dehydrogenase (U/L)	2277.75±116.87	2469±442,8	2604.75±1067.43	1135.5±775.55*#α
Urea (mmol/L)	8.85±0.9	7.57±0.9	8.8±2.7	10.95±1.79*#α
Creatinine (μmol/L)	46.72±6.45	18.75±6.02*	30±6.65*	30±10.15*

*p<0.05 compared with Control group, #p<0.05 compared with Sevoflurane group, αp<0.05 compared with Halothane

Background and Goal of Study: Pain sensitizes the central nervous system (CNS) via N-methyl-D-aspartate receptors (NMDAR) leading to an enhancement of pain perception. However, the enhanced responsivness of pain processing areas can be suppressed by sub-anesthetic doses of the NMDAR antagonist xenon. To analyze the strength of the analgesic effect of low dose xenon using new economical application methods, we tested nasally applied xenon in an experimental human pain setting.
Materials and Methods: We tested 10 healthy volunteers using a multimodal experimental pain testing within a randomized double-blind placebo-controlled repeated measures study design. Xenon was administered using a novel low-pressure intranasal application device. Additionally, we measured xenon concentrations in blood samples taken from intracranial veins of experimental animals to describe the pharmacokinetic of intranasal applied xenon in the cerebral compartment.
Results and Discussion: Intranasal application of xenon at a rate of 1.0 L/h for 30 minutes significantly increased pain tolerance of volunteers to ischemic (+128%), cold (+58%), and mechanical (+40%) stimulation. However, 60 minutes after terminating xenon application, no significant alteration of pain tolerance in comparison to placebo could be observed. Cranial blood concentrations of xenon in pigs reached a steady-state of approximately 450 nL/mL after 5 minutes.
Conclusion(s): In this placebo-controlled experimental human study we described the increased pain tolerance induced by intranasally applied xenon. Based on our results we conclude that intranasally administered xenon has analgesic properties and suggest that the novel application-device presented here offers new possibilities for the administration of NMDAR-antagonists within a multimodal analgesia approach.

9AP3-3

Recovery after anesthesia and anesthetic gas consumption with remifentanil combined low flow sevoflurane anesthesia for tympanoplasty surgery

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Background and Goal of Study: Low flow sevoflurane anesthesia and low flow sevoflurane supplemented remifentanil anesthesia were administered to tympanoplasty operations and compared for recovery time, consumption amount of the anesthetic drugs.
Materials and Methods: Fifty ASA I-II patients aged 18 to 65 years were included in the study. Anesthesia induction with thiopental 3-5 mg kg^{-1}, remifentanil 1 µg kg^{-1} and vecuronium 0.1 mg kg^{-1} IV. After intubation, the first group received sevoflurane 1.8 vol % oxygen and nitrous oxide at 4 L min^{-1} and second sevoflurane 1.2 vol % and 0.25 µg kg min^{-1} remifentanil oxygen and nitrous oxide at 4 L. Ten min after intubation; the flow rates decreased to 1 L min^{-1}. Consumption of sevoflurane dose, postoperative recovery characteristics, anesthesia time and duration of surgery were noted. Total amount of remifentanil, analgesic and antiemetic drugs were recorded. Postoperative VAS scores and postoperative nausea/vomiting were assessed.
Results and Discussion: There were no significant differences haemodynamic parameters, tramadol consumption, VAS scores for pain. Early recovery parameters were shorter in the sevoflurane fentanyl group, except for spontaneous respiration time. Sevoflurane consumption was lower in the sevoflurane remifentanil group. Postoperative ondansetron consumption and was higher in the sevoflurane fentanyl group. Bradycardia was observed higher in the sevoflurane fentanyl group. PONV were significantly less in the sevoflurane fentanyl group at the early postoperative period, but there was no statistically difference for the other times.

Table 1. Emergence and Clinical Recovery

Recovery variable (min)	Group S (n=25)	Group SR (n=25)	P value
Eye opening	10 (6-13)	7 (5–9)	0.005
Spontaneous respiration	3 (2-6)	5 (4–6)	0.327
Extubation	6 (5-10)	5 (4–6)	0.009
State name	12 (10-16)	10 (6–13)	0.037
State birth date	13 (10-16)	11 (6–13)	0.033
Postanesthesia recovery score ≥ 9	13 (10-18)	8 (5-13)	0.015

Conclusion(s): Low flow sevoflurane and remifentanil anesthesia regimen in the patients undergoing tympanoplasty operations led to a faster early recovery, decreased sevoflurane consumption. However it should be considered that opioid related adverse events including early postoperative nausea and vomiting are higher, and use of anti emetic drug may be increased.

9AP3-4

Effects of the ABCB1 polymorphisms on the efficacy of ondansetron for postoperative nausea and vomiting

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Background and Goal of Study: Postoperative nausea and vomiting (PONV) is a common and distressing complication in patients undergoing general anesthesia and over 35% of patients treated with ondansetron experience PONV. We hypothesized that the patients with adenosine triphosphate-binding cassette subfamily B member 1 (ABCB1), an encoding gene of transporter for ondansetron in the brain-blood barrier, polymorphisms would have higher disposition of ondansetron in the brain and thereby less complain of PONV. Here, we investigated whether 2677G>T/A and 3435C>T polymorphisms of ABCB1 affect the efficacy of ondansetron to prevent PONV in patients undergoing general anesthesia.
Materials and Methods: One hundred and ninety-eight adult patients undergoing laparoscopic cholecystectomy were enrolled prospectively in this study. After induction of anesthesia, anesthesia was maintained with sevoflurane 1.5-2.0 vol% and remifentanil 0.1-0.2 µ/kg/min. The depth of anesthesia was monitored continuously with a bispectral index score monitor. Thirty minutes before the end of surgery, ondansetron 0.1 mg/kg was administered intravenously. The incidence of PONV was compared between genotypes for two single nucleotide polymorphisms (SNP) in ABCB1 (2677G>T/A, 3435C>T) at first 2 h and 2 h to 24 h after surgery.
Results and Discussion: Frequencies of the ABCB1 2677 GG, GT, GA, TT, TA, and AA genotypes were 21.3%, 34.5%, 16.8%, 13.7%, 10.2%, and 3.6%, respectively. Frequencies of the ABCB1 3435 CC, CT, and TT genotypes were 40.9%, 47.5%, and 11.6%, respectively. The genotype frequencies of all SNPs were in Hardy-Weinberg equilibrium ($P > 0.05$). Among 2677G>T/A variants, the incidence of PONV was lower in patients with 2677TT genotype than other genotypes during the first 2 hr after surgery (TT vs. Non-T vs. One-T, $P = 0.03$; TT vs. Non-TT, $P = 0.01$). For 3435C>T variants, the incidence of PONV was lower in patients with 3435TT genotype than other genotypes during the first 2 hr after surgery (CC vs. CT vs. TT, $P = 0.02$; CC + CT vs. TT, $P = 0.01$). In diplotype analysis, the incidence of PONV was lower in patients with the 2677TT/3435TT genotypes (Non-T/CC vs. One-T/CT vs. TT/TT, $P = 0.005$). There were no significant differences in the incidence of PONV according to genotypes during 2-24 hr after surgery.
Conclusion(s): The response to ondansetron for PONV was significantly influenced by ABCB1 polymorphisms. ABCB1 genotypes may be a clinical predictor of responsiveness for ondansetron.

9AP3-5

Effect of pretreatment for injection pain of microemulsion propofol

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Background and Goal of Study: To investigate the alleviation effect of vein pretreatment and palonosetron/lidocaine combination on microemulsion propofol injection-induced pain.
Materials and Methods: Two hundreds patients scheduled for arthroscopic surgeries were randomly divided into four groups: control group (group I), lidocaine group (group II), palonosetron group (group III) and palonosetron/lidocaine combination group (group IV), with 50 patients in each group. The patients in the above four groups received placebo (5 mL of 0.9% saline), 5 mL lidocaine (20 mg in 0.9% saline), 5 ml palonosetron (0.075 mg in 0.9% saline) and 5 ml palonosetron/lidocaine (0.075 mg pus 20mg in 0.9% saline) intravenously respectively. The patients were injected with one-fourth of scheduled microemulsion propofol (2.0 mg/kg body weight) via a dorsal hand vein after one minute of venous occlusion. The pain during the injection of propofol was evaluated.
Results and Discussion: Pain occurred in 96% of patients in the control group, 76% in the lidocaine group, 46% in the palonosetron group and 36% in the palonosetron/lidocaine combination group. There was a significant reduction in pain incidence in the three experimental groups compared with the control group ($P<0.05$).

Conclusion(s): Pretreatment with palonosetron and palonosetron/lidocaine may be effective in attenuating microemulsion propofol injection pain.

9AP3-6

Early postoperative cognitive recovery with Xenon anaesthesia: Randomized controlled trial

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Background and Goal of Study: Xenon, a N-methyl-D-aspartate antagonist, may be advantageous to reduce postoperative cognitive impairment after general anaesthesia. This randomised control trial was designed to compare early postoperative cognitive recovery after xenon and sevoflurane anaesthesia.

Materials and Methods: After institutional ethical approval, we obtained informed written consent of 60 adult patients, ASA I-II, scheduled for elective surgery with estimated duration between 60 and 360 minutes. Patients were randomized to receive xenon 60% or sevoflurane 1,5 %. Both groups received remifentanyl infusion titrated to clinical needs based on patients' hemodynamics and state entropy (SE) score < 60. Patients on Xenon group received a propofol infusion until they achieved a SE less than 60 points. The primary end-point of the study was the early postoperative cognitive recovery measured by the Short Orientation Memory Concentration Test (SOMCT). The SOMCT is a patient-based test designed to assess cognitive function in terms of level of orientation, memory and concentration. Data were analyzed using ANOVA or Mann-Whitney/ Wilcoxon as appropriate. A p 0,05 was considered statistically significant.

Results and Discussion: State Entropy values were significantly lower in patients receiving xenon anaesthesia than sevoflurane anaesthesia at every time point during surgery. Emergence was significantly faster in the xenon group (3 ± 1 min) compared with patients receiving sevoflurane (8 ± 4 min) (p < 0,001) There were no significant difference in mean preoperative SOMCT values (3 ± 3 on both groups p 0,53). Patients receiving xenon presented significantly lower SOMCT scores at 30 minutes (xenon 3 ± 3, Sevoflurane 7 ± 6) and 60 minutes (xenon 3 ± 3, Sevoflurane 5 ± 4) after extubation.(p 0,003).

Conclusion(s): Patients receiving xenon anaesthesia presented faster awakening and better early postoperative cognitive recovery compared with patients receiving sevoflurane anaesthesia.

9AP3-7

Dexmedetomidine and propofol have a different initial site of action

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Background and Goal of Study: The goal was to study the effects of two different types of anesthetic agents, dexmedetomidine and propofol, on consciousness using increasing drug concentrations and simultaneous measurements of cerebral perfusion.

Materials and Methods: 20 healthy male subjects were recruited and divided into two ten-subject groups to receive either dexmedetomidine or propofol as increasing target controlled infusions. First, individual drug concentrations for loss of consciousness (LOC) were assessed. LOC was tested at 5 min intervals by asking the subjects to open their eyes. LOC was defined as unresponsiveness to the request. Second, cerebral perfusion was assessed at I) baseline, II) 50% of the LOC-concentration, III) 75% of the LOC-concentration (pre-LOC) and IV) LOC-concentration using positron emission tomography (PET) and [^{15}O] H_2O. During the PET session targeted concentration was increased at 10 min intervals. Statistical Parametric Mapping (SPM) was used to pinpoint the cerebral structures most significantly affected by the anesthetic agents.

Results and Discussion: Mean(SD) concentrations at LOC were 3.17(1.15) ng/ml and 1.78(0.55) µg/ml for dexmedetomidine and propofol, respectively. Compared to baseline, dexmedetomidine decreased cerebral perfusion most significantly in the thalamus and brain stem at pre-LOC. At LOC, additional decreases were observed in the cingulate gyrus and parietal cortex. Propofol decreased cerebral perfusion most significantly in the frontal and parietal cortices at pre-LOC when compared to baseline. At LOC, additional decreases were observed in the thalamus, precuneus and the parietal cortex. The sedative (pre-LOC) effect of dexmedetomidine was associated with suppressed activity in the deep structures of the brain thus indirectly supporting the suggested effect of dexmedetomidine on the endogenous sleep pathway[1]. At LOC the suppressive effect of dexmedetomidine spread to cortical regions. Propofol-induced sedative effect was initiated through cortical depression while deep structures were suppressed at LOC-concentration thus supporting results obtained from previous studies[2].

Conclusion(s): The profile for cerebral depression during increasing concentrations seems to be different for dexmedetomidine and propofol: initiating from the deep structures and spreading to the cortex at higher concentrations with dexmedetomidine and the exact opposite with propofol.

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9AP3-8

A comparison of midazolam or dexmedetomidine for the prevention of myoclonic movements and injection pain following etomidate injection

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Background and Goal of Study: Opioids, midazolam and magnesium sulfate can effectively reduce etomidate related myoclonic movements. We designed a placebo-controlled study to investigate the effects of pretreatment with IV midazolam or dexmedetomidine on the incidence and severity of myoclonus and injection pain during induction of anesthesia with etomidate in elective ambulatory patients.

Materials and Methods: The study was approved by the local Ethics Committee. Patients gave their written informed consent. We assessed the effects of midazolam or dexmedetomidine in 150 unpremedicated, ASA physical status I- III patients, aged over 20 years, undergoing elective surgery with general anesthesia. Patients were allocated in a randomized and double-blind fashion to one of three pretreatment groups (*n*= 50 in each group): midazolam (0.1 mg kg $^{-1}$ group M) or dexmedetomidine (i.v dexmedetomidine 1 µg kg^{-1} group D) or saline as plasebo (group P). Patients were observed continuously for occurrence of myoclonus. The intensity of myoclonus was graded on a scale between 0 and 3. Patients were observed continuously by one anesthesiologist who was blinded as to group allocation, and who asked about injection site pain while infusing the etomidate.

Results and Discussion: There were no significant differences among the groups regarding age, weight, height, sex and ASA physical status. Pretreatment with midazolam and dexmedeteomidine reduced the incidence and the severity of myoclonic movements after etomidate induction. (p<0.001). Within 60 s after induction with etomidate, 19 of 51 patients (37%) in the midazolam group, 15 of 50 patients (30%) in the dexmedetomidine group and 46 of 51 patients (90%) in the placebo group developed myoclonic movements. The intensity of myoclonus was graded as mild in 28, moderate in 12, and severe in 6 patient in the placebo group, as mild in 16, moderate in 3 patient in the midazolam group and as mild in 11, moderate in 4 patients in the dexmedetomidine group. Pretreatment with midazolam and dexmedetomidine decreased the severity of pain on injection of etomidate compared to plasebo.

Conclusion(s): We concluded that pretreatment with midazolam and dexmedetomidine reduced etomidate-induced myoclonus and injection pain during anesthesia induction.

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9AP4-1

Time course of neuromuscular effects of rocuronium during desflurane anesthesia in patients with or without renal failure

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Background and Goal of Study: Previous studies of rocuronium in patients with renal failure were performed with isoflurane or propofol as the main anesthetic agent. Thus, the aim of this study was to compare the pharmacodynamics of a bolus dose of rocuronium under desflurane anesthesia in patients with and without renal failure.

Materials and Methods: The neuromuscular effects of rocuronium 0.6 mg/kg under desflurane anesthesia were investigated in 20 patients with renal failure undergoing renal transplantation surgery and in 20 patients with normal renal function. Neuromuscular transmission was monitored using acceleromyography with single stimuli at 0.1 Hz. The onset and 25%, 75%, and 95% twitch recovery times, the recovery of the train-of-four ratio to 70% (TOF70), and the recovery index (25-75%) were recorded.

Results and Discussion: Block onset was similar in the groups. The 25%, 75% and 95% twitch recovery times, the TOF70 time, and the recovery index were found to be prolonged in patients with renal failure compared to those with normal renal function (e.g. TOF70: 123.1 ± 49.1 vs. 68.7 ± 15.5 min) ($P < 0.001$). A very strong association between the time to TOF70 and the diagnostic duration of renal failure was found ($R^2 = 0.79$, $P < 0.001$).

Table 3. Neuromuscular Blocking Properties after Rocuronium (0.6 mg/kg)

Duration (min)	Renal failure group (n = 20)	Normal renal group (n = 20)	P
Onset time	4.1 ± 2.3	3.2 ± 1.2	0.129
Time to 25% recovery	62.1 ± 22.3	41.6 ± 11.3	< 0.001
Time to TOF70	123.1 ± 49.1	68.7 ± 15.5	< 0.001
Recovery index (25% - 75%)	32.8 ± 15.3	14.7 ± 5.2	< 0.001

Values are mean ± SD. TOF70: recovery to a TOF ratio of 70%.

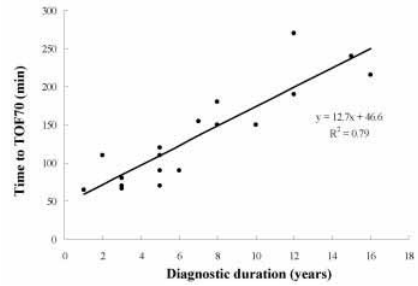

Figure 15 . The linear dependence of the time to TOF70 on the diagnostic duration during neuromuscular blockade caused by rocuronium (0.6 mg/kg) in the patients with renal failure is illustrated. Adjusted: R2 = 0.79, P < 0.001. The individual data points and exponential fitted curve are shown.

Conclusion(s): The duration of action of a bolus dose of 0.6 mg/kg rocuronium under desflurane anesthesia was increased significantly in patients with end-stage renal failure compared to that of healthy controls and was prolonged according to the duration of renal failure.

9AP4-2

Prolonged post-succinylcholine apnea: Biochemical and molecular analysis in two families

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Background and Goal of Study: Patients with pseudocholinesterase variants may exhibit markedly prolonged paralysis that alter the administration of succinylcholine. Identification of BChE variants can be performed by biochemical analysis. However, these tests are not entirely satisfactory. The identification of a single gene locus encoding of BChE have allowed molecular genetic techniques to be used for investigation in these patients.
Materials and Methods: We analyzed the sequence of BChE gene in two patients who suffered a prolonged paralysis after administration of a single dose of succinylcholine, and in their families. The aim was to compare the phenotypic presentation and molecular genetic results in these subjects.
Results and Discussion: In the first patient, a A variant homozygote mutation and K variant homozygote mutation were identified, which was reflected in a BChE levels of 1083 U/L and dibucaine number (DN) of 50. Homozygote K variant and heterozygote A variant mutations were identified in one of her family, which was reflected in a BChE levels of 1914 U/L with a normal DN. In the rest of the family, a heterozygote A variant with heterozygote K variant mutations were identified, which was reflected in normal BChE levels and normal DN. In the second patient, a A variant homozygote mutation and K variant homozygote mutation were identified, which was reflected in a BChE levels of 1278 U/L and DN of 38. Heterozygote K variant and heterozygote A variant were identified in one of her family, which was not reflected in a decreased BChE levels or in dibucaine number. Molecular genetics analyses have shown biochemical methods to be imprecise in determining BChE genotype and in patients with low BChE activity and low D (DN), a compound heterozygous genotype (AX) cannot always be discriminated from AA, even after pedigree analysis.
Conclusion(s): Biochemical methods have shown to be imprecise in determining BChE genotype and diagnoses phenotypic presentation. Molecular genetics analyses are indispensable to identify the exact BChE genotype and phenotype and to prevent future anaesthetics complications in patients are in their families.

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9AP4-3

Effect of intravenous infusion of lidocaine on spontaneous recovery from cisatracurium-induced neuromuscular block: Preliminary results

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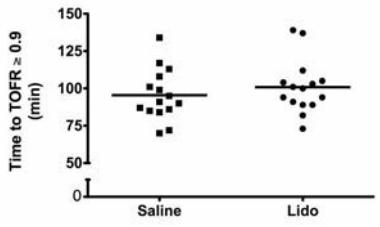
Background and Goal of Study: Intravenous lidocaïne (iv lido) is increasingly used intra-operatively for its analgesic and antihyperalgesic properties. Lidocaïne is also known to alter the response of the acetylcholine receptor at the neuromuscular junction [1]. This study investigates the effect of iv lido on the spontaneous recovery from non-depolarizing neuromuscular block.
Materials and Methods: After IRB approval, 30 adult consenting patients were enrolled in this randomized, double-blind, and placebo-controlled study. Before induction of anaesthesia with propofol and remifentanil infusions, patients were given intravenously either a bolus of lidocaïne 1.5 $mg \bullet kg^{-1}$ followed by a continuous infusion of 2 $mg \bullet kg^{-1} \bullet h^{-1}$ (group lido), or an equal volume of saline (group saline). After loss of consciousness and calibration of the neuromuscular transmission module M-NMT (Datex – Ohmeda, Helsinki, Finland) all of them received a 0.15 $mg \bullet kg^{-1}$ bolus of cisatracurium. They were ventilated with and air/oxygen mixture to keep an end-tidal CO_2 pressure at 35 mmHg. No additional injection of cisatracurium was given intraoperatively. The train of four ratio (TOFR) was measured every 60 seconds. Mean blood pressure, heart rate, nasopharyngeal temperature and end-tidal CO_2 were recorded every 10 minutes. The primary endpoint was the time to spontaneous recovery of a TOFR ≥ 0.9. Averaged data were analyzed using student's t-test. P≤0.05 was considered statistically significant.
Results and Discussion: Patient demographic data, haemodynamic parameters, end-tidal CO_2 pressure and nasopharyngeal temperature were similar between groups. The time to spontaneous recovery of a TOFR ≥ 0.9 was 101±18 min in the lido group and 95±17 min in the saline group (P=0.4, student's t-test). This study had a power of 0.7 to detect a 15 min difference at an 0.05 α level.



Conclusion(s): Intravenous lidocaïne does not affect the spontaneous recovery from cisatracurium neuromuscular block in a clinically relevant manner in this series of patients. Improved power is necessary to confirm these results.
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9AP4-4

Immediate reversal with sugammadex of intense blockade induced with rocuronium versus spontaneous reversal with succinylcholine

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Background and Goal of Study: Sugammadex reverts the effects of rocuronium at any depth of blockade[1,2]. The efficacy and security of intense blockade reversal with sugammadex, three minutes after rocuronium, was compared with spontaneous recovery after succinylcholine.
Materials and Methods: 50 patients anesthetised with propofol TCI and opioids scheduled for elective surgery (age 18-65 years, ASA I-III) who had given written informed consent were included in this parallel, two-groups study (25 per group). Were randomised for receive rocuronium 0.6 $mg.kg^{-1}$ or succinylcholine 1 $mg.kg^{-1}$. Neuromuscular blockade was monitored continuously using

acceleromyography (TOF-Watch SX®), stabilization, calibration and baseline responses were recorded upon anaesthesia induction according to GCRP[3]. Three minutes after rocuronium (intense blockade, no PTC responses) sugammadex 8 mg. kg^{-1} was administered. In the succinylcholine group, spontaneous recovery was recorded. The primary efficacy variable was the time from start of rocuronium or succinylcholine doses, to recovery 90% first response of TOF (T1 90%). Other variables were time to recovery 10% (T1 10%), time from start sugammadex dose to recovery 90% (Sug T1 90%), onset, HR and MAP. Anova and T-test were used, statistical significance was assumed for $p < 0.05$.

Results and Discussion: Mean times to recovery T1 90% and T1 10% were significantly faster in rocuronium+sugammadex group (5.7 and 4.0 min), as compared with the succinylcholine group (11.6 and 7.1 min). Succinylcholine onset was significantly faster compared with rocuronium (1.54 vs 1.97 min). There were no haemodynamic alterations.

Table 1

	Succinylcholine	Rocuronium+sugammadex
Age (years)	53(14)	49(15)
Weight (kg)	77(11)	76(11)
Sex (M/F)	9/16	10/15
Onset (min)	1.5 (0.6)**	1.9 (0.7)
T1 10% (min)	7.1 (1.8)	4.0 (0.3)*
T1 90% (min)	11.6 (2.8)	5.7 (1.0)*
Sug T1 90% (min)		2.7 (0.8)

Mean (Standard Deviation) * p< 0.001. ** p< 0.05

Conclusion(s): Sugammadex 8 mg·kg^{-1} reverts effectively and reliable in less than three minutes the intense blockade induced with rocuronium. Combination rocuronium+sugammadex is much faster in recovery the neuromuscular function than that spontaneously with succinylcholine, and is a reliable and suitable alternative in a non-anticipated difficult airway management in elective surgery.

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9AP4-5

The effect of ondansetron on onset time for neuromuscular blockade of rocuronium

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Background and Goal of Study: $5HT_3$-R(5-hydroxytryptamine type 3 receptor) is structurally similar with nAchR (nicotinic acetylcholine receptor) of muscle. Nicotinic-AchR is blocked by selective $5HT_3$-R antagonist relative to its concentration for muscle relaxation to occur. Animal studies have found that $5HT_3$-R antagonist increases the effect of neuromuscular blockade of rocuronium, a non-depolarizing neuromuscular blocking agent. We have examined whether ondansetron which is often used to prevent nausea and vomiting after surgery affects the onset time of neuromuscular blockade of rocuronium.

Materials and Methods: We enrolled 54 patients, ASA PS I or II of 20 – 60 years old, were randomly allocated into control group(N = 27) and ondansetron group(N = 27) for general anesthesia. The ondansetron group received ondansetron 8 mg IV and the control group received N/S 4ml IV 3 minutes before induction of anesthesia. Anesthesia was induced with fentanyl 2.0μ/kg and propofol 2.5 mg/kg IV. Neuromuscular function was assessed by acceleromyography of the adductor pollicis with a Train of-four (TOF)-Watch SX® monitor (Organon, Oss, the Netherlands). Monitoring was done on the opposite side to intravenous line. Surface electrodes were placed on cleaned skin over the ulnar nerve on the volar side of the wrist. We secured the position of the transducer by placing the thumb in a hand adapter (Hand Adapter®; Organon). The arm was fixed with a board and kept in the same position during the whole study procedure. After induction of anaesthesia and loss of consciousness, the acceleromyograph was calibrated. TOF stimulation was used (supramaximal square wave impulse of 200 μs duration, four stimuli at 2 Hz, 10-s interval). After having obtained stable baseline measurements, a bolus dose of rocuronium 0.6 mg/kg that was diluted by 2 mg/ml was administered intravenously over 3s. And onset time was measured as the time in seconds from the start of injection of rocuronium until 0 of the TOF count.

Results and Discussion: There was no difference in age, sex, weight, dose of fentanyl and propofol between each groups.The average of onset time of the ondansetron group was 148.09 ± 63.69 seconds and slightly faster compared with those of the control group(122.15 ± 50.10 seconds) but, there is insignificance statistically between the ondansetron group and the control group. (P = 0.2012).

Conclusion(s): Administration of ondansetron 8 mg IV during induction did not clinically affect the onset time of neuromuscular blockade of rocuronium.

9AP4-6

Evaluation of the reversal of neuromuscular blockade induced by rocuronium under inhaled anaesthesia

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Background and Goal of Study: Sugammadex is a novel modified gamma cyclodextrin with the ability to reverse steroidal neuromuscular blockade by direct encapsulation. This study aimed to evaluate the efficacy and safety of sugammadex to reverse rocuronium-induced neuromuscular blockade under inhaled anaesthesia.

Materials and Methods: A randomized, double-blind clinical study of 36 patients ASA 1-3, aged between 20 and 69, scheduled for elective surgery, was performed. Patients with impaired renal or hepatic function were excluded. Anaesthesia was induced with fentanyl, propofol 2 mg/kg and rocuronium 0,6 mg/kg. Neuromuscular blockade was monitored using acceleromyography. After randomization, maintenance of anaesthesia was performed with either desflurane (group A, n=18) or sevoflurane (group B, n=18) (MAC 1). Patients in both groups also received supplemental bolus doses of rocuronium (0,15 mg/kg) at the discretion of the anaesthetists, in order to achieve zero response to train-of-four. At the end of surgery, patients received sugammadex at a dosage of 2mg/kg on reappearance of second twitch (T2) of train-of-four 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 (secondary measures). Results are reported as mean [SD]. Data were evaluated by t-test. Differences were considered significant if p<0,05.

Results and Discussion: Although time to recovery was shorter for the desflurane (group A) than for the sevoflurane group (group B) (89,44 [51,53] seconds, and 122,79 [72,36] seconds respectively), the difference was not statistically significant (p=0,121). No difference was recorded between the groups with respect to the values of the systolic blood pressure (146,10 [14,10] mmHg for group A and 148,77 [14,68] mmHg for group B, p=0,982) as well as of the diastolic blood pressure (85,1 [10,38] mmHg and 84,0 [9,04] respectively, p=0,946). There was no statistical significant difference between groups with regard to the heart rate (74,0 [9,5] bpm for group A and 78,0 [10,7] bpm for group B, p=0,265). No signs of recurization or treatment-related adverse effects were observed.

Conclusion(s): A single dose of sugammadex is safe, effective, and well-tolerated under inhaled anaesthesia. The reversal time of sugammadex is unaffected by the interaction between inhaled anaesthetics and neuromuscular blocking agents.

9AP4-7

Priming technique can alleviate the withdrawal responses associated with intravenous administration of rocuronium

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Background and Goal of Study: Intravenous injection of rocuronium is associated with withdrawal responses which are attributable to the pain from the injection of rocuronium. Several methods have been proposed to abolish and attenuate rocuronium-induced pain. We hypothesized priming dose of rocuronium could reduce withdrawal responses associated with administering a second large dose of rocuronium for tracheal intubation. We compared the efficacy of the priming dose technique of rocuronium with intravenous lidocaine as a pre-treatment for the prevention of withdrawal responses associated with rocuronium injection.

Materials and Methods: We recruited 150 patients aged between 18 and 60 years, ASA physical status 1 or 2, who were going to undergo elective surgery requiring general anesthesia. Patients were allocated into three groups. Group C received normal saline, Group L received lidocaine 1 mg/kg, and Group P received rocuronium 0.06 mg/kg 2 minutes before administering a second large dose of rocuronium for tracheal intubation. After the loss of consciousness, rocuronium 0.6 mg/kg was administered intravenously over 10 seconds for tracheal intubation. The withdrawal responses to the injection of rocuronium were evaluated.

Results and Discussion: The incidence of withdrawal responses associated with rocuronium injection for tracheal intubation was 56%, 50%, 24% in group C, group L, and group P, respectively. The incidence of withdrawal responses was lower in group P than group C and group L, but there was no difference between group L and group C.

Conclusion(s): Priming dose technique is a useful clinical method to alleviate withdrawal responses associated with rocuronium injection.

9AP4-8

Effective dose 50 of sugammadex required to reverse neuromuscular block at a train-of-four count of four

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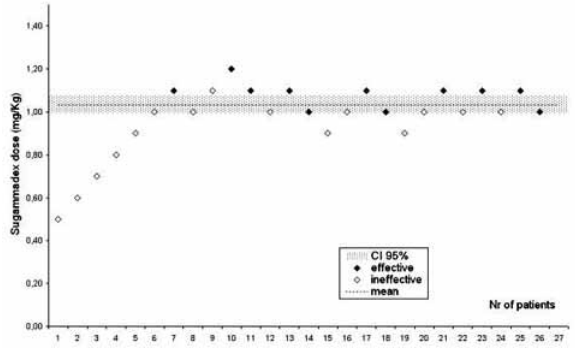
Background and Goal of Study: The dose of sugammadex required to reverse the level of neuromuscular block at a train-of-four count of four is not known. We measured the effective dose 50 (ED50) of sugammadex required to reverse this depth of neuromuscular block using the Dixon Massay up-and-down method (1).

Materials and Methods: After anesthesia induction with propofol and fentanyl, 40 healthy women aged between 30 and 65 years old, scheduled for abdominal hysterectomy were randomized to receive a single bolus dose of rocuronium 0.6 mg/kg, followed by maintenance doses (rocuronium 0.15 mg/kg) as needed. Neuromuscular blockade was monitored using acceleromyography. After the last dose of rocuronium, at train-of-four count of four, a single bolus dose of sugammadex was administered. The primary efficacy variable was the recovery of T_4/T_1 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 T_4/T_1 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.

Results and Discussion: The results are demonstrated in Figure 1. The ED50 of sugammadex to reverse a light level of neuromuscular block was calculated as 1.03 mg/Kg with SD 0.06 mg/Kg, SE 0.02 mg/Kg and Confidence Interval (CI) 95% 0.99-1.07 mg/Kg. A dose of 1.1 mg/Kg reversed train-of-four count of four to T_4/T_1 ratio >0.9 in 5 min in 87.5% of our patients, who received this dose. There were no serious adverse effects related to study treatments.



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 is 1.03 mg/Kg. Pharmacoeconomical cost benefit analysis should be performed.

Reference:

1 Dixon WJ, Massey FJ. Introduction to statistical analysis. 4th ed. New York: McGraw-Hill, 1983; 426-41.

9AP4-9

Pre-treatment with flucloxacillin does not affect the sugammadex-induced recovery from vecuronium-induced neuromuscular blockade in the rat

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Background and Goal of Study: Using an experimental protocol to detect high affinity binding to sugammadex, isothermal titration microcalorimetry experiments have shown that flucloxacillin has a moderate affinity for sugammadex (K_A value: 0.052 megaM^{-1}). K_A of vecuronium for sugammadex is 10 megaM^{-1}. Since flucloxacillin can be used at high therapeutic concentrations, this agent might interfere with the complexation between a steroidal neuromuscular blocking agent and sugammadex. The aim of this study was to determine whether pre-treatment of rats with flucloxacillin affects the ability of sugammadex to reverse vecuronium-induced neuromuscular blockade (NMB).

Materials and Methods: Male Sprague-Dawley rats were anaesthetised with pentobarbitone and artificially ventilated. Carotid artery and jugular vein catheters allowed administration of drugs, blood sampling and blood pressure measurements. Single twitch stimulation of the sciatic nerve resulted in M. gastrocnemius contractions. After steady-state muscle contractions were obtained, animals received a 10 min infusion (0.2 ml/min) of either saline or flucloxacillin (3 mg/kg/min), followed by an intravenous $3xED_{90}$ bolus dose of vecuronium (1.26 µmol/kg). One minute after complete NMB was obtained, the animals received 1 µmol/kg sugammadex, and recovery of neuromuscular function was subsequently monitored.

Results and Discussion: Neither saline nor flucloxacillin infusion had any effect on twitch height. No difference in the onset and depth of vecuronium-induced NMB was observed between the two groups. Sugammadex produced a similar rapid and effective recovery in both groups (Table).

	Pre-treatment	
	Saline (n=6)	Flucloxacillin (n=6)
Recovery parameter (min)		
Time to 25% recovery of baseline twitch height	0.6±0.1	0.7±0.1
Time to 50% recovery of baseline twitch height	0.9±0.1	1.2±0.2
Time to 75% recovery of baseline twitch height	1.5±0.1	2.1±0.4
Time to 90% recovery of baseline twitch height	2.2±0.3	2.7±0.5
Recovery index†	0.9±0.1	1.5±0.4
Maximum recovery		
Maximum recovery (%) observed	98.2±0.9	101.0±0.6*
Time to maximum recovery (min)	3.4±0.3	3.8±0.7

Values are means ± standard error of the mean (SEM). †Recovery index=time between 25 and 75% recovery (min). *Significantly different ($p < 0.05$ level; unpaired t-test)

Conclusion(s): Pre-treatment with flucloxacillin does not interfere with the ability of sugammadex to cause rapid and complete reversal of vecuronium-induced NMB in the rat.

9AP4-10

Effect of flucloxacillin on mouse hemi-diaphragm contractions after sub-optimal reversal of vecuronium-induced neuromuscular blockade with sugammadex

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Background and Goal of Study: After sub-optimal reversal of neuromuscular blockade (NMB) with low dose sugammadex, administration of a sufficient concentration of an agent with moderate or high affinity for sugammadex may result in re-occurrence of NMB by displacement of the neuromuscular blocking agent from its complex with sugammadex. Flucloxacillin has a moderate affinity for sugammadex (K_A value: 0.052 megaM^{-1}), but is used at high therapeutic doses; by comparison, vecuronium has a high affinity for sugammadex (K_A value: 10 megaM^{-1}). After an intravenous dose of 2 g flucloxacillin, the peak plasma concentration is 339 µM in humans, of which 96% is protein bound[1]. This study aimed to determine the concentration of flucloxacillin required to cause re-occurrence of NMB *in vitro* after sub-optimal reversal with sugammadex.

Materials and Methods: Hemi-diaphragms of 4 male mice were placed in tissue baths containing a buffer solution, bubbled with a mixture of 5% CO_2 and 95% O_2, and kept at a constant temperature of 37°C. Train-of-four (TOF) electrical stimulation of the phrenic nerve was applied to induce contractions. Preliminary experiments showed that flucloxacillin (10-1000 µM) had no direct effect on twitch height and that pre-treatment with 100 µM flucloxacillin had no effect on the potency and efficacy of vecuronium. After induction of complete NMB with a single administration of vecuronium (1.5 µM), sugammadex was added in a cumulative fashion until sub-optimal reversal (~85% of the first twitch of the TOF [T_1]) was obtained. This was followed by cumulative administration of flucloxacillin (10-1000 µM).

Results and Discussion: After vecuronium-induced NMB, a concentration of 1.7 µM sugammadex resulted in a recovery of T_1 and the fourth twitch of the TOF (T_4) to 85.9±6.9 % and 46.0±9.8% of baseline values, respectively (mean ± standard error of the mean [SEM]; n=4). Subsequent administration of 10, 30, 100 and 300 µM flucloxacillin did not cause a significant change in twitch height of T_1 and T_4. Re-occurrence of NMB was only observed at a concentration of 1000 µM flucloxacillin: mean ± SEM T_1 and T_4 decreased to 40.8±10.7 and 3.1±1.8 % of baseline values, respectively.

Conclusion(s): Administration of flucloxacillin after suboptimal reversal of vecuronium-induced NMB of mouse hemi-diaphragm contractions does not result in re-occurrence of NMB within therapeutic plasma concentrations of flucloxacillin, supporting clinical data[2].

Reference:

1 Bergan T et al. *Antimicrob Agents Chemother.* 1986;30:729-732. #2. de Kam et al. *Anesthesiology.* 2009;111:A429.

9AP5-1

A priming dose of fentanyl does not reduce fentanyl-induced cough

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Background and Goal of Study: Reflex cough after the delivery of an IV bolus of fentanyl is often observed during anesthesia induction. The aim of this study was to evaluate the effect of a priming dose of fentanyl on fentanyl-induced cough.

Materials and Methods: We studied 478 ASA class I–II patients aged 18–75 years and weighing 40–80 kg who were scheduled for elective surgery. We randomized the patients into four groups. All patients received 2 μg/kg fentanyl via a peripheral intravenous cannula placed on the forearm. Patients in Group I received bolus fentanyl injection over 3–5 s, whereas patients in Groups 2, 3, and 4 were injected with a 1/4 priming dose of fentanyl, which was followed by a 3/4 dose after 1, 2, and 3 min. The time of onset, incidence, and severity of the reflex cough were observed.

Results and Discussion: The incidence of the fentanyl-induced cough was 17, 11, 15, and 14% in the four groups, with no significant differences among the groups. The severity of the cough was similar among the groups, and the time of onset of the cough was 23 s after injection.

Table 1. Patient characteristics.

	Group 1 (n= 158)	Group 2 (n= 125)	Group 3 (n= 105)	Group 4 (n= 90)
Age (yr)	46.3 ± 14.5	46.0 ± 13.1	45.1 ± 13.4	44.0 ± 13.7
Gender M/F	83/75	52/73	47/58	49/41
Weight (kg)	62.3 ± 9.4	61.8 ± 9.0	64.2 ± 9.1	61.9 ± 8.3
Smoking status				
Never	88 (55.7%)	74 (59.2%)	57 (54.3%)	37 (41.1%)
Former	14 (8.9%)	16 (12.8%)	11 (10.5%)	21 (23.3%)
Current	56 (35.4%)	35 (28%)	37 (35.2%)	32 (35.6%)

Data are mean SD or number of patients (proportion). Current smokers = those still smoking; Former smokers = patients who had stopped smoking for more than 6 mo before being included in the study; Never smokers = patients who had never smoked.

Table 2. Incidence and severity of cough among the groups.

	No cough	Cough	Severity of cough		
			Mild	Moderate	Severe
Group 1 (n= 158)	131 (82.9%)	27 (17.1%)	13 (48.1%)	7 (25.9%)	7 (25.9%)
Group 2 (n= 125)	111 (88.8%)	14 (11.2%)	11 (78.6%)	1 (7.1%)	2 (14.3%)
Group 3 (n=105)	89 (84.8%)	16 (15.2%)	14 (87.5%)	1 (6.3%)	1 (6.3%)
Group 4 (n=90)	77 (85.6%)	13 (14.4%)	9 (69.2%)	4 (30.8%)	0

Data are number of patients (proportion). Severity of cough (number of coughs observed in one minute): mild (1-2), moderate (3-4), severe (5 or >5). P = not significant between groups.

Conclusion(s): The delivery of a priming dose of fentanyl before bolus injection did not decrease the incidence and severity of fentanyl-induced cough.

9AP5-2

Oxycodone concentrations are greatly increased after grapefruit juice

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Background and Goal of Study: Grapefruit juice (GFJ) interacts with many drugs by inhibiting CYP3A enzyme or transporter proteins. Oxycodone is an opioid, which is predominantly metabolized by CYP3A (1). This study was aimed to investigate the effect of repeated intake of GFJ on the pharmacokinetics and pharmacodynamics of oral oxycodone.

Materials and Methods: A randomized, crossover study design was used. 12 healthy volunteers ingested 200 ml GFJ or water t.i.d. for 5 days. Oral oxycodone hydrochloride 10 mg was administered on day 4. Oxycodone, noroxycodone, oxymorphone and noroxymorphone concentrations were measured for 48 hours and pharmacokinetic parameters were calculated by standard methods. Behavioural and analgesic effects were recorded for 12 hours. Student's t-test and Wilcoxon signed rank test were used for statistical analysis.

Results and Discussion: Oxycodone (mean±SEM) plasma concentrations are shown in Figure 1. After GFJ, the peak concentration of oxycodone increased from 18.9±4.7 to 26.8±4.0 ng/ml (P<0.001) and the area under plasma concentration-time curve from 7.3±2.1 to 11.8±2.7 μg·min/ml (P<0.001). The formation of noroxymorphone decreased from 1.02±0.38 to 0.56±0.22 (P<0.001) as assessed by the metabolite-to-parent drug area under plasma concentration-time curve ratio. During GFJ, the deteriorating effect of oxycodone on self-rated performance increased significantly (P<0.05). The observed changes are in agreement with the known effects of GFJ on CYP3A activity.

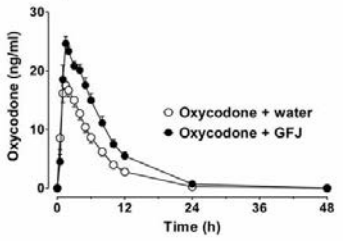

Figure 1. Oxycodone plasma concentrations after administration of oral oxycodone hydrochloride 10 mg and grapefruit juice or water 200 ml t.i.d. for 5 days in 12 healthy volunteers.

Conclusion(s): GFJ significantly inhibited the metabolism of oxycodone and increased its concentrations. These changes were accompanied by small increase in the pharmacologic response to oxycodone. GFJ may increase the plasma concentrations and clinical effects of oxycodone.

Reference:

1 Lalovic B, Phillips B, Risler LL et al. Quantitative contribution of CYP2D6 and CYP3A to oxycodone metabolism in human liver and intestinal microsomes. Drug Metab Dispos. 2004;32:447-54.

9AP5-4

Bioavailability of dexmedetomidine after intranasal administration in healthy subjects

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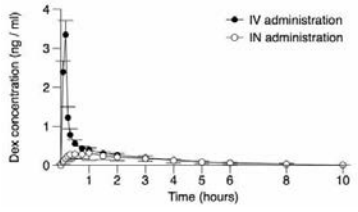
Background and Goal of Study: Although intranasal (in) dexmedetomidine has been used for premedication in children (1), its in pharmacokinetics has not been studied. We have studied the comparative in and intravenous (iv) pharmacokinetics and pharmacodynamics of dexmedetomidine in healthy volunteers.

Materials and Methods: We used a two-period, cross-over study design in seven male volunteers (age 18-24 yr, weight 60-86 kg). 100 μg of dexmedetomidine hydrochloride was administered either in or iv (10-min infusion). Dexmedetomidine concentrations were measured up to 10 h and effects (Bispectral index, heart rate, subjective drug effect, performance and alertness) up to 3 h. Pharmacokinetic parameters were calculated with noncompartmental methods and statistical comparisons were done with the Wilcoxon signed rank test.

Results and Discussion: Dexmedetomidine concentrations are shown in Figure. Peak plasma concentrations (mean ± SD) were 0.35 ± 0.19 and 3.35 ± 0.36 ng/ml and median (range) peak times 30 (15-60) and 10 (10-10) min after in and iv administration, respectively. The corresponding elimination half-lives were 124 ± 18 and 115 ± 19 min and areas under plasma concentration-time curves 71 ± 33 and 119 ± 16 min·ng/ml. The mean absolute bioavailability of in dexmedetomidine was 59% but the individual values greatly varied (range 21-93%). The tolerability of in dexmedetomidine was good. The areas under the effect-time curves were similar during both study phases but the areas under effect-time curves for the initial 0-30 min period were smaller after in administration of dexmedetomidine.



Conclusion(s): The mean bioavailability of intranasal dexmedetomidine is good, but the intraindividual variation makes the effect somewhat unpredictable. The onset of the action of dexmedetomidine is slower after intranasal than after intravenous administration.

Reference:

1 Yuen V, Hui T, Irwin M, et al. Anesth Analg 2008;106:1715-21.

9AP5-5

Paracetamol pharmacokinetics in critically ill trauma patients

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Background and Goal of Study: Since parenteral formulation of paracetamol was developed this drug is frequently used as an adjuvant of opioids analgesics in acute pain control. However, pharmacokinetic behavior of paracetamol has not been characterized in critically ill patients. Goal: to describe the predose concentrations (Cmin) and pharmacokinetic parameters of paracetamol in critically ill trauma patients.

Materials and Methods: This work was approved by the Ethics and Clinical Research Committee. Adult trauma patients admitted to our Intensive Care Unit and treated with paracetamol 1g/6h were included. After the administration of at least four doses of paracetamol, eleven blood samples were obtained during the 6h-interval between two consecutive doses to build the concentration-time curve. Pharmacokinetics parameters of paracetamol were calulated as follow: Area under the curve (AUC) was calculated by the trapezoidal method. Elimination constant (Ke) was calculated by nonlinear regression. Elimination half life (t1/2): ln 2 / Ke Plasma clearance (Clp): Dose / AUC Distribution volume (Vd): Clpp / Ke.

Results and Discussion: Twenty one curves were performed among the 21 patients included (14 males; age 48.1±20.6 years; weight 77.9±13.3 kg; APACHE II score 17.5±6.8. Blood samples were obtained after 8.7±3.3 doses of paracetamol were administered. Compared with the reference range of therapeutic plasmatic concentrations of 10-20 µg/mL, mean Cmin were very low (1.6±1.9µg/mL) and even 8 out of them were below the detection limit of the technique (0.2 µg/mL). Compared with normal reference values (NRV) for pharmacokinetics parameters, paracetamol showed shorter elimination half life, higher plasma clearance and, surprisingly, reduced volume of distribution. Analgesia was not evaluated but, even so, these results strongly suggest that the standard dose regimen of paracetamol of 1g/6h would be ineffective in critically ill trauma patients. Ke (min^{-1}) = 0.013±0.007 (0.005-0.033); NRV = 0.005-0.006 min^{-1} $T_{1/2}$ (min) = 73±39 (21-144); NRV = 120-180 min Clp (mL/min) = 490±252 (215-1175); NRV = 280-350 mL/min Vd (L) = 43.2±9.1 (10-61); NRV = 69-75 L

Conclusion(s): From a pharmacokinetic point of view standard dosage regimen of paracetamol (1g/6h) seems clearly ineffective in critically ill trauma patients, probably due to augmented elimination processes. In our opinion, a new therapeutic regimen of paracetamol is needed.

Reference:

1 Forrest JAH, Clements JA, Prescott LF. Clinical pharmacokinetics of paracetamol. Clin Pharmacokinet 1982;7:93-107.

9AP5-6

Plasma concentrations of intravenous oxycodone are greatly increased in the elderly

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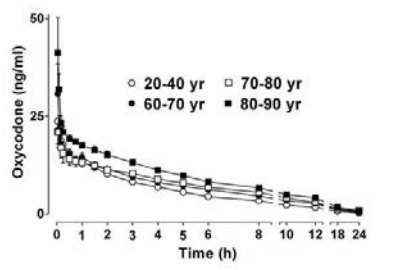
Background and Goal of Study: Global use of oxycodone has increased by several-fold during the past decade, including elderly patients (1). As the pharmacokinetic data available for oxycodone are mainly from subjects under the age of 70 years, we performed this study to assess the pharmacokinetics of intravenous oxycodone in high-aged patients.

Materials and Methods: We recruited 10 orthopaedic patients to each of the following four groups: patients aged 20-40, 60-70, 70-80, and 80-90 years. The youngest patients were scheduled for arthroscopic anterior cruciate ligament surgery of the knee and the older patients for elective knee prosthesis surgery. Patients with significant hepatic or renal diseases or a body mass index > 35 were excluded. After surgery under regional anaesthesia, 5 mg of intravenous oxycodone hydrochloride was administered in the recovery room immediately for postoperative pain management. Thereafter pain was treated with other methods. Oxycodone, noroxycodone, oxymorphone and noroxymorphone concentrations were measured for 24 h and pharmacokinetic parameters were calculated by standard methods.

Results and Discussion: The youngest and oldest groups differed significantly from the others in many respects. On the basis of ASA class the youngest group was healthier than the others (P<0.05). There was an overrepresentation of females (P<0.05) in the oldest group as compared to the other groups and this was also reflected in smaller mean (± SD) weight (68 ± 8 kg as compared to mean weights exceeding 80 kg in all other groups). Oxycodone plasma concentrations (mean ± SEM) are shown in the Figure. In the oldest group oxycodone clearance was 44% and volume of distribution at steady-state 29% smaller than in the youngest group. As a results, the exposure to oxycodone was increased by 80% (P<0.01) in the oldest patients as compared to the youngest.



Conclusion(s): Because oxycodone pharmacokinetics depend to a great extent on the age of the subject, it is important to titrate the analgesic dose individually, particulary in the elderly.

Reference:

1 Rischitelli DG, Karbowicz SH. Safety and efficacy of controlled-release oxycodone: a systematic literature review. Pharmacotherapy 2002;22:898-904.

9AP5-7

Comparison of two types of sufentanil administration during induction on the cardiovascular response to laryngoscopy and intubation

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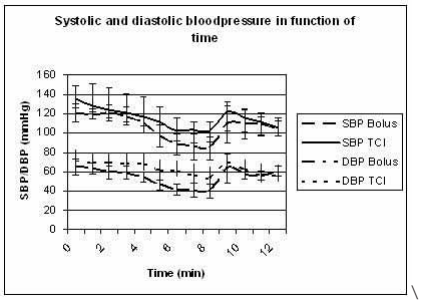
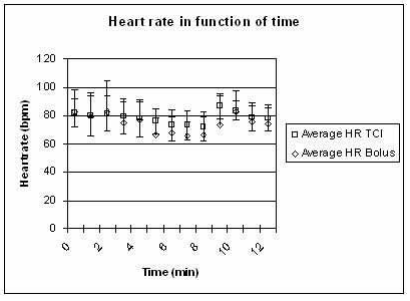
Background and Goal of Study: Sufentanil used during induction of anesthesia to suppress cardiovascular response to laryngoscopy (LAR) and intubation (INT) can be administered by a target controlled effect site (TCEC) pump. It is also possible to calculate an bolus dose sufentanil needed to reach a desired effect site concentration (EC) using volume of distribution at time to peak effect (loading dose = desired concentration x Vdpeakeffect). In this study we compare the effect of a TCI EC infusion and a bolus dose of sufentanil on induction of anesthesia and hemodynamical response to LAR and INT.

Materials and Methods: 19 ASA I-II patients were allocated randomly to receive a sufentanil bolus calculated to achieve a desired concentration of 0.6 ng/ml or TCEC infusion using the pharmacokinetic model of Gepts. In all patients a TCI of propofol at 4 µg/ml was started 3 minutes later. SBP, DBP, HR and BIS values were continuously monitored. When loss of consciousness (LOC) was achieved the time to LOC and the corresponding EC of propofol were recorded. Cis-atracurium was administered and LAR and INT where performed 8 minutes after start sufentanil administration.





Results and Discussion: The patient characteristics did not differ among the two groups. BP and HR decrease after induction in both groups, but this decrease was more pronounced in the bolus group. There was no significant difference in time to LOC between the two groups (59 ± 9 sec bolus group vs 64 ± 8 sec TCI group). The BP increased in both groups after LAR and

INT, but not above baseline value. This increase was more pronounced in the bolus group. The total amount of sufentanil administered at the time of INT was greater in the bolus group than in the TCI group (41.7 ± 3.5 vs 34.4 ± 3.4 µg).
Conclusion(s): Administration of sufentanil by a TCEC infusion seems to provide more hemodynamic stability during LAR and INT.
Reference:
1 Gepts E et al. Anesthesiology 1995;83:1194.

9AP5-8

Effect of clonidine on propofol and remifentanil TCI titrated as a function of PRST score, BIS, and the A-line ARX index (AAI) in morbidly obese patients during laparoscopic gastric by-pass

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Background and Goal of Study: Intravenous clonidine reduces intraoperative requirements of anaesthetic agents, which is particularly welcome in morbidly obese patients. Mechanisms of this sparing effects remain controversial : haemodynamic control vs. direct anaesthetic effect.1We investigated the effects of clonidine on propofol (PROP) and remifentanil (REMI) requirements in morbidly obese patients during laparoscopic gastric by-pass (LGBP) using PRST score, BIS, and A-line ARX index (AAI)2.
Materials and Methods: After IRB approval and informed consent 34 morbidly obese patients scheduled for LGBP were included in this study. Anaesthesia consisted of PROP and REMI TCI. Before the induction of anaesthesia patients were randomly allocated in two groups: Clonidine 4 g/kg of IBW in 10 min then 2 g/kg/h during 1 h or Saline. PROP is titrated to keep BIS around 50, and REMI to maintain PRST < 3 and AAI < 30. PRST, BIS, AAI, and the effect site concentrations of PROP and REMI were recorded at skin incision (T1), entero-enteral anastomosis (T2), gastric stapling (T3), gastro-intestinal anastomosis (T4). Data (mean ± SD) were analyzed using ANOVA. P≤0.05 = statistically different.
Results and Discussion: Demographic data, PRST scores, BIS, AAI, and haemodynamics were similar in both groups. Effect site concentrations of PROP [table 1] and REMI [table 2] were significantly less in clonidine group (respectively P=0.029 et P=0.05).

Table 1. Effect of Clonidine on Propofol requirements

	Incision	Entero-enteral anastomosis	Gastric stapling	Gastrointestinal anastomosis
clonidine	2.1±0.4*	1.8±0.5*	1.7±0.4*	1.6±0.6*
saline	3.4±0.4	2.8±0.3	2.8±0.4	2.7±0.2

Data = effect site concentrations of Propofol (mean ± SD (µg/ml)); * P≤0.05 as compared to saline

Table 2. Effect of Clonidine on Remifentanil requirements

	Incision	Entero-enteral anastomosis	Gastric stapling	Gastrointestinal anastomosis
Clonidine	3.1±0.4*	1.7±0.3*	1.6±0.3*	1.4±0.4*
Saline	3.7±0.3	3.1±0.2	2.7±0.2	2.8±0.3

data = effect site concentrations of remifentanil (mean ± SD (ng/ml)); * = P≤0.05 as compared to saline

Conclusion(s): This study demonstrate that Clonidine decreases PROP and REMI requirements by a hypnotic and analgesic effects. These sparing effects are independent on haemodynamic properties of clonidine.
References:
1 Wallace A. Curr Opinion Anaesthesiol 2006; 19:411-17.
2 Bonhomme V. et coll., BJA 2006; 96:353-60.

Paediatric Anaesthesia and Intensive Care

10AP1-1

Sevoflurane based volatile induction/maintenance anesthesia for rigid bronchoscopy for tracheal or bronchial foreign body removal: A better choice than propofol-remifentanil intravenous anesthesia

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Background and Goal of Study: This study was designed to compare induction, maitanence, and recovery characteristics of sevoflurane volatile induction/maintenance anesthesia(VIMA) and propofol-remifentanil total intravenous anesthesia(TIVA) for rigid bronchoscopy for tracheobronchial foreign bodies removal in children.
Materials and Methods: Sixty-four children(age of 1~4 years) were allocated randomly to receive sevoflurane(Group VIMA;n=32) or propofol-remifentanil(Group TIVA;n=32). Respiratory rate(RR),heart rate(HR),and mean blood pressure(MBP) were compared at the time points including baseline level(T_0),laryngoscopy(T_{lary}), insertion of rigid bronchscope(T_{bron}),5,10,and 20 minutes during procedure(T_{5m},T_{10m},T_{20m}),the end of procedure(T_{end}),and discharge(T_{dis}). Induction time, emergence time,intubating condition scores, and the incidence of adverse events were compared.
Results and Discussion: RR kept stable in Group VIMA and was decreased significantly from T_{lary} to T_{end} in Group TIVA.RR, HR,and MAP were significantly higher in Group VIMA than in Group TIVA from T_{lary} to T_{end}, and returned to the baseline levels at T_{dis} in both groups. Time for loss of consciousness, time of BIS value decreased to 40, and emergence time in Group VIMA were significantly shorter than those in Group TIVA(p<0.05).The incidence rates of breath holding and desaturation in Group VIMA were significantly lower than those in Group TIVA(p<0.05).

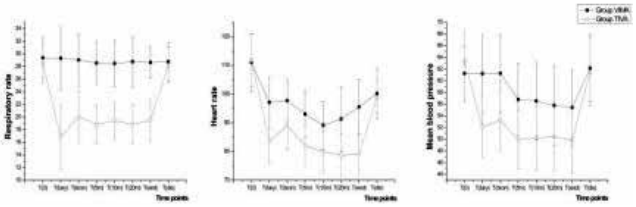

Fig 1. Changes of respiratory rate, heart rate, and near arterial pressure at different time points

Table1. Time quantum, intubating condition score, and adverse events (number of patients and percentage of group) in the two groups

	Group VIMA	Group TIVA
Duration of anesthesia (min)	21.8±6.3	21.9±5.7
Time for loss of conciousness (sec)	95.6±15.2	146.2±26.9*
Time of BIS decreased to 40 (sec)	115.3±16.5	160.4±25.8*
Emergnece time (min)	10.5±2.6	16.9±3.1*
Intubating condition score	8.1±0.9	8.1±1.0
Breath holding	2 (6.25%)	10 (31.25%)*
Cough	2 (6.25%)	3 (9.38%)
Laryngospasm	0	1 (3.13%)
Desaturation (<93%)	5 (15.63%)	12 (37.50%)*

* p<0.05

Conclusion(s): Sevoflurane VIMA provides more stable respiration and better hemodynamic stability, and quicker induction and recovery for rigid bronchoscopy for tracheobronchial foreign bodies removal than propofol-remifentanil TIVA in children.

10AP1-2

The effect of ketamine on the tracheal intubating conditions during sevoflurane induction in children

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Background and Goal of Study: During sevoflurane inhalation induction, addition of an opioid has been shown to allow rapid tracheal intubation. Although the higher dose of opioids could improve conditions for tracheal intubation, it could cause a greater decrease in mean arterial pressure, particularly before tracheal intubation. The purpose of this study was to investigate the effect of ketamine on intubating conditions for tracheal intubation during anaesthesia induction with sevoflurane and alfentanil in paediatric patients.
Materials and Methods: Fifty children, aged 3-10 years, were randomly allocated to receive normal saline (control group, n=25) or ketamine 0.5 mg/kg (ketamine group, n=25). One minute after injection of the study drug (ketamine or saline), anaesthesia was induced with 5% sevoflurane, followed by injection of alfentanil 10 µg/kg 1 min later. The trachea was intubated four minutes after inhalational induction of anaesthesia. Acceptable intubation was defined as excellent or good intubating conditions. Mean arterial pressure (MAP) and heart rate (HR) were recorded during the induction period.

Results and Discussion: The percentage of patients with acceptable intubating conditions was higher in the ketamine group (87%) than in the control group (52%) ($P = 0.0129$). Excellent overall intubating conditions were present in 6/25 (24%) children in the control group and in 9/23 (39%) children in the ketamine group. MAP prior to intubation was significantly lower in the control group than in the ketamine group ($P = 0.001$).
Conclusion(s): This study demonstrated that administration of ketamine 0.5 mg/kg could improve intubating conditions for tracheal intubation without neuromuscular blockade and preserve haemodynamic stability during sevoflurane inhalation induction with alfentanil in children.

10AP1-3

Comparison of extubation readiness between sevoflurane and desflurane titrated to bispectral index value in children

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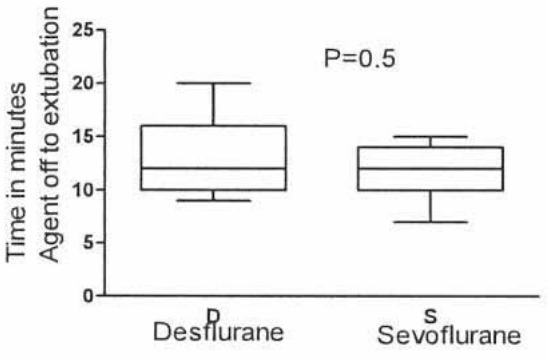
Background and Goal of Study: Recovery from anesthesia is influenced by the choice of volatile anesthetic agent. Studies in healthy adults indicate that recovery from anesthesia proceeds nearly twice as fast with desflurane as compared to sevoflurane. This study was designed to compare the extubation readiness between two groups of pediatric patients receiving either sevoflurane (S) or desflurane (D) for maintenance of anesthesia titrated to BIS value of 40-60.
Materials and Methods: Following the IRB approval,we conducted randomized controlled trial in 30 patients (1yr to 6 yrs) of ASA I and ASA II category undergoing elective outpatient surgery. Anesthetic induction was achieved with sevoflurane in 50% oxygen and nitrous oxide. Maintenance of anesthesia was with 50% oxygen and nitrous oxide and MAC of desflurane in GroupD and sevoflurane in Group S titrated to maintain BIS index value between 40-60 range. Fentanyl was dosed as needed. All patients were ventilated to normocapnia with comparable fresh gas flows in all patients. The volatile anaesthetic agent was turned off with the last surgical stimulus and the patient was allowed to wake spontaneously. Patients were extubated on meeting the criteria of gross limb movement, eye opening, regular breathing. Data was analysed using non-parametric two tailed Mann-Whitney Test with confidence interval 95%.
Results and Discussion: Agents with lower tissue and blood:gas solubility such as desflurane have been shown in adults to be associated with faster extubation and recovery. Choice of inhalational agent is based on their cost benefits. We compared two anesthetic agents namely desflurane and sevoflurane titrated to BIS monitor in short outpatient pediatric surgical procedures to determine if there was a difference in extubation readiness in two groups. Duration of Inhalational Agent(min) was 65.33 ± 24.7 (group D) and 56.6± 14.4 (group S). BIS at extubation was 80 ± 8.4(group D)and 77.6 ± 7.7(group S). In our study we found that for procedures of short duration, sevoflurane and desflurane have comparable recovery profile.



Conclusion(s): We conclude that the extubation timing is unaffected by the choice of desflurane versus sevoflurane titrated to BIS monitor in short procedures.

10AP1-5

Pediatric i-gel evaluation under nuclear magnetic resonance (NMR)

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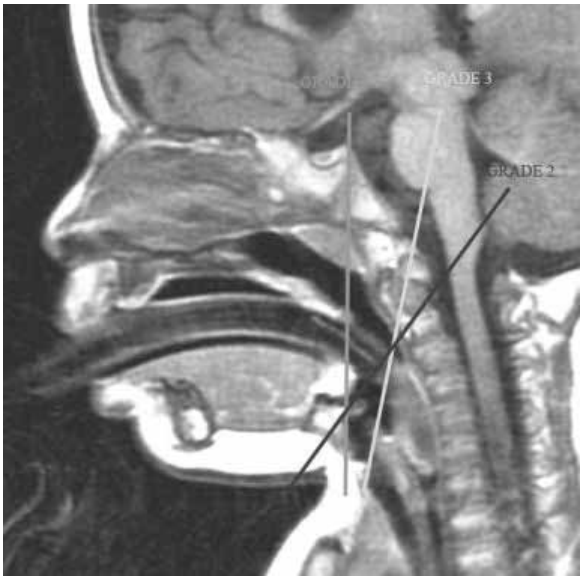
Background and Goal of Study: A paediatric size for the i-gel® supraglottic airway (IG-LMA) has been recently introduced. Our goal was to evaluate the clinical and radiological aspects of this device, and it's applicability to everyday practice.
Materials and Methods: After approval of the Ethic Committee, 70 children scheduled for cranial MRI (Magnetic Resonance Imaging) scan were enrolled in this prospective non-randomized study. Demographic and result datas are presented. After inhalational induction, the IG-LMA was introduced under spontaneous ventilation, with subsequent placement of the drainage tube. Introduction attempts and leak pressure were recorded. Radiological images were later reviewed to determine the angle between the longitudinal axis of the cuff and the cervical spine and the relative position of epiglottis. We then traced three lines from the end of the IG tube to the anterior and posterior part of the glottis to evaluate epiglottis interposition (equivalent to Cormack's classification).

Size correlation and clinical parameters

	Weight	Age (dm)	Seal pressure	angle Lm-cer spine
Size 1	4,9±1,26	2,16±1,50	24±4,69	40,34±5,07
Size 1,5	10,46±2,14	24,16±13,82	25,64±3,66	34,32±6,49
Size 2	18,56±3,34	53,53±18,76	26,08±3,39	30,54±8,89
Size 2,5	27,8±5,26	90,73±32,21	24,8±3,89	27,4±9,31



Results and Discussion: The IG-LMA was introduced without difficulty at first attempt (except one case in group 1,5). Drainage tubes were also introduced at first attempt. Leak pressure allowed mechanical ventilation if needed. The epiglottic interposition was also evaluated. While in all cases the epiglottis was found in the inlet of the IG cuff (grade 1:0 cases; grade 2:40 cases; and grade 3: 30 cases), clinical performance was correct in all instances. The clinical significance of these findings remains unclear. The angle between the cuff and the cervical spine is a common problem in all supraglottic devices. It's increased in small children and decreases during growth, improving stabilization.
Conclusion(s): The pediatric IG-LMA was easy to insert and the drainage channel works well. In our hands, this device proved to have a good clinical and radiological performance in paediatric patients.

10AP1-6

Influence of five different head and neck positions on the perilaryngeal seal of the i-gel® device in paediatric patients

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Background and Goal of Study: The I-gel® is a novel supraglottic airway device. There is still little data about its performance in the paediatric population.

Materials and Methods: We performed a prospective, observational study of fourteen ASA physical status I-II children, scheduled for elective office-based surgery. The I-gel ® was placed under general anaesthesia according to the manufacturer's recommendations. Correct ventilation was evaluated by proper chest excursion, a square wave capnogram, absence of audible leak and gastric distension. The oropharyngeal sealing pressure was measured at fresh gas flow of 5 $L.min^{-1}$, and pressure adjustment valve at 30 cmH_2O with the head and neck in neutral, flexed, extended and rotated positions. The fiberoptic laryngeal views in these positions were also assessed.

Results and Discussion: In our study, the sealing pressure with the I-gel ® device was lower in the *extended* and the *rotated* positions, than that in the *neutral* position. Sealing pressure was increased in the *flexed* position. These findings were explained during the fiberoptic examination of the laryngeal inlet. The vocal cords were more easily seen in extension and rotation. Neck *extension* facilitated airway patency by increasing the laryngeal inlet space. Head *rotation* widened the oropharyngeal space, as it had a component of extension. Additionally, this position preserved to a great degree the adaptation of the ventilation hole of the I-gel® to the laryngeal inlet due to a simultaneous rotation of the neck and the supraglottic device. The *flexed* position narrowed the laryngeal inlet, but was not associated with airway obstruction since the epiglottis was not enclosed or down folded in the cuff.

Sealing pressure at five different head and neck positions

Position	Sealing Pressure (cmH_2O)
Neutral	23, 7 ± 5, 2
Flexed	27, 0 ± 5, 3
Extended	20, 1 ± 5, 3
Rotated to the right	20, 7 ± 3, 9
Rotated to the left	21, 5 ± 3, 8

Conclusion(s): Adjustment of the head and neck position often allows optimizing poor ventilation with supraglottic devices. This preliminary study suggests that the I-gel ® is a reliable airway device at five different head and neck positions in the paediatric population. Its position undergoes a small modification in the rotated position. This is of particular interest for the paediatric anaesthesiologists, since many of the anaesthetic techniques involve the realization of caudal neuroaxial block with the child in the lateral decubitus position.

10AP1-9

The perfomance of the pediatric-sized i-gel™ compared with the Ambu Aura Once™ laryngeal mask in anesthetized and ventilated children

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Background and Goal of Study: The pediatric i-gel (Intersurgical Ltd, Wokingham, Berkshire, UK) is an adjusted adult i-gel. It features a gastric channel down to size 1.5. The Ambu Aura Once (Ambu A/S, Ballerup, Denmark) is a precurved laryngeal mask widely used in pediatrics. The aim of this prospective randomized controlled clinical trial is to compare the performance of both masks in anesthetized children. We assumed that both devices have equal insertion time and airway seal pressure.

Materials and Methods: With IRB approval and informed consent we included 86 of the planned total of 200 children of both genders, aged 0-17 years, 5-50kg, ASA physical status I-II, scheduled at the University Hospital of Bern for elective surgery under general anesthesia. Anesthesia was induced with sevoflurane or propofol. Time to insert the device was measured from the time the face mask was taken away until sufficient ventilation was established. We also evaluated fiberoptic view through the masks and adverse events.

Results and Discussion: Demographic data did not differ between groups (age 7±4years, p=0.945, weight 26±12kg, p=0.669, ASA physical status, p=0.589). Male:female ratio was 63:23 and equal between the groups (p=0.465). Both devices were equally used in all subgroups (<10kg, 10-14.9kg, 15-19.9kg, 20-29.9kg, 30-50kg). In 19 of the 43 i-gels, the device had to be pushed down to maintain sufficient airway leak pressure especially in smaller children. In 1 Ambu, the patient developed bronchospasm, which was quickly resolved by deepening the anesthesia level. In 1 case, the i-gel was removed and reinserted to treat the onset of a new leak. There were no major side effects.

Supraglottic Mask Performance

	Ambu Aura Once (n=43)	i-gel (n=43)	p-value
Success n (%)	41 (95)	41 (95)	1.000
Insertion time until successful ventilation (sec)	22 ± 9	28 ± 13	0.020
Airway Leak Pressure (cm H2O)	19 ± 4	23 ± 5	<0.001
Fiberoptic view grade 1/ 2/ 3/ 4* n (%)	37/1/1/0 (94/3/3/0)	40/3/0/0 (93/7/0/0)	0.382

* 1=full view of glottic aperture, 2=partial view, 3=only epiglottis visible, 4=no glottic structures visible

Conclusion(s): The pediatric-sized i-gel is suitable for ventilation of anesthetized children and offers the additional advantage of gastric access. Compared to the Ambu Aura Once, it shows higher airway leak pressures. However, especially in very small children, the i-gel has the tendency to protrude outwards and often needs to be taped down with light force.

10AP1-10

Comparison of intranasal dexmedetomidine and midazolam for premedication in children

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Background and Goal of Study: Premedication plays a very important role to minimize the distress for children in the operating room and to facilitate a smooth induction of anaesthesia (1). Midazolam is the most commonly used premedication in children (2). Dexmedetomidine is a new alpha-2 agonist with a more selective action on the alpha-2 adrenoceptor and a shorter half-life. In our study; we aimed to evaluate whether intranasal dexmedetomidine is as effective as intranazal midazolam for premedication in pre-school children.

Materials and Methods: This clinical study was designed as a prospective randomized controlled trial. After the approval of Ethics Committee of Sisli Etfal Training and Research Hospital and informed consent of the parents, 60 patients aged 2-6 years in ASA I-II physical status were enrolled the study. Standart monitorization including heart rate(HR) and peripheral O_2 saturation (SpO_2) was applied to all patients in Premedication Unit and patients were randomized into two groups as to receive 0.5 µg/kg intranasal dexmetedomidine in Group D or 0.5 mg/kg intranasal midazolam in Group M. Sedation score, HR and SpO_2 were recorded before drug administration (basal=0.min), at 10.min after administration and with 5 min intervals until 30.min. Parental seperation at 30.min and mask tolerance at the anaesthesia induction were also evaluated. Student t, Mann Whitney U, Wilcoxon, chi square tests were used for the statistical analyses. P<0.05 considered as significant.

Results and Discussion: Sedation score was significantly higher in Group D compared to Group M at 15.min(p<0.05). When compared to 10.min sedation score values were significantly lower at all intervals in Group D and Group M (p<0.05). Parental seperation score was significantly higher (p<0.05) and mask tolerance at anaesthesia induction score was significantly lower (p<0.01) in Group D compared to Group M. HR and SpO_2 were comparable between the groups. HR values were significantly higher in Group D than Group M at all intervals except basal values (p<0.05). SpO_2 were comparable between the groups.

Conclusion(s): We conclude that; intranazal 0.5 µg/kg dexmedetomidine can be an alternative to intranasal 0.5 mg/kg midazolam when used for premedication in pre-school children.

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10AP1-11

Parental presence in the operating room makes inhalational anaesthesia smoother in children

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Background and Goal of Study: Inhalational anaesthesia induction is safe and worlwide used in paediatric anaesthesia because it avoids awake venous access. However this is not the only stressful situation fot the children in the perioperative period: the separation from their parents can be a moment of maximum anxiety and may hinder the inhalational anaesthesia induction. The

aim of this paper is to know if the presence of the parents in the operating room can make inhalational anaesthesia in children smoother.

Materials and Methods: After local ethics committee approval, written informed consent was obtained from the parents of 40 ASA I paediatric patients scheduled for tonsillectomy. Those with previous surgery were excluded. Patients were randomly allocated to two groups: one with the presence of children's mother or father in the operating room (group P) or control group (group C). In group P, the parent was invited to enter to the operating theatre with his son and to hold him in his arms till loss of consciousness. In group P, children entered the operating room without their parents. Standard inhalation anesthesia induction with 8% sevoflurane in oxygen was done in both groups by an experienced anesthesiologist. When the children didn't respont to verbal commands, the parents left the operating theatre and an iv cannula was inserted and the procedure continued as usual. The smoothness was evaluated as children breathing from the face mask without crying or fighting, children crying but not fighting and children fighting (and physical restraint needed). Chi square test or Fisher's exact test and Student's t test were used as appropiate. A p<0.05 was considered significant.

Results and Discussion: Both groups were similar. Demographic data are shown in table 1. Time and difficulty for inhalation induction are shown in table 2. In the parental group a smoother anaesthesia induction could be achieved, althrough no differences in crying incidence were found.

Table 1

	Age	Weight(Kg)	Sex(M/F)	Height(cm)	Mother/Father
Group P	4,2(1,9)	17,6(5,1)	8/12	108,2(9,2)	6/14
Group C	4,1(1,5)	16,4(4,8)	9/11	106,3(8,2)	-

Data show number or mean(SD)

Table 2

	Time of inhalation induction(s)	Smoothness		
		Not crying (*)	Crying	Physical restraint(*)
Group P	78,9(9,2)	13(65%)	5(25%)	2(10%)
Group C	81,7(9)	5(25%)	8(40%)	7(35%)

Data shows median(SD) or number(percentage).(*)p<0.05

Conclusion(s): The parental presence in the operating room makes inhalational anaesthesia smoother and is likely to reduce the preoperative and postoperative stress.

10AP2-1

Dexamethazon preoperatively reduces postoperative pain and nausea, vomiting to children undergoing urology surgery

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Background and Goal of Study: Previous studies about the effect of dexamethazon on nausea and pain have been contradictive. The purpose of this study is to clarify the effects of the only one dose of dexamethazon preoperatively in cases of severe episodes of postoperative pain and vomiting to children undergoing urology surgery while endotrecheal anesthesia is used.

Materials and Methods: This study is a double-blinded study.The subjects are100 random children in urology. From those 50 pts(patients)received IV preoperatore0.4mg/kg-1 dexamethazone(max.8mg) and the remaining 50 pts received the same volume of Normal saline. The study started from 01.2008 – 12.2009.The subjects were between ages 3-14years old. The study analyzed differences between both groups such as occurrence of vomiting in early and late stages post operatively, the need for antiemetic, the amount of time pts were able to get off the NPO status, the time when pts received the first analgesic and the total amount of analgesics received. Pain level was evaluated based on"Children's Eastern Hospital Pain Scale"that includes facial expression and the visual analog pain scale 0-10.

Results and Discussion: Compared with the group that received placebo the dexomethazon group presented with significantly decreased vomiting on early stage postoperative and late stage postoperatively (P<0.05, P<0.001) respectively, consequently in the group that receive dexamethazone, number of pt that used antiemetic was smaller (p<0.01). The NPO status was shorter for the group that received dexamethosen pts were able to take by mouth earlier than the pt on the other group. Pain level 30min post extubim was lower to pt that received dexamethazone compare with pt that received placebo (P<0.05), as result the time that analgesic was needed was longer for the group that received dexamethasone compared with the group that receive placebo (p<0.01). Furthermore 12-24hours post operation pts that received dexamethasone presented with significantly lower pain levels compared with the pts that did not receive dexamethasone (P<0.01).

Conclusion(s): The use preoperaore of 0.4mg/kg dexamethason IV one time reduces vomiting and pain postoperatively to children undergoing urology surgery.

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10AP2-2

General anesthesia with epidural morphine for pain relief after major orthopedic surgery in children

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Background and Goal of Study: Major orthopedic surgery in children needs an optimal postoperative pain control (1). The using of combining several methods of anesthesia may be safer than the use of only one method. In this study, we compared the postoperative outcome between two anesthesia technique combinations of general and epidural block (GE) or general (G) anesthesia.

Materials and Methods: After obtaining written informed consent and local ethic committee approval 42 children (aging 10-13, ASA II-III) scheduled for surgical correction of scoliosis were randomly allocated to the G and GE group (each 21 patients). Group G: propofol 2 $mgkg^{-1}$-fentanyl 1 μgkg^{-1}were used for induction, sevoflurane %3-4 for maintaining anesthesia. Group GE: same induction, after that each patient was placed on a prone position and the epidural space was administered with 3-5 morphine in 10 ml NaCl 0.9 % prior to surgical incision. Postoperative pain was assessed with a visual rating scale (VRS: 0-10) and treated with doses of 20 mg trimeperedine i.m. on demand. The area of hyperalgesia around the surgical wound was evaluated in the morning of day 1, 3, 5 and 7 after surgery. *Data were processed unpaired t-test with Statistica 6.0 (StatSoft Inc., Tulsa, OK, USA); p*<0.05 significant. Data are means ±SD.

Results and Discussion: *Sex ratio and ASA scores were similar.* VRS in GE (5.3±2.3) was lower than in G (6.1±2.4); total analgetic consumption (trimeperedine) was higher in G (40.0±6.7 mg vs 10.3±4.6; p<0,02) on the first day after operation. On the third postoperative day the square of secondary hyperalgesia around the surgical wound as well as VRS readings were higher in group G than in group GE (218.7±10.1 CM^2 vs 130.7±21.3 CM^2, p < 0.04; 4 to 5 vs 1 to 2, p<0.01). On postoperative day 7 the hyperalgesia field around the wound was larger in group G than in group GE (76.4±14.2 CM^2 vs 28.9±10.3 CM^2, p<0.05).

Conclusion(s): The use of low lipid solubility opioid epidural might help to improve postoperative pain management after correction of scoliosis in children.

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10AP2-3

Dependence of intraoperational hemodynamic responses on alveolar concentrations of sevoflurane and i.v. doses of fentanyl in children

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Background and Goal of Study: The use of opioids along with inhaled anesthetics allows for a significant reduction in their MACbar. The aim of this investigation was to study dependence of hemodynamic responses to tracheal intubation (TI) and hypopharyngeal packing on alveolar concentrations of sevoflurane and i.v. doses of fentanyl in children aged 3 months to 3 years undergoing surgical correction for congenital maxillofacial deformities.

Materials and Methods: Sixty-seven anesthesias were delivered. The patients were divided into 3 groups: Group 1 (21 patients): 0.8 MAC sevoflurane and

6 mcg/kg fentanyl; Group 2 (21 patients): 1.3 MAC sevoflurane and 4 mcg/kg fentanyl; Group 3 (25 patients): 1.5 MAC sevoflurane and 2 mcg/kg fentanyl. Anesthesia was induced with 2 MAC sevoflurane; a bolus of fentanyl was administered 5 min prior to TI; after the bolus its infusion was started. Standard monitoring and an impedance cardiographer were used.

Results and Discussion: In Groups 2 and 3 good or excellent intubation conditions were achieved without the use of neuromuscular blockers; in Group 1 one patient required a muscle relaxant before TI. The following hemodynamic responses were observed after TI: in Group 1 mean blood pressure (MBP) decreased by 4% from the pre-intubation level, while HR increased by 4%, and CI increased by up to 5%; in Group 2 MBP increased by 26%, while HR did not changed, and CI decreased by 26%; in Group 3 MBP did not change, HR increased by 3%, and CI increased by up to 2%. After an oral retractor was set and the hypopharynx packed, the following hemodynamic responses took place: in Group 1 MBP increased by 6% from the pre-intubation level, HR decreased by less then 2%, and CI decreased by 22%; in Group 2 MBP increased by 8%, HR increased by 6%, and CI decreased by 38%; in Group 3 MBP increased by 15%, HR increased by 7%, and CI increased by 7%. In addition, pre-intubation HR in Group 3 was 16% higher vs. Groups 1 and 2.

Conclusion(s): Hemodynamic responses to TI Groups 1 and 3 did not exceed 20%, which demonstrates there was no stress response to this manipulation in those patients, but the following maintenance of high rates of fentanyl infusion in Group 1 led to a decrease in CI by more than 20% from the pre-intubation level at the time of hypopharyngeal packing, while in Group 3 the low fentanyl dose combined with the high sevoflurane concentration, causing tachycardia, attenuates hemodynamic response to hypopharyngeal packing, which did not exceed 20% from pre-intubation level.

10AP2-4

Comparison of awake spinal anesthesia with awake caudal anesthesia in preterm and ex-preterm infants for herniotomy

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Background and Goal of Study: Spinal anaesthesia (SA) is widely used for awake regional anaesthesia in ex-preterm infants scheduled for herniotomy. Awake caudal anaesthesia (CA) is suggested as an alternative approach for these patients and type of surgery. Aim of this study was to compare efficacy and complications of the two different techniques.

Materials and Methods: Two historical populations of 575 ex-preterm infants undergoing herniotomy under awake SA (1998–2001) and under awake CA (2001–2004) were investigated with regard to technical feasibility, success rate and perioperative complications. Data are compared using t-test and Chi-square tests ($P < 0.05$). Data are mean (SD).

Results and Discussion: The SA group consisted of 339 patients with 32.0 (3.3) weeks of gestation and birth weight of 1691 (725) g. The CA group consisted of 236 patients born after 32.1 (3.7) weeks with birth weight of 1617g (726). At time of operation the total age was 41.37 (3.6) gestational weeks (SA) respectively 41.28 (4.0) weeks (CA) and the corresponding weights were 3326 (1083) g (SA) respectively 3267 (931) g (CA). For SA significantly more puncture attempts were needed (1.83 vs 1.44, $p<0.001$). Pure regional anesthesia was obtained in 84.96% (SA) and 90.1% (CA) (ns). A change to general anesthesia was necessary in 7.67% (SA) and 3.9% (CA) (ns). Overall intra- and postoperative complications were not statistically different.

Conclusion(s): Caudal anesthesia was technically less difficult than spinal anesthesia and showed a tendency to have a higher success rate. Its application as awake regional technique in this patients seems more appropriate than spinal anesthesia.

10AP2-5

Single level paravertebral block in children

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Background and Goal of Study: Paravertebral block (PVB) has been used for postoperative analgesia in children since 1992.There are no prospective randomized studies comparing the use of PVB versus caudal block for outpatient inguinal hernia repair surgery. The aim of this study was to delineate the efficacy and duration of a single level, single injection PVB for children undergoing inguinal herniorrhaphy.

Materials and Methods: Seventy children, aged 3-7, ASA 1-2, herniograpy surgery were enrolled in the study. The patients were divided into two groups. In group PVB patients were taken 0.2 ml /kg levobupivacaine via paravertebral block and in group CB patients were taken 0.5 ml/kg levobupivacaine caudally. Sevoflurane concentration was evaluated perioperatively. FLACC scores, heart rate, blood pressures, SpO2 were evaluated postoperatively.

Results and Discussion: Inpired sevoflurane concentrations were higher in goup C than group PVB ($p < 0.000$ to $p < 0.001$). Only four (11.4 %) patients in the PVB group needed rescue analgesic drugs compared to 12 (34.3%) patients in the CB group ($p=0.044$). All patients, needed analgesia, were given tramadol in 4 hours postoperatively. No patients had any supplemental analgesic drug apart from tramadol. FLACC scores were the same in the both groups. Parental satisfaction (74.3% vs 40 %) was significantly higher in the PVB group than in the CB group ($p = 0.01$).

Conclusion(s): This study showed that single level single injection paravertebral block is more advantageous than caudal block for unilateral inguinal hernia repair regarding prolonged post-operative analgesia and less sevoflurane requirement peroperatively.

References:

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10AP2-6

Effects of ondansetron and ramosetron on patient-controlled analgesia related nausea and vomiting after orthopedic surgery in children

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Background and Goal of Study: This study was designed to compare the preventive effects of ramosetron and ondansetron on post-operative nausea and vomiting (PONV) in children undergoing general anesthesia using patient controlled analgesia (PCA).

Materials and Methods: 170 children, 2-15 years old, ASA physical status 1 or 2, scheduled for elective orthopedic surgeries, were randomly divided into the ramosetron group (group R, n = 83) or ondansetron group (group O, n = 87). Patients in group O received ondansetron 100 mg/kg and patients in group R received ramosetron 6 mg/kg after surgery. Intravenous PCA with fentanyl was used in both groups. The incidence of PONV and side effects were assessed during the 48 hours after surgery.

Results and Discussion: There was significantly less vomiting during the 6-24 hour period after surgery in group R than in group O. There were no significant differences in nausea and side effect of 5-HT_3 antagonist between the two groups.

Incidence of PONV and rescue antiemetic requirements

Symptom	Group O (n = 87)	Group R (n = 83)	p
Nausea or retching			
0-6hr	1 (1.1)	3 (3.6)	0.317
6-24hr	18 (20)	13 (16)	0.396
24-48hr	2 (2.2)	3 (3.6)	0.669
Vomiting			
0-6hr	0 (0)	1 (1.2)	0.319
6-24hr	10 (11)	2 (2.4)	0.029*
24-48hr	1 (1.1)	3 (3.6)	0.319
Rescue antiemetics			
0-6hr	0 (0)	0 (0)	
6-24hr	9 (10)	1 (1.2)	0.031*
24-48hr	1 (1.1)	1 (1.2)	0.766

Values are number (%).

Conclusion(s): Ramosetron was more effective during the 6-24 hour period after surgery than ondansetron in children using fentanyl PCA after general anesthesia.

10AP2-7

Factors complicating peripheral venous cannulation in children for anesthesia

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Background and Goal of Study: Potential risk factors for difficult intravenous (IV) cannulation access (BMI and age) are well known from experience, but previous studies evaluating these risk factors have never been published thus far. In the present study, we want to identify factors influencing difficulties in IV cannulation.

Materials and Methods: In a prospective cohort study, all consecutive patients scheduled for elective surgery at a university children's hospital were evaluated during 4 months (n=1080). Cannulation time, number of punctures and potential risk factors (figure 1) were noted. BMI (> 2 years) or weight-to-age (≤ 2 years) was converted to a z-score to allow comparison. Data are presented as median and interquartile range (IQR). A logistic regression analysis for single puncture rate was performed to determine predictive factors for difficult IV cannulations.

Results and Discussion: IV cannulation was difficult (more than one puncture was necessary) in about 27% of the children. Median time of cannulation was 77 s (46-150) with a maximum of 55 min. The logistic regression showed age, profession of the performer and type of surgery to be predictive for single puncture rate (P<.001), with an R^2 of 8%. A younger age, a profession other than anesthetic nurse and being scheduled for maxillofacial surgery, neurosurgery and general surgery were predictive for a lower single puncture rate. However, contrary to general assumptions, BMI or weight-to-age and skin color were not found to be related to difficulty of cannulation.

Potential risk factors		Median (IQR) / proportion	p-value log regression		Odds (95%CI)
Age (IQR)		6 (2-10)	< .001		0.88 (0.85-0.92)
Gender (% males)		626/1082 (58%)	.133		
Dark skin color (%)		49/1037 (5%)	.812		
Anesthetized (%)		874/1058 (83%)	.251		
BMI or weight to age z-score (± SD)		-0.18 (-1.10-0.62)	.415		
Surgery	otolaryngology	156/1083 (14%)	.026	(overall)	
	maxillofacial surgery	29/1083 (3%)	.002		4.79 (1.82-12.62)
	ophthalmology	98/1083 (9%)	.982		0.99 (0.48-2.03)
	paediatric interventions	118/1083 (11%)	.161		1.60 (0.83-3.09)
	general surgery	269/1083 (25%)	.013		2.65 (1.23-5.74)
	neurosurgery	48/1083 (4%)	.041		1.78 (1.02-3.10)
	orthopedic surgery	71/1083 (7%)	.378		1.27 (0.75-2.17)
	urologic surgery	285/1083 (26%)	.329		1.40 (0.71-2.74)
	other	9 (1%)	.849		0.85 (0.16-4.45)
Profession	anesthetic nurse	299/1022 (29%)	.013	(overall)	
	anesthetic nurse trainee	125/1022 (12%)	.002		2.15 (1.32-3.51)
	anesthesiologist	211/1022 (21%)	.018		1.69 (1.08-2.33)
	anesthesiologist trainee	367/1022 (36%)	.031		1.69 (1.04-2.42)
	student	20/1022 (2%)	.090		2.38 (0.87-6.49)

Conclusion(s): Age, gender, profession of the performer and type of surgery, and not BMI and skin color, are predictors for difficult IV cannulation. Nevertheless, there is still much unexplainable variation remaining. The present study shows that IV cannulation is difficult in more than a quarter of the patients and that cannulation is not very well predictable by easy accessible patient characteristics.

10AP2-8

Elastomeric pump analgesia after renal operations in children

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Background and Goal of Study: Pain after renal surgery in children is often extensive and mostly controlled with opioids which have unfavourable side-effects. The ON-Q PainBuster system delivers local anesthetic continuously to the incisional site by elastomeric pump and catheter placed subfascially by surgeon at the end of operation. The aim of the study was to determine the effectiveness of elastomeric pump system in children for pain relief after renal surgery. Better pain relief and significantly less need for narcotics post surgery is to be expected. PONV and other opioids side effects should be minimized.

Materials and Methods: A retrospective observational study of 68 children who underwent renal surgery and received local anesthetic by subfascial catheter and elastomeric pump has been done. Variables to be measured during first two postoperative days were the level of pain by visual analogue scale (VAS), amount of additional analgesics and appearance of PONV and constipation. Bupivacaine 0,5% in a dose of 5 mg/kg diluted with saline to 100 ml at flow rate 2 ml/h for up to two days was used. Concentration of bupivacaine was ranging from 0,15% to 0,5% (mostly 0,25%).

Results and Discussion: Demographic characteristics were: 68 children, 38 M,30F, aged from 1 year to 17 years (mean 8.4),weight ranged from 11kg to 65 kg(mean 32.4 kg).Types of renal operations were pyeloplasty in 25 patients, heminephrectomy in 8, nephrectomy in 5 patients, ureter modelage in 10,operation of nephroblastoma in 14 patients and neuroblastoma in 6 patients. All were ASA physical status 2. Average duration of ON-Q system use was 44.5h, range 38h to 48h. Pain scores by VAS (range 0 to 10) on the first and second postoperative days were 3.4 and 2.1 respectively. Additional analgesia was used in 15% of patients in the form of tramadol infusion. PONV have 4patients,constipation two patients. Complications encountered were catheter leakage which precluded earlier removal in five patients. No wound healing complications or infections associated with the use of the system were noted.

Conclusion(s): Subfascial catheter placement and elastomeric pump continuous analgesia with bupivacaine for pain relief after renal operations in children appears effective regarding postoperative low pain scores, decreased need for additional analgesia and less side-effects than with opioids.

Reference:

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10AP2-9

Comparison of intranasal and oral dexmedetomidine for premedication in children

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Background and Goal of Study: One of the challenges for paediatric anaesthesiologists is to minimize the distress for children in the operating room and to facilitate a smooth induction of anaesthesia (1,2). Dexmedetomidine is a new alpha-2 agonist with a more selective action on the alpha-2 adrenoceptor and a shorter half-life. In our study; we aimed to compare the effects of intranasal and oral dexmedetomidine on sedation and parental seperation when used for premedication in pre-scholl children.

Materials and Methods: This clinical study was designed as a prospective randomized controlled trial. After the approval of Ethics Committee of Sisli Etfal Training and Research Hospital and informed consent of the parents, 52 patients aged 2-6 years in ASA I-II physical status were enrolled the study. Standart monitorization including heart rate(HR) and peripheral O_2 saturation (SpO_2) was applied to all patients in Premedication Unit and patients were randomized into two groups as to receive 1 µg/kg dexmetedomidine by intranasal route in Group I or oral route in Group II. Sedation score, HR and SpO_2 were recorded before drug administration (basal=0. min), at 10.min after administration and with 5 min intervals until 30.min. Parental seperation at 30.min and mask tolerance at the anaesthesia induction were also evaluated. Student t, Mann Whitney U, Wilcoxon, chi square tests were used for the statistical analyses. P<0.05 considered as significant.

Results and Discussion: Sedation score was significantly higher in Group I compared to Group II at 10.min(p<0.05) and at 15., 20., 25. ve 30. minutes (p<0.01). When compared to basal values sedation score was significantly lower at 30.min in Group I (p<0.05) and at all intervals in Group II (p<0.01). Parental seperation and mask tolerance at anaesthesia induction scores were significantly lower in Group I compared to Group II (p<0.01). HR and SpO_2 were comparable between the groups. HR values were significantly lower at all intervals in Group I (p<0.01), at 15. and 20.min in Group II (p<0.01) compared to basal values.

Conclusion(s): We conclude that; when 1 µg/kg dexmetedomidine used for sedation in children aged between 2-6 years, intranasal route can be preferred to oral route with rapid onset time and more effective sedation level, better parental seperation conditions and mask tolerance at anaesthesia induction and less haemodynamic effects.

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10AP3-1

Respiratory and haemodynamic effects of volume-controlled vs pressure-controlled ventilation during laparoscopy in children

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Background and Goal of Study: The respiratory and haemodynamic effects of several ventilatory strategies during CO_2 pneumoperitoneum have been reported. The purpose of this study was to compare the effects of pressure controlled ventilation (PCV) and volume controlled ventilation (VCV) on the ventilatory and oxygenation parameters in paediatric patients during laparoscopy.

Materials and Methods: Thirty paediatric patients, aged 3-14 yr, undergoing laparoscopic appendectomy due to acute appendicitis, were randomly allocated to receive mechanical ventilation using either VCV (n=15) or PCV (n=15) mode with 5 cmH_2O positive end-expiratory pressure (PEEP) Haemodynamic and ventilatory parameters were measured 10 min before pneumoperitoneum (T1) and 30 min after pneumoperitoneum (T2). Arterial blood gases were obtained at T2.

Results and Discussion: Mean blood pressure was significantly increased from T1 to T2 in both groups without intergroup difference. Mean airway pressure and dynamic compliance in PCV group were significant higher than those in VCV group. There were no significant differences in oxygenation parameters between two groups after CO_2 insufflation.

The changes of haemodynamic and ventilatory parameters during laparoscopy

	VCV	(n=15)	PCV	(n=15)
	T1	T2	T1	T2
mean blood pressure (mmHg)	77 (11)	89 (15)†	77 (9)	89 (11)†
Heart rate (beats/min)	101 (17)	101 (16)	92 (14)	91 (14)
Minute volume (L]	4.5 (1.8)	4.9 (1.4)	4.6 (1.7)	5.2 (1.1)†
Peak airway pressure (cmH2O)	18 (4.5)	24 (2.7)†	17 (2.9)	21 (4.2)†
Mean airway pressure (cmH2O)	8.3 (1.2)	9.8 (1.1)†	9.4 (1.0)*	11.2 (1.5)*†
Dynamic compliances (ml/cmH2O)	27.7 (14.4)	18.1 (5.9)†	33.7 (11.9)	25.8 (10.4)*†
PaO2/FiO2	NA	499 (81)	NA	462 (63)

Values are means (SD). VCV group: volume controlled ventilation, PCV group: pressure controlled ventilation. T1: 10 min before pneumoperitoneum, T2: 30 min after pneumoperitoneum.*: P < 0.05, compared with VCV group. †: < 0.05, compared with T1 value within the group.

Conclusion(s): This study demonstrated that mean airway pressure and dynamic compliance were significantly higher in PCV compared with VCV in paediatric patients during laparoscopic appendectomy. No other difference of ventilatory and oxygenation parameters could be noted.

Reference:

1 Balick-Weber CC, Nicolas P, Hedreville-Montout M, Blanchet P, Stéphan F. Respiratory and haemodynamic effects of volume-controlled vs pressure-controlled ventilation during laparoscopy: a cross-over study with echocardiographic assessment. *Br J Anaesth* 2007; 99: 429-35.

10AP3-2

Haemodynamic effects of laparoscopic appendecectomy in children

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Background and Goal of Study: The aim of this study was to investigate the haemodynamic effects of pneumoperitoneum during a laparoscopic appendecetomy in children.

Materials and Methods: Ten children, ASA II-III, aged 6-14 years, undergoing laparoscopic appendectomies in the trendelenburg position were recruited in the study. All children received intravenously propofol (4mg/kg), lidocaine (1mg/ml), fentanyl (0.005mg/kg) and cisatracurium (0.2mg/kg) for the induction, followed by sevoflurane 2% – 3% for maintaining general anaesthesia. The carbon dioxide pneumoperitoneum induced an increase of intra-abdominal pressure up to 12mmHg. We evaluated using a radial artery catheter, systolic, diastolic and mean arterial pressure, heart rate, cardiac output, arterial pH and HCO_3. All these parameters were recorded during anaesthesia at three time points: After induction of anaesthesia and just before the CO_2 insufflation (T1), 10 min after the onset of pneumoperitoneum and turn to a mild trendelenburg position (T2), and 5 min after the end of pneumoperitoneum and turn to the supine position. Cardiac output was evaluated using the flotrac sensor (Vigileo) connected to the radial artery catheter. Data were analyzed using a two-way analysis of variance for repeated measures.

Results and Discussion: There were no statistically significant differences regarding arterial pressure. Heart rate (beats/min) increased significantly during the pneumoperitoneum (T1=93.4±8.9, T2=100.5±8.7, T3=94.8±7, p=0.003), as well as significantly increased the cardiac output (T1=4.22±0.8, T2=4.65±0.6, T3=4.6±0.7, p=0.002). There were no significant differences regarding arterial pH and HCO_3, during the surgery.

Conclusion(s): Haemodynamic changes induced by pneumoperitoneum during a laparoscopic appendecectomy in children include an increase in heart rate and cardiac output, but arterial pressure as well as arterial pH and HCO_3 do not change significantly.

10AP3-3

The effects of different anesthesia techniques on plasma nitric oxide and superoxide production after tourniquet release in children

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Background and Goal of Study: The aim of this prospective study was to investigate possible effect of different anesthesia techniques on nitric oxide (NO) and superoxide anion (O2*-) production connected with ischemia-reperfusion (I/R) injury during extremity operations at children's age.

Materials and Methods: After obtaining the ethical committee approval and written informed consent from the parents we studied 45 patients ASA I or II, 8 to 17 years of age, undergoing orthopedic procedures that required bloodless limb surgery. Children were randomized into three groups of 15 patients each: general inhalational anesthesia with sevoflurane (group S), total intravenous anesthesia (TIVA) with propofol (group T) and regional anesthesia (group R). All patients were premedicated with midazolam. In the group S general anesthesia was induced with thiopental (5 mg/kg) and maintained with inhalation of sevoflurane (3-4 vol%). In the group T anaesthesia was induced with propofol followed by continuous infusion of propofol at a rate of 10 mg/kg/h, reducing to 8 and 6 mg/kg/h, respectively. Atracurium was given to facilitate tracheal intubation in groups S and T and the lungs were ventilated with 65% nitrogen in oxygen. Rescue analgesia was provided by single bolus doses of alfentanyl. In the group R, patients received peripheral nerve blocks using bupivacaine 0.25%. Venous blood samples were obtained at four time points: before peripheral nerve block and induction of general anesthesia (baseline), 1 min before tourniquet release (BTR), 5 and 20 min after tourniquet release (ATR). Plasma NOx level, xanthine oxidase (XO) and superoxide dismutase (SOD) activity were determined.

Results and Discussion: Plasma NOx value in group S was significantly higher at 5 min ATR in comparison with groups T and R (66.25±14.83µmol/L vs 47.90±13.97 and 38.78±15.3µmol/L respectively). There was a significant difference in NOx level between groups S and T after 20 min of reperfusion (48.45±13.30 vs 35.39±12.15 µmol/L, P<0.01). The lowest plasma XO activity was noted in group T 5 min ATR compared with groups S and R (0.14±0.09 U/ml vs 0.24±0.05 and 0.21±0.04 U/ml). Plasma SOD activity in group S was significantly decreased at 5 and 20 min ATR in comparison with the baseline (116.58±80.62 and 106.84±45.79 U/ml vs 183.35±61.25 U/ml).

Conclusion(s): TIVA with propofol attenuated increases in plasma NO and overproduction of O2*- after tourniquet release in children.

Reference:

1 Gourdin MJ, Bree B, De Kock M. European Journal of Anaesthesiology 2009;26(7):537 547.

10AP3-4

Significance of clinical and laboratory parameters in various subtypes of acute appendicitis in children

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Background and Goal of Study: Numerous parameters could be used for estimation of appendicitis inflammation. Clinical and laboratory parameters were analyzed in non- perforated or perforated appendicitis in children.

Materials and Methods: The prospective study included 50 pediatric patients with clinically suspected appendicitis aged 5 to 15 years, who underwent appendectomy. Children were randomized into two groups 25 patients each with non- perforated appendicitis (ANP) and with perforated appendicitis (AP). Body temperature –axilar, rectal; total count of white blood cell, WBC; percentage of neutrophils, Ne; C- reactive protein, CRP; and procalcitonin, PCT concentrations were followed before surgry as well as duration of fewer and

postoperative hospital stay. Measurement of PCT concentration was carried out by immunoluminometric assay and CRP concentration by immunonephelometric assay.

Results and Discussion: There was no difference in demographic characteristics such as age, body mass, sex between patient groups. Higher axilar (38,02 +/- 0,7 vs 37,23 +/- 0,73 °C; p<0,001), rectal (38,67 +/- 0,75 vs 37,8 +/- 0,8 °C; p<0,001) body temperature and longer duration of fewer (5,2 +/- 3,78 vs 2,0 +/- 0,97 days; p,0,001) was recorded in AP group comparing to ANP. Duration of postoperative hospital stay was longer in AP group (7,22 +/- 1,57 vs 14,0 +/- 6,41 days; p<0,001). There was no difference between total count of white blood cell, WBC (18,31 +/- 7,77 vs 14,44 +/- 5,28 x10^3/μL; p>0,05) and percentage of neutrophils (80,29 +/- 8,29 vs 76,65 +/- 11,18%; p>0,05) between groups, while CRP (85,36 +/- 44,89 vs 18,49 +/- 24,15 mg/L; p<0,001) and PCT (9,26 +/- 8,23 vs 0,13 +/- 0,12 ng/ml; p<0,001) concentrations were significantly higher in AP group.

Conclusion(s): Clinical and laboratory parameters such are axilar, rectal temperature, duration of fewer in days as well as CRP and PCT concentrations might be useful in differentiation of higher risk patients with perforated appendicitis, that require longer postoperative hospital stay.

10AP3-5

Analysis of ESPEN guidelines on aminoacids and energy needs estimation in neonates

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Background and Goal of Study: In order to determine optimal parenteral nutrition (PN) formula for neonate, energy and aminoacids needs should be estimated precisely. Usually these two values are assessed independently but still are functionally bounded in balanced PN scheme. It allows increasing PN efficacy and decreasing risk of complications. The goal of the study is to analyze rates and relations between energy and aminoacids needs that determine the balanced PN scheme and to develop an algorithm for practical use of ESPEN guidelines (1) on estimations of energy and aminoacids needs in neonates.

Materials and Methods: The study methods include mathematical analysis of linear equations system and graphical reflection 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 energy and aminoacids needs in patient-focused optimal proportion.

Results and Discussion: According to ESPEN guidelines there are two independent ways to calculate total energy needs: one calculating scheme is based on neonate weight and some other patient's data while the other takes into account the amount of received aminoacids. They may lead to different results. To solve this problem one should define the interval of doses of aminoacids (g/kg/day) where the following two conditions are fulfilled: a) the neonate should be supplied with energy that covers all his day energy expenditure not exceeding it; b) each gram of administered aminoacids should be provided by 25-40 kcal of non-protein energy. This study revealed that interval of optimal doses of aminoacids (that meets both of requirements) is definitely determined by two pairs of values: minimum and maximum of total energy expenditure per day and the same pair of non-protein energy that should supply each introduced gram of aminoacids. This combination of four values determines tetragonal area on the plane formed by full set of possible pairs of energy/aminoacids needs values. Any point that belongs to this area can be considered as a reasonable choice for optimal energy/aminoacids rate in individual clinical condition.

Conclusion(s): The analysis of ESPEN guidelines on PN in neonates with mathematical and graphical methods allowed developing easy practical algorithm for estimating neonate energy and aminoacids needs in balanced proportion.

Reference:

1. SPEN/ESPEGHAN Guidelines on paediatric parenteral nutrition Clinical Nutrition 2006;25:177-360.

10AP3-6

Ultrasound guidance versus the landmark technique for subclavian vein cannulation in children

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Background and Goal of Study: The use of ultrasound (US) guidance for central venous catheterization (CVC) has been recommended by the National Institute for Clinical Excellence (NICE) guidelines. This study evaluated whether US increases the first attempt success rate and decreases CVC complications for subclavian vein cannulation in children undergoing open heart surgery.

Materials and Methods: Ethics Committee approval and written informed consent from all patients or their next of kin were obtained. Seventy-two children less than 10 year of age were prospectively enrolled into either ultrasound (Group US) or the landmark group (Group LM) for subclavian vein cannulation. All procedures were performed by the same physician, who was experienced in both techniques. Success rate at the first attempt, catheterization times and complications were recorded.

Results and Discussion: Both groups were similar with respect to demographic features and ASA classification. There was no significant difference between the two groups regarding catheterization success (Group LM %94.7, Group US %91.7, p=0.63) and first attempt success (Group LM %58.3, Group US %66.7, p=0.46). Mechanical complicaton rates and catheterization times were similar in both groups (p>0.05). The time taken to determine puncture site was significantly longer in Group US when compared with Group LM (Group LM: 6.2 ± 5.6 sec, Group US 26.7 ± 12.1 sec, p<0.001). More inadvertent artery punctures occured in Group LM (3 of 36, 8.3%) compared with Group US (0 of 36, p=0.07).

Conclusion(s): The success rate at the first attempt could not be improved with US guidance when compared with the landmark technique for subclavian vein cannulation in children undergoing open heart surgery. However, US guidance may decrease inadvertent artery punctures during CVC.

10AP3-7

A novel model of perinatal hypoxia/ischemia brain damage in rats

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Background and Goal of Study: Perinatal hypoxic-ischemic brain damage remains a major cause of mortality and chronic neurological disability worldwide (1). The existing preclinical model has been based consists of 7 day old postnatal rat pups subjected to right common carotid artery ligation followed by hypoxia (2). However, this postnatal model does not reflect perinatal hypoxic-ischemic brain damage during birth. The aim of our current study was to implement a more clinically-relevant model of perinatal asphyxia.

Materials and Methods: On the gestation day 22, Sprague-Dawley rat dams (n = 15) were killed by cervical dislocation and the uterine horns were removed, and thereby placed in a water-bath at 37° for 5, 10, 15, 18 or 20 min. Thereafter, the pups were rapidly removed from the uterus and manually stimulated to initiate breathing in an incubator at 37° for one hour. Pups harvested directly from the uterine horn without ischemia served as controls. Surrogate dams sustained both ischemic-hypoxic and control pups. On postnatal days (PND) 1, 3 and 7, pups were euthanized with pentobarbital, perfused with 4% paraformaldehyde and brains removed and sectioned and immunostained for caspase-3 to detect apoptosis. Caspase-3 positive cells in the hippocampus and survival rates one hour after recovery from hypoxia/ischemia were assesssed in a blinded manner.

Results and Discussion: The prolonged period (> 10 min) of hypoxia caused a significant increase of caspase 3 cells when compared to that of controls at PND 1. The same pattern changes with a much less increase of caspase 3 were revealed at PND 3 and 7 (Figure 1). Survival rate for controls was 89 % and for 5, 10, 15, 18 and 20 min hypoxia were 89, 92, 85, 58, 0 and 0% respectively.

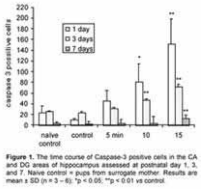

Figure 1. The time course of Caspase-3 positive cells in the CA and DG areas of hippocampus assessed at postnatal day 1, 3, and 7. Naive control = pups from surrogate mother. Results are mean ± SD (n = 3 – 6). *p < 0.05, **p < 0.01 vs control.

Conclusion(s): Subjecting the uterine horn of parturients to hypoxia/ischemia directly before birth may represent a more clinically-relevant perinatal asphyxia model. Studies to assess the neurological function are ongoing.

Acknowledgements: This study was supported by a grant from Action Medical Research, West Sussex, UK. T.Y. was supported from a scholarship of the Chinese Society of Anesthesiology, Beijing, China.

References:

1 Shankaran S.J Neurotrauma. 2009;26:437-43.
2 Rice JE 3rd, et al. Ann Neurol. 1981;9:131-41.

10AP3-8

Haemodynamic effects of propofol and desflurane during remifentanil-based deliberate hypotension anaesthesia for paediatric ENT procedures

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Background and Goal of Study: Remifentanil-based (REM) deliberate hypotension may be employed in selected paediatric ENT procedures to reduce bleeding and enhance visibility in surgical field. Exact mechanism of hypotension produced by propofol (PRO) or desflurane (DES) in combination with REM remains unclear. **Aim:** To compare haemodynamic effects of PRO and DES during REM-based deliberate hypotension.

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. After oral midazolam and induction with PRO, REM and vecuronium, we randomized patients to PRO (n=21, 11.9±2.9yr, 40.5±10.6kg) or DES (n=20, 13.0±3.2yr, 45.3±15.9kg) groups. In PRO gr anaesthesia was maintained with PRO 3-4 mg/kg/h, in DES gr with DES/O_2/air, ETconc 3-4%. In both groups analgesia was provided with REM 0.75 µg/kg/min. IPPV was used with $ETCO_2$ 35-40 mmHg, MV and SpO_2 were recorded. Haemodynamic parameters were measured with standard equipment and non-invasive cardiac output monitor (NICO, Philips-Respironix, USA). We aimed to maintain MAP within 50-65 mmHg range. The analysis of HR, SBP, DBP, MAP, CI, SVI and SVRI was started 5 min after intubation and completed at discontinuation of anaesthesia. Data are shown as median [range]; M-W and Chi^2 tests were used (significant if p<0.05).

Results and Discussion: The incidence of MAP<50 mmHg was higher in DES gr (10% vs 1% of all recordings; p<0.001), which was mainly due to lower values of DBP. Mean CI was lower in PRO gr. Extremely low CI (<2.5 l/min/m^2) was very rare in both groups. CI>5.5 l/min/m^2 was observed more often in DES gr (12% vs 5%, p<0.001). Both methods of anaesthesia produced very significant reduction of SVRI: values <1,600 dyns·cm^{-5}·m^2 were observed in 94% of all recordings in PRO gr and in 98% in DES gr. Very low SVI (<40 ml/beat/m^2) occurred more often in PRO group (8.8% vs 0.77%, p<0.001), while SVI>70 ml/beat/m^2 – in DES gr (65% vs 25%, p<0.001).

	Haemodynamic parameters	
	PRO	DES
HR	65 [36-138]	60 [26-125]*
SBP	94 [79-154]	90 [66-125]*
DBP	42 [21-103]	39 [17-71]*
MAP	61 [48-120]	58 [36-90]*
CI	3.9 [1.9-7.7]	4.6 [1.6-8.7]*
SVI	62 [31-113]	76 [53-133]*
SVRI	1087 [581-2124]	869 [527-3059]*

*p<0.001

Conclusion(s): In both methods of anesthesia hypotension was related mainly to SVRI reduction. DES-REM anaesthesia was less stable. Therefore PRO-REM technique seems to be preferable for controlled hypotension in paediatric ENT procedures.

10AP3-10

Effects of sevoflurane and isoflurane on renal glomerular and tubular function after congenital heart surgery

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Background and Goal of Study: Debate still exists regarding the effects of sevoflurane on perioperative renal function. Children with congenital heart disease are especially vulnerable to development of postoperative renal impairment. This study assessed the renal effects of sevoflurane anesthesia by using sensitive and specific markers of renal glomerular and tubular function in children undergoing congenital heart surgery.

Materials and Methods: Ethics Committee approval and written informed consent from all patients or their next of kin were obtained. Fifty-eight children aged 2 months to 6 years undergoing cardiopulmonary bypass (CPB) for surgical correction of congenital heart disease were randomly allocated to receive one of two agents: sevoflurane (Group S) or isoflurane (Group I) as part of their maintenance anesthesia. Serial blood and urine samples after induction of anesthesia and 2, 24, 48, 72 hours post CPB were collected to measure serum cystatin C, creatinine levels and urinary b2-microglobulin. Glomerular filtration rate (GFR) and Fractional excretion of sodium (FeNa) were calculated to evaluate renal glomerular and tubular functions respectively.

Results and Discussion: The groups were similar in terms of physical characteristics, surgical procedures performed and hemodynamic measurements. There were no statistically significant differences in cystatin C and b2-microglobulin levels between the groups throughout the study period (p>0.05). The calculated GFR and FeNa values were also similar in both groups (p>0.05).

Conclusion(s): Sevoflurane anesthesia does not worsen renal function more than isoflurane after congenital heart surgery in children.

10AP3-11

Prediction of tracheal tube size in children using regression analysis

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Background and Goal of Study: More than 2000 paediatric patients are submitted to endotracheal intubation in our Hospital each year. Therefore, choosing an appropriate tracheal tube size is an important issue in our daily practice because it allows correct ventilation and helps to avoid possible complications. This study tests de accuracy of Levin's formula (D=18+age/4) in selecting the appropriate size of tracheal tube to be used and seeks for an alternative formula that could make a better prediction.

Materials and Methods: A retrospective study was undertaken using our anaesthetic records between 2003 and 2007 (12035 children). Data preprocessing consisted on excluding: incomplete records, patients with age <1 or >12 years old, cases where there was an inherent difficulty in the intubation process, tracheal tubes reinforced with wire, cases where intubation occurred without muscle relaxation, nasotracheal intubation, weight <P_5 or >P_{95}. Diameters of tracheal tubes were analysed in 3182 children. A screening of the variables sex, ln(weight) and paediatric age (P.A) was made, in order to select those that better explain the variability in tracheals tube size data. With this purpose a regression analysis was first performed, using the classical forward and backward variable selection methodologies. Those results were compared with Levin's formula using computer calculations. This was achieved by repeatedly estimate the model from random selected data, followed by testing each estimated model with another data set, also randomly selected.

Results and Discussion: The variable that better explain the variability found in the tracheal tube size is {ln(weight), PA}. Predictive models were constructed with this variable subset and the results found for the R^2-statistic in the model development phase were R^2=0,756. A formula with these variables was derived (D=3.4498+0,513 ln(weight) + 0,1821 PA). The performance of Levin's formula and the {ln(weight), PA} formula was analysed and showed that the results from this new formula were consistently better.

Conclusion(s): We concluded that the selection of tracheal tube size is best accomplished using {ln(weight), PA}. Through this new formula a 2-entry table can be obtained to determine the best tube size with subsequent increase in efficiency and less economic strain. Further prospective study is suggested for our new formula with a larger number of children and analysing separately cuffed and uncuffed endotracheal tubes.

Abstract 10AP3-10 – Table 1. Serum and urine laboratory data

		After induction of anesthesia	2h post CPB	24h post CPB	48h post CPB	72h post CPB
Group S (n=29)	Serum Cystatin C (ng/ml)	1204.8 ± 382.5	915.2 ± 324.1	1209.8 ± 451.5	1193.9 ± 460.7	1330.5 ± 494.5
Group S (n=29)	Urine B2-microglobulin (mg/L)	0.4 ± 0.6	2.2 ± 4.3	2.0 ± 3.9	2.4 ± 4.4	1.3 ± 3.7
Group I (n=29)	Serum Cystatin C (ng/ml)	1148.1 ± 309.5	958.7 ± 352.1	1288.9 ± 487.0	1213.7 ± 464.1	1182.9 ± 522.5
Group I (n=29)	Urine B2-microglobulin (mg/L)	0.4 ± 0.3	1.2 ± 2.1	1.7 ± 3.6	1.3 ± 2.9	1.7 ± 3.3

Obstetric Anaesthesia

11AP1-1

Effective dose of levobupivacaine and ropivacaine in 80% of patients (ED80) receiving epidural analgesia in labour using the continual reassessment method (CRM)

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Background and Goal of Study: The effective dose in 50% of patients (ED50) obtained from the MLAC studies suggested that levobupivacaine (levo) potency is between bupivacaine and ropivacaine (ropi) potencies. CRM is used to determine the effective dose for 80% of patients (ED80), which is more relevant than ED50 for clinical purposes. Our goal was to determine ED80 for levo and ropi in labour epidural analgesia.

Materials and Methods: The parturients were included after ethics committee approval in first stage of eutocic labour, with visual analog pain score (VAPS) > 30 mm. They were randomised into cohorts of 6, and received in a double blind manner 20 mL of levo or ropi epidurally. The efficacy (i.e., VAPS ≤ 10) was assessed 30 minutes later. The first cohort received the lowest concentration. Every new cohort received a concentration according to the response's probability calculated with the specific software BPCT [1], incorporating data from all consecutive previous patients. The concentrations chosen were 0.04, 0.08, 0.11, 0.14, 0.17, and 0.2% with the following a-priori chosen probability of success: 0.2, 0.45, 0.65, 0.75, 0.85, 0.95 for levo and 0.15, 0.4, 0.6, 0.7, 0.8, 0.9 for ropi. Patients were included until the probability for the concentration administered to remain unchanged becomes > 0.99 for both groups. A logistic equation was fitted a-posteriori to the whole data set to determine the whole dose-probability curve.

Results and Discussion: 54 patients were enrolled. The two groups were similar. A levo concentration of 0.17% gave a probability of success of 82% (95% credibility interval: 0.63-0.94). A ropi concentration of 0.2% gave a probability of success of 72% (95% credibility interval: 0.5-0.88). By fitting a logistic model to the data, we determined an ED50 of 0.085% for levo *vs.* 0.17% for ropi and an ED80 of 0.14% for levo *vs.* 0.24% for ropi. There was no difference in side effects between the two groups.

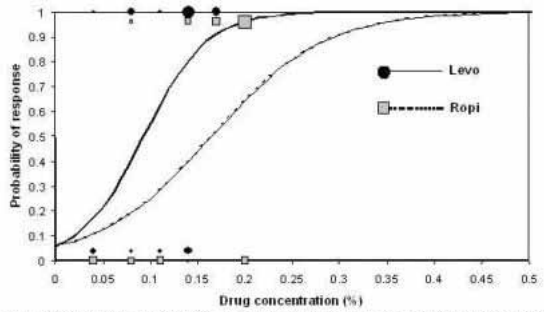

Figure: Individual data (success=1 ,failure=0) vs. concentration of ropivacaine (squares) or levobupivacaine (circles) and fitted curves using the two-parameter logistic equation. The area of the symbols is proportional to the logarithm of the number of events

Conclusion(s): This study suggests that ED80 is lower for levobupivacaine than ropivacaine, which may confirm that levobupivacaine is more potent than ropivacaine at this concentration (ED80) close to the one targeted in clinical practice.

Reference:

1 Zohar S, Comput Methods Programs Biomed 2003.

11AP1-2

Effect of rocking motion on labor pain in the sitting position during the onset of epidural analgesia

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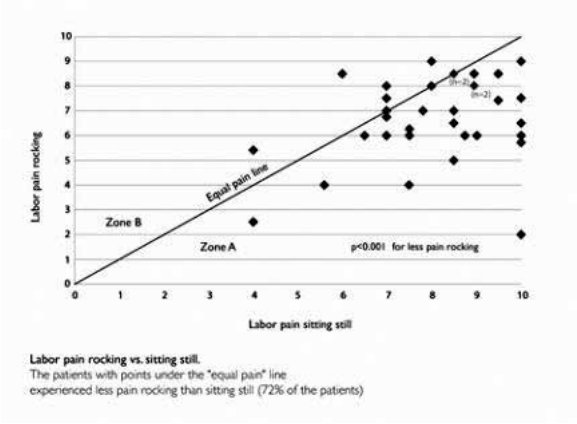
Background and Goal of Study: To rock the body is an ancient universal practice and cradling babies is used to calm them down. This study assessed the effects of rocking motion on labor pain and women satisfaction during the epidural analgesia procedure.

Materials and Methods: In this clinical prospective observational study, 50 laboring women were asked to rock back and forth while preparing epidural analgesia material as well as during the puncture and while inserting the epidural catheter. Pain scores were recorded in three consecutive positions: lying down, sitting still and then rocking back and forth while seated. We also noted overall satisfaction (0 to 10) and any other comments on the rocking procedure. Pain scores are presented as means ± SD and were compared by paired Student t-tests sign tests with Bonferroni corrections. P < 0.05 was considered as significant.

Results and Discussion: Only one patient refused to rock during the procedure. Five women alternated moving and still periods. Pain scores were similar in the lying (7.9 ± 1.7) and then sitting position (8.0 ± 1.7), whereas it significantly decreased while rocking (6.4 ± 1.7; p < 0.001 vs. both lying and sitting still positions). This decrease in pain score was individually felt by 72% of the women. Satisfaction associated with rocking chair motion was 8.9 ± 1.4. 90% of the women felt a well-being perception as they were rocking back and forth. The rocking motion didn't disturb the anesthetic's technical work. No complications occurred such as dural punctures. This rocking procedure was also well accepted by healthcare givers. Involvement in an action that focuses parturient attention, loss of parturient landmarks and/or vestibular system stimulation producing a change in the cognitive perception of the body[1] may explain these effects.



Labor pain rocking vs. sitting still.
The patients with points under the "equal pain" line experienced less pain rocking than sitting still (72% of the patients)

Conclusion(s): Within the limits of this observational and preliminary study, we observed that rocking motion during epidural procedure was associated with a significant decrease in labor pain.

Reference:

1 Lenggenhager B, Mouthon M, Blanke O. Spatial aspects of bodily self-consciousness. Consciousness and Cognition 2009; 18:110-7.

11AP1-3

PCEA labour analgesia: Are we better with or without background infusion?

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Background and Goal of Study: Patient controlled epidural analgesia (PCEA) has been used for pain relief during labour since 1988. We looked into the current regime to find out the incidence of the motor blockade and other effects.

Materials and Methods: This is a prospective audit from a London teaching hospital birth centre with about 6000 deliveries every year.The current PCEA regime is Bupivacaine (0.1%) with Fentanyl (2micrograms/ml) delivered via a GemStar® Infusion pump. The bolus dose is 8ml with a lock out of 30 minutes. We use a background infusion rate of 8ml/hour. The patients were followed up after the delivery in the ward.

Results and Discussion: We included 40 women who had PCEA for labour pain relief. About 52% women experienced one sided pain during labour, most of which was relieved by subsequent PCEA bolus doses or a manual bolus. 77% said they had heavy motor blockade with a Bromage score of 2or more. Heavy motor blockade was one sided in 70% of the subjects. 48% parturients said the motor blockade was very distressing. 67% were lying on one side most of the time during their labour. Even though the background infusion enhances the quality of the analgesia, the motor blockade is one of the complications. The back ground infusion reduces the incidence of unscheduled clinician interventions[1]. Bolus only PCEA are known to reduce the incidence of motor blockade. Bolus dose given in the lateral position can increase the height of the block on the dependent side by up to 3 segments. Also faster the rate of injection, faster will be the onset of the effect. The maximum speed of injection with the GemStar® Infusion pump is 125ml/hour (8ml over 3 minutes 50 seconds)

compared to a manual bolus which can be completed in 20 seconds. Catheter tip position seems to play a role to influence the spread as well. Other pregnancy related factors are epidural space pressures and adjacent cavity pressures. With good explanation and communication with the parturient as well as midwives, better outcome can be expected with the bolus only regimes. PCEA Pumps with variable speed of injection needs evaluation to find out the optimum speed of bolus delivery through the epidural route.

Conclusion(s): Background infusions with PCEA are successfully used to provide labour analgesia. Incidence of motor blockade is very high which raises the concern as major complications can go unnoticed. Boluses only PCEA regimes can potentially reduce the motor blockade.

Reference:

1 Halpern SH. Patient-controlled epidural analgesia for labor. Anesth Analg 2009;108(3):921-8.

11AP1-4

Assessment and comparison of endogenous modulatory pain mechanisms in pregnant women at term and non pregnant women

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Background and Goal of Study: Sex differences in pain perception and modulation are documented in experimental conditions and chronic pain. Hypoactivity of pain inhibitory systems and enhanced excitatory mechanisms place female patients at higher risk for acute and persistent pain (1)(2). Late pregnancy seems associated with protective analgesic mechanisms. The study assessed endogenous pain modulatory systems in pregnant women at term (before elective cesarean section,>36 weeks) and non pregnant women (adult volunteers).

Materials and Methods: Recruited women underwent two testings. Excitatory system was assessed by temporal summation (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. Diffuse noxious inhibitory controls (DNIC) were evaluated by application of tonic heat pain stimulus and pain reduction during the exposure to another noxious stimulus (hot water) in a remote body area as previously described (3). Statistical analysis used Mann-Whitney rank sum test, a P value < 0.05 was considered significant (*).

Results and Discussion: Non pregnant (n=20) and pregnant women (n=23) did not differ for age and health status. Sensitivity to noxious mechanical but not thermal stimulus was reduced in late pregnancy. Positive DNIC score (i.e. efficient DNIC, > 0) was present in 58% of pregnant women but only in 25% of non pregnant women (* p=0.03). Positive TS was found in 31% and 28% of pregnant and non pregnant women respectively.

Pain scores during TS and DNIC tests (median, IQR)

	Pregnant women	Non pregnant women	
TS test			
First mechanical pain stimulus VAS	0 (0-10)*	10 (10-20)	p<0.01
TS value	10 (0 - 20)	10 (0 - 15)	p=0.35
DNIC test			
Hot water conditonning pain stimulus VAS	40 (20-50)	30 (5-42)	p=0.103
DNIC value	0 (-5 - 13)	-9 (-21 - (-2))	p=0.08

Conclusion(s): These preliminary results seem to show that inhibitory mechanisms (DNIC) rather than excitatory mechanisms (TS) are influenced by pregnancy. Similarly, sexual hormones influence DNIC analgesia but not TS during the menstrual cycle (2).

References:

1 Fillingim et al. J Pain 2009; 10 : 447-85;

2 Toussignant-Laflamme et al. Pain 2009;146:47-55 #3. Yarnitsky et al. Pain 2007; 138:22-28.

11AP1-5

Predictive criteria of difficult epidural analgesia for labour

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Background and Goal of Study: Epidural analgesia is widely used for labour pain relief. Multiple attempts at needle placement and epidural space identifying may cause patient discomfort, higher incidence of spinal hematoma, postdural headache and trauma of neural structures. Several factors have been identified as predictive of a technically difficult neuraxial block. The aim of the present study was to determined which of the factors reported were best predictors of difficult epidural analgesia in obstetric.

Materials and Methods: After institutional approval and informed consent, 120 parturients requiring lumbar epidural analgesia were included. All epidurals were performed in the sitting position. A difficult puncture was considered if the identification of the epidural space and the placement of the catheter need more than one skin puncture or one skin puncture but more than one redirection in the interspinous space. The following criteria were recorded before placing the epidural: – Body mass index (BMI, kg. m-2) – Body habitus subjectively classified as thin, normal, muscular or obese; – Abdominal perimeter (cm) – Quality of anatomical landmarks: Grade 1 = the spinous processes are visible; Grade 2 = the spinous processes are not seen but easily palpated; Grade 3 = the spinous processes are not seen and not palpated but the interval between them is palpated as a low land mark under the thumb; and Grade 4 = none of the previous cases. – Apparent spinal anatomy, assessed by inspection and examination: normal or deformed. The factors evaluated as predictive of difficulty were: BMI > 30 kg. m-2, body habitus classified obese, abdominal perimeter > 105 cm, anatomical landmarks grade 3 or 4 and spine deformity. Univariate comparisons between groups were made by Chi-Squared –test for categorical variables. Logistic regression was used to test the association between variables and level of difficulty. The level of significance was set at $P < 0.05$.

Results and Discussion: We studied 120 patients. The total number of attempts varied between 1 and 4. Among the 120 lumbar epidural analgesia, 51 were considered difficult (42,5%). In the multivariate analysis only the BMI > 30 kg. m-2 (OR = 1.1; 95% CI = 1 – 1.2) and a spine deformity (OR = 8.5; 95% CI = 1.5 – 47) were independent predictors of difficult epidural analgesia.

Conclusion(s): Lumbar scoliosis and difficult identification of the interspinous spaces indicate the need for an alternative identification technique of the epidural space like echography.

11AP1-6

Maternal satisfaction with different techniques of epidural analgesia: A comparison between top-ups, programmed intermittent epidural bolus (PIEB) and continuous epidural infusion (CEI)

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Background and Goal of Study: We evaluated maternal satisfaction with three epidural techniques using a retrospective audit of multiparous women and a prospective study of nulliparous women.

Materials and Methods: To investigate maternal satisfaction with top-ups vs PIEB we interviewed a sample of 35 multiparous women who received epidural labor analgesia with PIEB+PCEA for their current labor and with the intermittent manual bolus techniques (top-up) for their previous labor. To investigate maternal satisfaction with PIEB vs CEI, both with PCEA, we interviewed 145 nulliparous women who were previously enrolled in a double blind, randomized clinical study of PIEB and CEI. After delivery mothers were given a questionnaire (5 point Likert scales) covering the following themes: experience of labor pain, feeling of control, sense of deprivation and or participation, fears and expectations associated with pain control. To elaborate on these answers, 30 mothers were further randomized to a semi structured interview, in which the same topics were discussed. Wilcoxon rank sum tests and Fisher's exact test were used where appropriate.

Results and Discussion: All groups were comparable in respect to duration and neonatal and labor outcome. Multiparous women reported to be more pleased in the second birth, since the PIEB have had offered a better control and stability of labor analgesia, avoiding wide fluctuations in analgesia previously observed with manually administered boluses (P<0.001). In the prospective analysis, nulliparous women expressed less satisfaction with CEI, compared to PIEB, because they experienced motor block, numbness and feeling of loss of control (P<0.01). In addition, women who received CEI reported less ability to ambulate and to cope with labor and delivery (P<0.05). Nulliparous women randomized to CEI consistently reported lower scores at the post delivery overall evaluation when compared to those allocated to PIEB (P<0.001).

Conclusion(s): Analgesia and satisfaction with analgesia are not equivalent concepts[1]. PIEB has been associated to less breakthrough pain, CEI with higher incidence of motor block and top-ups with analgesic fluctuations: these aspects may affect maternal satisfaction. Continuous and stable analgesia, sense of control, painless uterine contraction feeling, ability to walk, absence of numbness and motor block and ability to push are also important to determine maternal satisfaction with labor analgesia.

Reference:

1 Hodnett E AJOG 2002; 186:S160–72.

11AP1-7

Maternal satisfaction with labour analgesia: Evidence from tertiary care centre in Lithuania

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Background and Goal of Study: satisfaction with medical care during childbirth is a multidimensional issue, of which analgesia is but one component. It depends on subjective patient's values and is result of the comparison between expectations and perceived outcome. Knowing what is important for our patients offers a space for continuous improvement of care.

Materials and Methods: a cross sectional study carried out at a tertiary centre of perinatology in Kaunas, Lithuania, in January of 2009. After informed written consent standardized questionnaires covering different aspects of anaesthetic care (information on labor analgesia techniques, preanalgesia visit, analgesia and postanalgesia period) were presented on second post-partum day to all mothers having given vaginal birth. Data were analysed using ***t***, χ^2 and Kruskal-Wallis tests were appropriate ($p<0.05$ was considered significant).

Results and Discussion: 217 women agreed to participate in the study, response rate was 93%. 29% of patients received continuous epidural analgesia (EA), systemic analgesics or no analgesia was administered in 71% of patients. Willingness to get EA correlated with younger age (p=0.000) and less parity (p=0.03). All patients had sufficient information about analgesia techniques, but primary sources of it were different: EA was chosen more frequently by women who identified maternity classes as primary source of information in comparison to those who learned about it from internet, media, etc (p=0,028). Respect experienced during anaesthesia care and level of discomfort before analgesia had no influence on patients' evaluation of analgesia efficacy (p=0,5, p=0,2 respectively). Efficiency of pain relief highly influenced satisfaction with analgesia (p=0,000), perceived anaesthesiologist's competence (p=0,000) and overall estimation of anaesthesia care (p=0,000).

Conclusion(s): younger nulliparous women choose invasive analgesia techniques more often. Efficiency of pain relief is main determinant of different aspects of satisfaction with anesthesia care during labour.

11AP1-8

A comparison between programmed intermittent epidural bolus (PIEB) and continuous epidural infusion (CEI) both with patient controlled epidural analgesia (PCEA) at different concentrations

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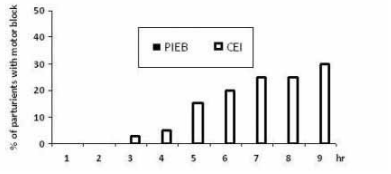
Background and Goal of Study: PIEB+PCEA have been reported to be superior to CEI+PCEA for labor analgesia[1]. We hypothesized that, as pain intensifies with the progress of labor[2], the current PIEB+PCEA technique needs to be refined to customize analgesia by using 2 pumps with 2 different local anesthetic solutions less or more concentrated respectively for PIEB or PCEA. The primary outcome was maternal motor block. Levobupivacaine (L) consumption and n of PCEA boluses were the secondary outcomes.

Materials and Methods: After informed consent, we enrolled 160 nulliparous women in active labor. After epidural loading dose (20 mL L 0.0625% + sufentanil 10 mcg) pts were randomized to receive PIEB +PCEA or CEI+PCEA. We used 2 pumps: one programmed to deliver L 0.0625% + sufentanil 0.5 mcg / mL as PIEB or CEI, and the other programmed to deliver L 0.125% as PCEA (bolus 5 mL, 10 min lockout, max 2 boluses/hr). VAPS and a modified Bromage score were determined every 60 min until delivery. PCEA boluses, n of manual rescue boluses and total L consumption were recorded. Student's *t*-test, Mann-Whitney *U*-test, Chi^2 or the Fisher's exact test were used.

Results and Discussion: 15 pts were excluded from the study due to protocol violations. No differences in demographics, labor data and VAPS were observed. Results in table and figure.

	PIEB (n=75)	CEI (n=70)	P
Total number of PCEA boluses	3 (0-5)	6 (1-8)	< 0.01
First PCEA bolus (min before delivery)	210 (185-420)	370 (210-580)	< 0.05
Additional manual boluses (n)	11	23	< 0.01
Total levobupivacaine dose (mg)	41.4 (12.5-85)	68.3 (18.5-136)	< 0.05



Conclusion(s): In the PIEB group we observed a reduction of the total local anesthetic dose and the n of PCEA boluses which were requested later in labor process, which suggested a more tailored analgesia. The lower dose used with PIEB may explain the absence of motor block. The different mechanism of the diffusion of the anesthetic solution into the epidural space claimed for the intermittent techniques[3] might also play a role in reducing the involvement of motor fibers.

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11AP1-9

Comparison of two techniques of epidural analgesia in the experience of labour: Intermittent bolus versus continuous infusion

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Background and Goal of Study: Improvement in analgesia techniques not always have resulted in a measurable improvement in maternal satisfaction. Satisfaction is a multidimensional issue, of which analgesia is one component. The aim of our study was to compare epidural analgesia by intermittent hourly boluses with continuous infusion for labour maintenance, regarding maternal satisfaction, analgesic efficiency, mode of delivery and neonatal outcomes.

Materials and Methods: Prospective, observational study in 48 full-term pregnancy patients, in labour, with cervical dilatation between 2-5 cm. After initial bolus of 10 ml of ropivacaine 0,2 % and 2 ml of sufentanyl 0,005 mg/ml, parturients were divided in 2 groups, Group I (n=24) – analgesia maintenance by continuous infusion of ropivacaine 1 mg/ml and sufentanyl 0,25 µg/ml, at 8 ml/h started after 1 hour of initial bolus and Group II (n=24) – analgesia maintenance by hourly intermittent boluses of 8 ml of the same solution, also started one hour after the initial bolus. Supplementary analgesia was provided on request with 5 ml boluses of 0,2 % ropivacaine. Clinical data, pain intensity (numeric rating scale), sensory and motor block, drug dose, number of rescue boluses, labour duration, Apgar and pH of the newborn were registered. At 48 hours, patient satisfaction was assessed through a questionnaire – QESP.

Results and Discussion: There were no differences between the 2 groups regarding the clinical characteristics, motor and sensitive block, duration of labour, drug doses, patient satisfaction, Apgar and pH of the newborn. During labour, Group II had an average decrease in pain intensity of – 0,416 (CI 95%, -0,766 to -0,066). Group II required fewer rescue boluses (p=0,003), had less pain in the first (p=0,001) and second day postpartum (p=0,009). There were no differences in the level of satisfaction using QESP between groups. (p=0,510). During labour, parturients in Group I showed higher degree of concern regarding the fetus (p= 0,025).

Conclusion(s): In both techniques the degree of satisfaction was similar. Epidural analgesia by hourly intermittent bolus is an effective technique, leads to lower pain intensity, fewer rescue bolus, reducing maternal concerns during childbirth.

Acknowledgements: We would like to thank Professor Joaquim Viana.

11AP1-10

Association of continuous perfusion and patient controlled epidural analgesia for the management of labour pain: A randomized double-blinded study vs single patient controlled epidural analgesia

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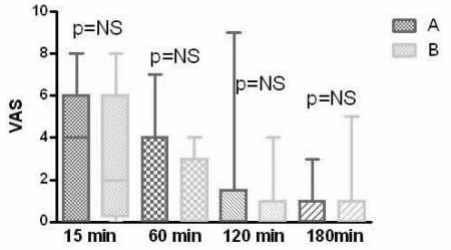
Background and Goal of Study: The use of a continuous perfusion of local anaesthetic (LA) to treat labour pain is controversial. The aim of the study was to evaluated the association of a continuous perfusion (CP) with a Patient Controlled Epidural Analgesia (PCEA) in a tertiary university hospital.

Materials and Methods: After local ethic committee approval, 40 patients were randomized in two groups A (PCEA with CP) and B (PCEA alone). The primary outcome was a decrease of consumption of LA during labour: for a 40% decrease[1], the number of patients required is 17 per group (α=0,05 and β=0,80). The secondary outcomes were the quality of analgesia (VAS), the requirements of epidural supplementary doses administrated by the anesthesiologist and the maternal satisfaction (numeric scale from 0 to 10). Non parametric tests were used for quantitative variables and Chi-2 or Fischer exact test when appropriate for qualitative variables. p<0,05 was considered significant.

Results and Discussion: Three patients of group A where excluded for violation of the protocol. Demographic parameters and labour duration (A: 385±143 min B: 355±167 min p=NS) were comparable between groups. AL dose was lower in patients of group B compared with those in group A (A: 70,3±31,4 mL B:38,5±23,5 mL p<0,001). The number of auto-administrated bolus was higher in group B compared with group A (A: 1,4±1,6 B:3,9±24 p<0,001). Patients in group B didn't require more extra doses administered by the anaesthesiologist than those in group A (A: 2/17 patients (11,8%) B: 3/20 patients (15%) p=NS), suggesting a comparable incidence of irruptive pain. Pain levels where comparable between groups (Figure 1) suggesting a good management of labour pain in both groups. Maternal satisfaction was comparable between groups (A:9,65±0,7 B:9, ±1,2 p=0,07).



Conclusion(s): The absence of continuous perfusion in the PCEA reduced total LA consumption for labour analgesia with no change on analgesia levels, maternal satisfaction and labour time, and does not implicate an overload of work of the anesthesiologist.

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11AP2-1

The treatment of hemorrhage in obstetrics – Our experience

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Background and Goal of Study: Massive obstetrics bleeding is the most common cause of maternal mortality and morbidity. The first step in the treatment of these patients is establishing the adequate circulatory volume. The primary goal of the therapy is to identify and remove the cause of bleeding with appropriate symptomatic and substitution therapy. Human recombinant activated factor VII (rFVIIa) is officially registered for the treatment of patients suffering from haemophilia with inhibitors. It has also proved successful in other congenital and acquired coagulopathies and in patients with acute non-haemophilic bleeding. A special significance is given to the application of rFVIIa in cases of obstetrics haemorrhage, in order to avoid postpartum hysterectomy and occurrence of complications of haemorrhagic shock in obstetrics.

Materials and Methods: The aim of this study is to present our experience and results of the use of rFVIIa in the treatment of patients with massive postpartum bleeding. The retrospective study included six patients with primary postpartum haemorrhage treated with rFVIIa at our institution in the period from 2005 to 2007.

Results and Discussion: The treated patients were divided into two groups. In the first group, there were three patients who underwent hysterectomy and who received rFVIIa over 24 hours after delivery. The second group consisted of three patients who received rFVIIa in the first 24 hours after delivery, before we decided to perform hysterectomy. The application of rFVIIa led to successful cessation of bleeding in all patients. Serious side effects were not registered.

Conclusion(s): The administration of rFVIIa in obstetrics should be considered for each patient before decision to perform hysterectomy and it should certainly be applied in patients who want to preserve the uterus and fertility capability. According to our experience, in cases of postpartum haemorrhage, rFVIIa is to be administered in intravenous bolus doses of not less than 90 µg /kg at least 6 hours after the onset of bleeding. rFVIIa is not an alternative to adequate surgical haemostasis; therefore, it needs to be administered after its detailed revision.

11AP2-2

The role of the post-anesthetic care unit in the postoperative management of high-risk obstetric patients

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Background and Goal of Study: The need for more selective admissions to the intensive care unit calls for a more practical but equally safe management of high-risk obstetric patients. We describe the utilization of the post-anaesthesia care unit (PACU) for high-risk obstetric patients in the immediate postpartum period.

Materials and Methods: We retrospectively described the recorded PACU admissions of all women deemed high-risk after giving birth for a period of 4 years (2005-2008) in a non-primarily obstetric University hospital. Criteria for admission were severe or poorly controlled gestational hypertension, peripartum hysterectomy, major hemorrhage, anaesthetic complications, and severe comorbidities. We studied the kind of administered anesthesia, the reason for PACU admission, the duration of PACU stay, as well as parturient outcome. One-way ANOVA was used for statistical analysis.

Results and Discussion: Of the total 3,071 women who gave birth, 47 (1.5%) were transferred to PACU. Total PACU admissions in the same period were 10,766 (consisting of general surgery, orthopedic, vascular surgery and gynecological patients) and obstetrical cases represented 0.44% of them. Of the 47 admissions 57% were urgent, while 43% were planned. Anesthesia was epidural (EA) in 26%, combined spinal and epidural (CSEA) in 21% and general (GA) in 38%. GA was used in 85% of emergency deliveries (11/13), but only in 27% of non-emergency cases (9/33) ($p<0.01$). The leading reason for admission in PACU was hemorrhage (48.9%), followed by cardiovascular problems (19%) and preeclampsia/eclampsia (17%). PACU stay was 16±13h for patients who received CSEA, 19±14h for GA, 10±7h for RA converted to GA and 8±6h for EA. The difference in PACU stay was significant between EA and GA ($p=0.012$). This may have resulted from the fact that more urgent cases were treated with GA, rather than from a pure advantage of the EA. No maternal death, neurological disorder or deterioration of other pre-existing organ insufficiency was observed and no patient was transferred to the ICU.

Conclusion(s): Utilizing PACU for postpartum treatment of high-risk obstetric patients successfully prevented all ICU admissions and was associated with a short stay (<24h). In a non-primarily obstetric hospital, taking advantage of PACU as an intermediate facility seems a satisfactory alternative, instead of unnecessarily using the ICU or establishing a high-dependency unit.

11AP2-3

Continuous noninvasive blood pressure monitoring during spinal anaesthesia for cesarean section

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Background and Goal of Study: Hypotension is a common adverse event during spinal anaesthesia (SPA) for cesarean delivery. Detection and treatment of it is essential. Discontinuous oszillometric blood pressure (Discont BP) measurement is routinely applied in these patients. Whereas rapid changes of BP after SPA may be missed (1). Recently, a continuous noninvasive monitoring device (Cont BP) has been introduced. This device is based on continuous pressure recording via finger cuffs calibrated with a single oszillometric measurement. We hypothesise that (I) Cont BP can be easily applied in women under SPA for cesarean section, (II) lowest systolic BP can be detected only with the Cont BP device, (III) hypotensive episodes can be reliably detected only by Cont BP.

Materials and Methods: 50 women scheduled for cesarean section under SPA were enrolled. Cont BP was measured by CNAP Monitor (CNSystems, Graz, Austria), Discont BP every three minutes by Datex AS5 (Datex, Helsinki, Finland). For every three minute interval the maximum difference between Cont BP and Discont BP and the lowest BP of both devices in the course of SPA were compared. Additionally, the number of hypotensive episodes (sys BP < 80mmHg) was compared. Statistics: t test and Fisher's exact test, p<0.05.

Results and Discussion: Cont BP was applied to all women without side effects or discomfort. Cont BP identified lowest BP within three minute intervals as well as absolut lowest BP more precisely compared to Discont BP. The number of hypotensive episodes was significantly higher with the Cont BP device compared with the Discont BP measurement (table 1).

Continuous vs. Discontinuous BP monitoring

Device	Lowest BP within 3 min	Absolute Lowest BP within SPA	Hypotensive Episodes (n)
Continuous BP	99+-21 mmHg	78+-22 mmHg	225 (n=611)
Discontinuous BP	123+-19 mmHg*	95+-13 mmHg*	148 (n=611)

BP = blood pressure, SPA = spinal anaesthesia, * = p<0.05

Conclusion(s): BP could be measured precisely by use of the Cont BP device. Absolute lowest BP and lowest values within three minutes intervals were significantly lower in Cont BP compared to Discont BP. The number of identified hypotensive episodes was significantly higher when BP was measured continuously. Thus, rapid changes of BP in the course of SPA for cesarean section can be detected

more precisely by the Cont BP method. Anaesthesia care of women scheduled for cesarean section under SPA may be improved by Cont BP monitoring.

Reference:

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11AP2-4

Pressure ulcers after obstetric neuraxial blockade. What's the risk?

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Background and Goal of Study: In obstetrics,women are considered to be at low risk of developing pressure ulcers,however there are cases reported in the literature particularly associated with epidurals.In 2005,NICE published recommendations on the prevention and treatment of pressure ulcers but no such risk assessment is carried out in our unit.Following two cases in a month,we aimed to review previous cases and see if these could have been prevented by following the NICE guidelines.

Materials and Methods: We identified obstetric patients diagnosed with a pressure ulcer between April '07 to April '09.The notes were reviewed and any risk factors for pressure ulcers listed as per NICE guidelines (table 1).

pressure	↓mobility	concious level	posture	extremes of age	surgery
shear	↓↓Sensation	acute/chronic illness	cognition	nutrition/hydration	critical care
friction	Incontinent	comorbidity	previous pressure damage	moisture to skin	

Results and Discussion: Six patients were identified,all of whom had some form of neuraxial blockade. Table 2 shows the risk factors for each patient. [table1]Many of these risk factors relate to being in labour itself but when combined with neuraxial blockade,surgery or a critical care stay,parturients are at high risk of developing pressure ulcers.

Patient 1	Patient 2	Patient 3	Patient 4	Patient 5	Patient 6
Posture/ Shear/ Friction	Posture/ Shear/ Friction	Posture/ Shear/ Friction	Posture/ Shear/ Friction	Posture/ Shear/ Friction	↓mobility
Incontinent	Incontinent	Incontinent	Incontinent	Incontinent	↓Sensation
↓mobility	↓mobility	↓mobility	↓mobility	↓mobility	Surgery
↓Sensation	↓Sensation	↓Sensation	↓Sensation	↓Sensation	
Moisture to skin	Moisture to skin	Moisture to skin	Moisture to skin	Moisture to skin	
Surgery		Surgery	Surgery	Surgery	
Critical Care			Critical Care	Critical Care	
				↓concious level	

Conclusion(s): Pressure ulcer prevention is a key indicator of quality of care and has traditionally been managed by the nurses,however prevention is multidisciplinary. Although the numbers in our unit are small,pressure ulcers are entirely preventable.Neuraxial blockade had been performed in all the cases,therefore anaesthetists have a responsibility to educate parturients and midwives that there is an increased risk particularly when labour is prolonged and during recovery of sensory/motor blockade. Having identified several risk factors in all six patients, we are introducing a risk assessment proforma for pressure ulcers in obstetrics together with the NICE recommendation of frequent repositioning as a preventative measure.

11AP2-5

Differential impacts of modes of anaesthesia on the risk of stroke among preeclampsia-eclampsia women who undergo caesarean delivery: A population-based study

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Background and Goal of Study: This study compared the stroke-free survival rates and hazard ratios (HR) of stroke between preeclamptic patients who received general anaesthesia and those who received neuraxial anaesthesia (i.e., epidural and spinal anaesthesia) for caesarean section (CS) delivery.

Materials and Methods: The study used 2002-2007 data from the Taiwan National Health Insurance Research Database. There were a total of 8567 women with preeclampsia/eclampsia who underwent CS delivery. The stroke-free survival rate was estimated by the Kaplan-Meier method. The log-rank test was used to examine the difference in the effect on the stroke-free survival rate among three modes of anaesthesia. Cox proportional hazard regression was used to estimate the HR for general anaesthesia after adjustment of variables significantly associated with strokes.

Results and Discussion: The stroke-free survival rate was significantly lower in the women who received general anaesthesia as compared with those who received epidural ($p = 0.01$) and spinal anaesthesia ($p < 0.001$) within the 6-year period after the index delivery. The risk of stroke was not significantly greater for those who received spinal anaesthesia ($p = 0.203$) as compared with those who received epidural anaesthesia. After adjusting for age, severity of preeclampsia, ICU admission and history of CS, the adjusted HR for those who received general anaesthesia remained 2.24 (95% CI, 1.25 – 4.01, $p = 0.007$) times as high compared with those who received neuraxial anaesthesia over a 1- to 6-year follow-up period.

Conclusion(s): General anaesthesia for CS delivery is associated with increased risk of stroke as compared with neuraxial anaesthesia in preeclamptic/eclamptic patients.

11AP2-8

Table tilt for caesarean section – An audit

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Background and Goal of Study: Maternal cardiovascular compromise and foetal distress in the supine position are well recognised.The systematic use of lateral table tilt or pelvic tilt is in practice since 1970s[1]. NICE recommends 15 degrees left lateral tilt for all pregnant women undergoing Caesarean sections[2]. Aim of the study was to compare the visually estimated tilt and the true measured tilt and the maternal and foetal outcome.

Materials and Methods: A prospective audit was carried out over a period of three months.43 parturients had singleton pregnancies and were undergoing elective or emergency LSCS. Table was tilted by the anaesthetists after the administration of the anaesthetic. Tilt was measured by the author with Inogon angle indicator and corrected to15 degree where necessary. Tilt was changed to neutral once baby was born.Type of anaesthetic, booking BMI,visual tilt,measured tilt,maternal hemodynamics,Apgar score and umbilical artery pH were recorded.

Results and Discussion: 40 patients had spinal or epidural and 2 had GA. All anaesthetists had knowledge of 15 degree tilt for Caesarean section. Visually guess was grossly inaccurate in 42/43. Average tilt given was only 8.09 degrees.Maternal hemodynamics were maintained within normal limits with fluids and metaraminol boluses.Apgar from 8-10 and cord pH from7.1 to 7.5 were found.

Table tilt	Number of patients
<12	38
12-14	4
15	1
>15	0

Number of patients and table tilt

Conclusion(s): Visual estimated angle were much less than 15 degree in most of the patients and may lead to aortocaval compression. Women felt insecure when table tilted to 15 degree especially in women with BMI> 35.Supports should be inserted to prevent inadvertent fall of the mother. Increasing the left

lateral tilt and/ or manual uterine displacement can treat hypotension promptly. Table tilt should be measured routinely during Caesarean section.

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11AP2-9

Non-invasive assessment of the incidence of raised intracranial pressure in preeclampsia

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Background and Goal of Study: Preeclampsia occurrs in 7-8% of pregnancies. Mechanisms of neurological complications occompagnying preeclempsia are not precisely known. Raised intracranial pressure (ICP) is one of the hypothesis[1]. However, the incidence of raised ICP in preeclampsia is unknown. Recently, clinical studies in trauma patients have shown a good relationship between optic nerve sheath diameter (ONSD) measured using ocular sonorgraphy and invasive ICP[2]. The aim of this study was to evaluate the incidence of raised ICP in preeclampsia using measurement of ONSD with ocular sonography.

Materials and Methods: 26 preeclamptic patients and 25 healthy pregnant women were studied. Preeclampsia was defined by the association of high arterial blood pressure (systolic blood pressure>140 mmHg or diastolic pressure>90 mm Hg) and proteinuria>0.3 g/day after 20 gestation weeks. All patients gave their informed consent. Ultrasonography was performed with the 7.5-MHz linear probe (Sonosite, Micromaxx). The two-dimensional mode was used, and ONSD was measured 3 mm behind the globe. For each optic nerve two measurements were made, one in the transverse plane and one in the sagittal plane. Data are expressed as median (CI 95%).

Results and Discussion: Epidemiologic data are presented in Table 1. Blood pressure and mean ONSD were significantly higher in preeclamptic patients (Table 2). Five patients had ONSD values>5.8 mm (value associated with 100% risk of raised ICP in previous studies). In those patients, ONSD decreased after the fourth day after delivery.

Epidemiologic data

	Preeclamptic n=26	Control n=25	p
Age (yr)	33.5 (31.0-36.4)	31 (28.0-34.0)	0.0911
Term (wk)	36.8(33.5-37.2)	34.7(33.5-35.0)	0.0611
Gravida	2 (1-4)	2 (1-3)	0.2212
Parity	0 (0-1)	0 (0-1)	0.6965
Weight (kg)	79 (68.6-88.7)	69 (63.3-79.1)	0.0744

Comparison of the two groups

	Preeclamptic n=26	Control n=25	p
Systolic blood pressure (mmHg)	143 (138-153)	111 (102-119)	< 0.0001
Mean blood pressure (mmHg)	105 (98-109)	84 (80-92)	< 0.0001
Mean ONSD (mm)	5.39 (5.16-5.73)	4.45 (4.26-4.79)	< 0.0001

Conclusion(s): This study shows that ONSD is enlarged in preeclamptic patients compared to non-preeclamptic pregnant women and suggests that raised ICP may occur in about 20% of patients with preeclampsia.

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Intensive Care Medicine

12AP1-1

The evaluation of the ability of the STG-22 to decrease the variability of blood glucose concentration in ICU patients

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Background and Goal of Study: NICE-SUGAR study showed that intensive insulin therapy (IIT) worsen mortality in critical ill patients (1). However, Egi et al. described it was important to emphasize that the findings of NICE-SUGAR study did not justify neglecting glycemic control (2). Furthermore, they reported that decreasing the variability of blood glucose concentration might be an important aspect of glucose management (3). The STG-22 (NIKKISO Inc, Tokyo, Japan) has been developed to maintain appropriate blood glucose level by automatic infusion of insulin and glucose, and target range was set up manually. We hypothesized that the STG-22 could decrease the variability of blood glucose concentration without hypoglycemia events in intensive care unit (ICU) patients. In the current study, we investigated the variability of blood glucose concentration using the STG-22.

Materials and Methods: Patients receiving IIT using the STG-22 in our ICU between August 2006 and July 2009 were enrolled in this study. IIT was started after ICU admission and continued to the end of ICU stay. The STG-22 setting was as follows; insulin was infused continuously when blood glucose level was higher than 110 mg/dl, and 10% glucose solution was infused continuously when blood glucose level was lower than 90 mg/dl. The infusion speed depended on the original algorithm of this device. In each patient, the mean and SD (standard deviation) of blood glucose during IIT using the STG-22 were calculated (Glu_{Ave} and Glu_{SD}). To evaluate relative variability, the coefficient of variability (Glu_{CV}=Glu_{SD} *100/Glu_{Ave}) was also calculated for each patient (3).

Results and Discussion: A total of 208 patients were enrolled in this study. The average driving time of the STG-22 was 33.9±42.4 hours (mean±SD). The mean blood glucose level measured by the STG-22 was 117.4±22.8 mg/dl and the average dose of insulin was 7.5±5.7 IU per hour. The Glu_{SD} was 19.9±10.9mg/dl and Glu_{CV} was 16.5±6.9%. There were no hypoglycemic events less than 71 mg/dl. The value of Glu_{CV} in our study was similar to the value in another study (20±12%) which was significantly different between ICU survivors and nonsurvivors (3).

Conclusion(s): The STG-22 could decrease the variability of blood glucose concentration without hypoglycemia events in ICU patients. This device might contribute to improvement of patients' outcome.

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12AP1-2

Pharmacokinetics of vancomycin during continuous infusion in ICU patients

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Background and Goal of Study: Recently, higher and more sustained target concentrations have been suggested for optimal antimicrobial effectiveness of vancomycin (VAN). In this study, we determined clearance (CL) and volume of distribution (Vd) of VAN in ICU patients as a basis for rational dosing algorithms.

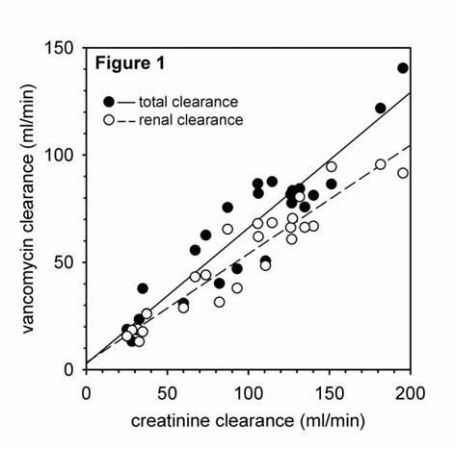
Materials and Methods: We enrolled 25 surgical ICU patients (14m/11f; table 1) into the study. The patients received continuous infusion of VAN and were not on renal replacement therapy. During steady-state, serum and urine samples were assayed for VAN (by HPLC) and for creatinine (Cr). Total and renal VAN-CL and Cr-CL were calculated. At the end of treatment, Vd was determined from VAN-CL and the elimination constant.

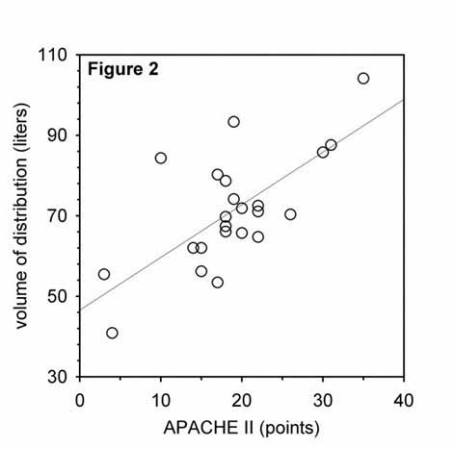
Patient characteristics and focus of infection

	median	range
age (years)	59	31 - 82
total body weight (kg)	80	45 - 120
body mass index (kg/m^2)	25.3	16.5 - 41.5
APACHE II	22	8 - 36
	n	% of total
device-associated meningitis	10	40
peritonitis	8	32
other	7	28

Results and Discussion: Both total and renal VAN-CL were closely correlated to Cr-CL (r^2 = 0.88 and 0.89, respectively; both p < 0.001; figure 1), which rules out significant elimination routes other than glomerular filtration, as have

been proposed by previous studies. In these studies, Cr-CL was estimated by the Cockcroft-Gault-formula, which is known to be inaccurate in ICU patients. Median Vd was 70 (range 41 – 104) L and positively correlated with the APACHE II-score ($r^2 = 0.48$, $p < 0.001$; figure 2). For hydrophilic drugs, increased Vd due to capillary leakage have been reported in ICU patients, but so far no formal statistical correlation with an illness-severity-score has been described for VAN.





Conclusion(s): Rational dosing of VAN in ICU patients should include an increased loading dose according to severity of ilness and a maintenance dose proportional to renal function, which should be measured rather than estimated.

12AP1-3

The correlation between blood glucose level and metabolic acidosis in acute pancreatitis

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Background and Goal of Study: Early hyperglycemia in acute pancreatitis (AP) is a prognostic sign of severe attack. Since inflammation and necrosis may develop and progress after admission, accurate identification of the subset of patients who are likely to develop severe complications is important. On the other hand, in severe cases of acute pancreatitis, regardless of origin, destruction of pancreatic tissue occurs, resulting in a systemic inflammatory response and islet cell dysfunction. This explains why hyperglycemia and leukocytosis are associated with the development of complications requiring ICU management. In this context is seen that hyperglycaemia would affect strong ion difference and acid-base balance. We studied how much hyperglycaemia correlates with metabolic acidosis in the course of acute pancreatitis.
Materials and Methods: 91 patients recovered in ICU with the primary diagnosis acute pancreatitis are included in the survey. The patients were divided in three groups regarding the severity of the disease using Balthazar-Ranson grading system (A, BC, DE): Group 1-A (n=29) with blood glucose level below 120 mg/dl, Group 2-BC (n=31) with blood glucose level until 180 mg/dl, and Group 3-DE (n=31) with blood glucose level up to180 mg/dl. All the arterial hemogasanalysis, biochemistry parameters, electrolytes and haemodinamic data were recorded.
Results and Discussion: Arterial blood pH was lower in Group 3 (Mean ± SD 7, 32±0, 05) than in Group 2 (7,34 ±0, 07), and in Group 1 (7, 36±0, 07). The bicarbonates values was lower in Group 3 (Mean ± SD, 16±1, 7) than in Group 2 (19 ±0, 9), and in Group 1 (20±1, 1). Metabolic rate was higher in Group 3 (81, 7%) that corresponds with the aggressive forms of acute pancreatitis (Balthazar-Ranson score forms: D, E).
Conclusion(s): The findings suggest that increased blood glucose level in severe cases correlates with increased rate of metabolic acidosis during the course of acute pancreatitis.

12AP1-4

Cardiac power: A reliable hemodynamic correlate of mortality in myocardial infarction

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Background and Goal of Study: Insufficient reliability and specificity of cardiac output (CO) as widely used parameter for prognosis of acute myocardial infarction outcomes led to investigations and search for new methods and parameters. A new parameter – cardiac power (CP) (parameter proportional to the product of cardiac output and mean arterial pressure) was introduced after studies mainly performed using invasive intermittent thermo dilution technique (ITD). The aim of this study was to investigate the reliability and specificity of the new parameter mainly by means of non-invasive techniques such as impedance cardiography (ICG).
Materials and Methods: Hemodynamic data – cardiac output (CO), cardiac index (CI), stroke volume (SV), and systemic vascular resistance (SVR) were evaluated by both ITD and ICG methods in patients with acute myocardial infarction complicated by CS (cardiac shock?), admitted within 12 hours from the onset of pain. During the period of 2004-2008 years 289 (196 men and 93 women) patients were investigated. The standard 8-electrode ICG registration was used. Cardiac power was evaluated using suggested formula: CP=CO x MAP/451, where CP – cardiac power, CO – cardiac output, MAP – mean arterial pressure. Optimal binning method by using minimal description length principle was used to predict outcomes after myocardial infarction: lethal of income patients, survival after 6 months and survival after 12 months.
Results and Discussion: CP evaluated on the first day was found as the only valuable prognostic parameter using model entropy method in the group of patients where non-invasive evaluation of CO was used. Lethal outcome of inpatients was predicted with a single cut point 0.65, sensitivity 100% and specificity 92.2%, while survival of 12 months was predicted with single cut point 0.90, sensitivity 88.9% and specificity 73.0%. Only prediction of in-hospital mortality was possible in the group of patients where CO was evaluated using ITD technique. The most significant criteria using minimized entropy model were CP evaluated on the 3rd day (single cut point 0.79, sensitivity 84.6%, specificity 100.0%) and CO evaluated also on the 3rd day (single cut point 4.00, sensitivity 84.6%, specificity 100.0%).
Conclusion(s): Cardiac power is a reliable predictor for in-hospital mortality and survival within first year after acute myocardial infarction. It could be evaluated using intermittent thermo dilution and with sufficient accuracy by means of non-invasive method – impedance cardiography as well.

12AP1-5

Echocardiographic estimates of left ventricular filling pressure and weaning failure

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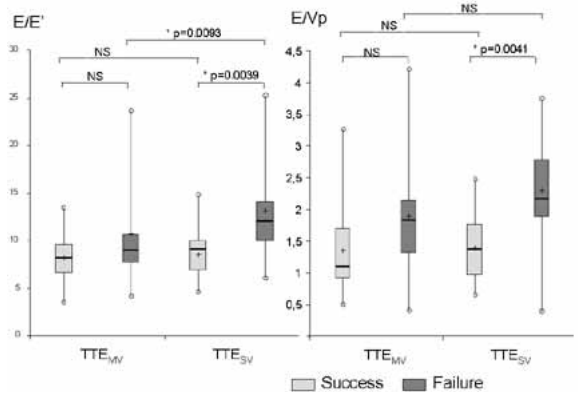
Background and Goal of Study: Causes of mechanical ventilation (MV) weaning failure in critically ill patients are multiple and include cardiac failure and fluid overload. The goal of our study was to assess whether variations of left ventricular filling pressure estimated by transthoracic echocardiography (TEE) during a spontaneous breathing trial (SBT) were predictive of weaning outcome.
Materials and Methods: This monocentric study was in accordance with the French Bioethic law. All consenting patients (>40 yrs old), MV>48 hrs and scheduled for SBT before tracheal extubation were included. Criteria of MV weaning and SBT were in accordance with the National guidelines [1]. TEE (3.5 MHz cardiac probe, Vivid7, General Electrics, USA) was done: (1) before SBT (TTE_{MV}); and (2) 5 min after the beginning of SBT (TTE_{SV}). The parameters studied were: (1) the peak velocity of the transmitral protodiastolic E wave (E); (2) the corresponding E' wave in tissue Doppler imaging; and (3) the color M-mode derived flow propagation velocity (Vp). The combined indices E/E' and E/Vp were computed. At the end of the SBT, the patient was extubated or not,

according to predefined clinical criteria [1]. According to weaning outcome, the patients were included either in **Failure** group (MV weaning failure during SBT or patient reintubated during the first 2 days), or in **Success** group (MV weaning success). Intra and intergroup comparisons were done using non parametric tests. A p<0.05 was considered significant.

Results and Discussion: 41 patients (65±13 yrs, IGS II=48±17, MV duration=10±6 d) were analyzed during a 4 months period. **Failure** group was constituted of 10 patients (5 MV failure during SBT and 5 reintubations). TEE parameters in both groups are given in Figure 1. At TTE_{SV} the E/E' and the E/Vp values were significantly higher in the **Failure** group than in the **Success** group (Figure 1).



Box plots distribution of E/E* values (left) and E/Vp values (right) at TTEMV and at TTESV

Conclusion(s): Our study suggests that the echocardiographic parameters estimating the left ventricular filling pressure could be of interest to predict the weaning outcome during SBT.

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12AP1-6

Presynaptic versus postsynaptic immobilization of the diaphragm: Effects on the acetylcholine and MuSK receptors

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Background and Goal of Study: Muscle immobilization leads to upregulation of acetylcholine receptors (AChR). Muscle-specific kinase (MuSK) is a receptor tyrosine kinase inducing clustering of AChRs. We compared 3 different diaphragmatic immobilization models and their effects on AChR and MuSK receptor expression.

Materials and Methods: Diaphragmatic immobilization for 8 days in 60 rats was induced either by 1) cervical phrenicotomy, 2) presynaptic tetrodotoxin nerve blockade (TTX), or 3) postsynaptic polyethylenorthosis. AChR and MuSK expression on excised diaphragms was quantified by immunohistochemistry. Histological changes were evaluated on ATPase and HE stains.

Results and Discussion: Fetal AChRs were significantly upregulated in all 3 models junctionally and extrajunctionally with the highest values after denervation and the lowest after orthosis immobilization. MuSK was also significantly upregulated in all models, whereas the expression of the adult AChR was not affected. In all models there was an atrophy of type 2b/c fibers. Cross-sectional area of type1 and 2a fibers remained unchanged.

Group	Fetal AChR	Adult AChR	MuSK			
	NMJ	Membrane	NMJ	Membrane	NMJ	Membrane
Denervation	2.6 ± 0.5*§	3.0 ± 0.0*§	0.5 ± 0.5§	0.0 ± 0.0	2.6 ± 0.7*	1.5 ± 0.5*
Sham denervation	0.4 ± 0.5*	0.1 ± 0.3*	0.4 ± 0.5	0.0 ± 0.0	0.6 ± 0.8*	0.0 ± 0.0*
TTX	2.1 ± 0.9*	2.6 ± 0.7*	0.6 ± 0.8	0.0 ± 0.0	2.7 ± 0.5*	1.7 ± 0.5*
Sham TTX	0.5 ± 0.9*	0.0 ± 0.0*	0.1 ± 0.3	0.0 ± 0.0	0.8 ± 0.7*	0.0 ± 0.0*
Orthosis	2.1 ± 0.3*§	2.1 ± 0.3*§	0.2 ± 0.4§	0.0 ± 0.0	2.9 ± 0.3*	1.4 ± 0.5*
Sham orthosis	0.0 ± 0.0*	0.0 ± 0.0*	0.4 ± 0.5	0.0 ± 0.0	0.3 ± 0.7*	0.0 ± 0.0*

*p<0.05 immobilization vs. sham operation; §p<0.05 denervation vs. orthosis; IHC-Score: Arbitrary units

Conclusion(s): Upregulation of MuSK correlates with the upregulation of fetal AChRs and is not associated with an increase in adult AChR. This indicates that MuSK is part of a signal pathway regulating the expression of fetal AChRs. Complete disruption of neurotrophic influence by nerve transection has a greater impact on AChR and MuSK regulation than pre- or postysnaptic immobilization of the diaphragm.

12AP1-7

Effect of intravenous glucocorticoids on the efficiency of tight glycaemic control

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Background and Goal of Study: Intravenous glucocorticoids (GC) are often administered during critical illness in the context of post-transplantation immunosuppression, ARDS, septic shock or severe inflammatory vasoplegia. As a counter regulatory hormone of insulin, GC may interfere substantially with tight glycaemic control to normal for age blood glucose levels by intensive insulin therapy. Therefore we hypothesized that the first administration of an intravenous GC gives rise to significant hyperglycaemia and that the effect is more pronounced for the synthetic GC.

Materials and Methods: All patients admitted to the surgical and paediatric ICU between 01-07-2008 and 01-07-2009 were screened for intravenous glucocorticoid use in our patient data management system. In those patients arterial blood glucose levels, all measured by blood gas analyzer, within the time frame of 48h surrounding the GC administration were retrieved. Up to 2 baseline blood glucose levels (before GC administration) and up to 6 blood glucose levels post-administration were analysed by repeated measures ANOVA. Data are expressed as mean ± SD or as median (IQR).

Results and Discussion: 452 patients {n= 26 (< 1y), n=76 (1-17y), n=350 (>17y)} received intravenous GC: hydrocortisone 32%, bolus methylprednisolone 52%, drip methylprednisolone 4% and dexamethasone 12%. Baseline blood glucose levels were 97 ± 34 mg/dL (< 1y), 104 (89-132) mg/dL (1-17y), 136 (106-174) mg/dL (>17y). In the adult patients the first blood glucose measurement was 1.0 (0.4-2.0) h after GC administration. Blood glucose levels decreased over time from baseline after GC administration (p< 0.0001). The 6th glycaemia was 110 (91-139) mg/dL taken 12.4 (9.6-16.5) h after GC administration. This decrease of glycaemia was only present in patients who received 92 ± 35 mg hydrocortisone (P= 0.004) or 40 (20-125) mg bolus methylprednisolone (p<0.0001). In patients who received 113 (71-160) mg drip methylprednisolone/day (p= 0.14) or 10 (5-12.5) mg dexamethasone (p=0.44) blood glucose levels did not change over time.

Conclusion(s): We showed that, when a tight blood glucose protocol is implemented, intravenous GC administration does not necessarily lead to an increase in blood glucose level. The blood glucose profile after methylprednisolone or dexamethosone administration did not differ from the glycaemic response after hydrocortisone administration. However this requires an on average 2 hourly blood glucose measurement after the GC administration.

Acknowledgements: G. Mwani and J. Herbots contributed equally.

12AP1-8

A retrospective analysis of Flotrac utilisation and usability in a cardiothoracic intensive care unit

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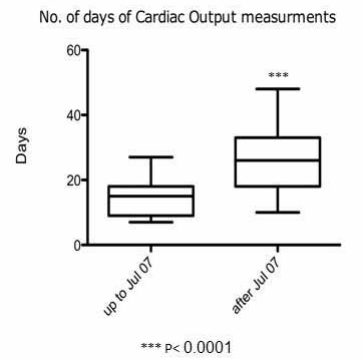
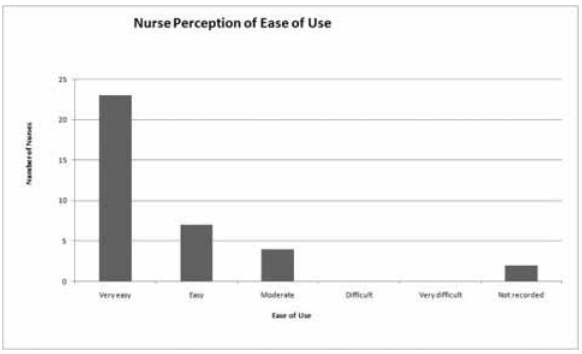
Background and Goal of Study: Improving cardiac output (CO) has been shown to improve outcome and reduce length of hospital stay in patients undergoing major surgery (McKendry et al). Amongst devices available to estimate CO we introduced FloTrac. This validated device estimates stroke volume from arterial pulse contour analysis. Previously in our unit, CO monitoring was by Oesophageal Doppler and PAC. The goals of this study were to assess whether a simpler device resulted in a change in the frequency of monitoring, which device was easiest to use and which device the nursing staff would prefer to use.

Materials and Methods: In this retrospective analysis of the ICU database from September 2005 to September 2008 we analysed the number of days of CO monitoring per month and the number of patients from whom this data was gathered. A prospective audit of nurse assessment of the Flotrac device compares Flotrac with previous monitoring devices. Inclusion criteria for the use of cardiac output monitoring were clinical evidence of low CO, patients on phosphodiesterase inhibitors, and where goal directed fluid resuscitation was used.

Results and Discussion: With FloTrac there was a significant increase in number of days of CO monitoring P<0.0001. Patient demographics were similar throughout.]In the prospective analysis of Flotrac use in 36 patients 83% of nurses found the device to be either very easy or easy to use (n = 30), and 94% preferred the use of flotrac to that of oesophageal doppler or PA Catheter (n = 34).





Conclusion(s): The introduction of flotrac in our unit has resulted in an increase in flow based haemodynamic monitoring in a greater number of patients and high levels of nurse satisfaction with a strong preference for FloTrac over other devices.

References:

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12AP1-9

A method to audit the quality of glycaemic control on a general ICU

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Background and Goal of Study: There is growing understanding of the important role which glycaemic control plays in management of critically ill patients. Much of the literature is devoted to the quality of local protocols in their ability to maintain the target glycaemic level. While there are a number of proposed quality indicators,[1] there is no consensus on the 'gold standard'. This study aimed to audit the quality of the local glycaemic control protocol.

Materials and Methods: The Royal Liverpool University Hospital is a tertiary health care setting treating critically ill adults with multiple pathologies. The intensive care unit (ICU) has 13 beds. We conducted a retrospective audit of glycaemic control on all patients admitted to the unit between 1 December 2008 and 31 December 2008. 55 patients were admitted to the ICU during this month. 5,890 measurements of blood glucose were analysed from blood gas samples taken regularly from the patients. Data for each patient was analysed by the time spent in a predefined glycaemic range[2] and presented as time in each glycaemic range as a proportion of the total length of stay on ICU.

Results and Discussion: Table 1 demonstrates the relationship between the percentage of time spent by patients within the six different glycaemic bands. Over 91% of patients remained within 4.4 mmol/l to 10 mmol/l using the local protocol.

Proportion of time spent in each glycaemic band

Band	Value (mmol/l)	LOS>3 days	LOS>5 days
Hyperglycaemia	>11.1	2.43%	2.64%
Liberal	10–11	3.07%	3.14%
Intermediate	8–10	20.69%	20.26%
Normal	6.1–8	47.56%	47.78%
Stringent	4.4–6.1	24.21%	24.50%
Hypoglyceamic	<4.4	2.01%	2.02%

LOS denotes length of stay in the ICU

Conclusion(s): Our local protocol specifies the target range for the level of blood sugar based on a prescriptive, stepwise increase or decrease of the level of insulin infusion, combined with adequate calorie intake. The protocol is nurse-led and blood glucose measurements are performed on arterial blood samples. Overall performance of the protocol was comparable to the published literature. Moreover it was similar to some computerised online measurements and delivery protocols.[3] This demonstrates a powerful method of auditing compliance with glycaemic control protocols.

References:

1 Critical Care Medicine 2008, 12:R139.
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3 Critical Care Medicine 2007, 11.

Acknowledgements: The authors have no conflict of interests to declare.

12AP2-2

Effect of central angiotensin II receptor antagonist and endogenous vasopressin on blood pressure regulation during normotension endotoxemia in rats

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Background and Goal of Study: Several investigators have reported that endotoxemia stimulates systemic vasopressin secretion via a central mechanism, not due to plasma hperosmolality, hypovolemia, and hypotension. The purpose of this study was to evaluate the involvement of central angiotensin II (ANG II) and ANG II type 1 (AT(1)) receptors in systemic release of vasopressin and effect of endogenous vasopressin on blood pressure regulation during normotension endotoxemia.

Materials and Methods: Experiments were performed using male Sprague-Dawley rats and an intravenous catheter and an intracerebroventricular (icv) stainless gude cannula were implanted. LPS (0.15 mg/kg) was injected intravenously 30 min after icv losartan (0.05 mg), an AT(1) receptor antagonist, or subcutaneous (sc) captopril (50 mg/kg), an angiotensin-converting enzyme inhibitor. Rats with icv and sc saline injections served as control. Plasma vasopressin concentration, osmolality, hematocrit, systolic blood prresure, heart rate and body temperature were measured before icv losartan injection, and before and 60 min after intravenous LPS injection.

Results and Discussion: Low-dose LPS administration increased plasma vasopressin concentration from 2.1 +/- 0.2 to 15.2 +/- 2.5 pg/ml (60 min after LPS injection) without significant changes in plasma osmolality or hematocrit. LPS-induced vasopressin secretion was significantly inhibited by pretreatment with icv losartan (2.3 +/- 0.5 to 3.7 +/- 0.5 pg/ml) but was not attenuated after peripheral captopril treatment (2.2 +/- 0.6 to 17.6 +/- 4.2 pg/ml). LPS administration significantly decreased systolic blood pressure (SBP) by 22.7 +/- 5.4 mmHg after intravenous LPS injection in icv losartan-treated rats, while SBP remained unchanged in vehicle-treated or sc captopril-treated rats by intravenous LPS.

Conclusion(s): Low-dose LPS stimulates vasopressin release without any change in blood pressure and central AT(1) receptor antagonism with losartan inhibited the LPS induced vasopressin secretion. Systemic vasopressin secretion is increased during normotension endotoxemia and plays an important role in maintenance of blood pressure.

12AP2-3

Dobutamine pretreatment improves hepatic microcirculation after polymicrobial sepsis in rat

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Background and Goal of Study: The β_1-adrenoceptor agonist dobutamine is recommended for therapy of circulatory failure in current guidelines for the management of septic shock. Previous data suggest that dobutamine pretreatment may improve liver function and hepatic perfusion after hemorrhagic shock in rat. However, it is unknown whether these improvements may also be seen after induction of septic shock. Therefore, this study was initiated to investigate the effect of dobutamine pretreatment on liver microcirculation after polymicrobial sepsis in rat.

Materials and Methods: After institutional review board approval, animals were continuously infused with vehicle or 10 µg/kg/min dobutamine intravenously for 5 hours (n=4 per group). After pretreatment, sepsis was induced by cecal ligation and incision (CLI). Sham operated animals were treated likewise, but underwent cecal mobilisation and no incision. Intravital microscopy of the left liver lobe was performed 5 hours after induction of CLI for evaluation of hepatic perfusion index, hepatic redox state (measured by nicotinamide ade-

nine dinucleotide phosphate [NADPH] autofluorescence as arbitrary Units [aU]) and hepatic integrity (assessed by propidium iodid staining as cells per field [c/f]). Data were evaluated by ANOVA followed by a Student-Newman-Keuls test and are given as mean ± standard deviation.

Results and Discussion: Compared with sham controls, CLI sepsis significantly reduced hepatic perfusion index (sham/vehicle 712.3±171.6 pl/sec/mm vs. sepsis/vehicle 181.1±89.8 pl/sec/mm; p<0.001), increased NADPH autofluorescence (sham/vehicle 96.8±3.7 aU vs. sepsis/vehicle 111.4±10.2 aU; p<0.001) and induced hepatocellular injury (sham/vehicle 2.2±0.9 c/f vs. sepsis/vehicle 15.5±9.7 c/f; p<0.001). These effects were significantly attenuated by dobutamine pretreatment, resulting in a significantly improved hepatic perfusion index (sepsis/dobutamine 709.4±179.0 pl/sec/mm; p<0.001 vs. sepsis/vehicle), reduced NADPH autofluorescence (sepsis/dobutamine 97.5±6.4 aU; p<0.001 vs. sepsis/vehicle), and reduced hepatocellular injury (sepsis/dobutamine 5.9±2.5 c/f; p<0.001 vs. sepsis/vehicle). There was no significant difference between sepsis/dobutamine and sham/dobutamine for all parameters investigated (each p>0.05). Conclusion(s): This study indicates that pretreatment with dobutamine may improve hepatic perfusion, hepatic redox state and hepatocellular integrity after sepsis in rat. Dobutamine may therefore be able to induce hepatoprotective effects, in addtion to its circulatory mechanisms.

12AP2-4

The effect of sepsis on renal acid base transport

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Background and Goal of Study: Acute renal failure and metabolic acidosis are common characteristics seen in critically ill patients during sepsis. In such conditions, an accumulation of lactate and acid equivalents due to inadequate organ perfusion contributes to the development of acidosis. Besides the lung, the kidney plays a crucial role for maintaining acid-base-homeostasis in the organism. To accomplish this task, an intact function of several membrane transport proteins along the nephron is needed to secrete acid equivalents and reabsorb filtered bicarbonate.

Materials and Methods: In order to investigate the impact of an inflammatory reaction as seen during sepsis on renal acid base transport, rats were injected intraperitoneally with lipopolysaccharide (LPS) 5mg/kg, a dose known to alter renal function without affecting hemodynamics. After 12 and 48 hours, respectively, blood and urine samples were obtained. Kidneys were taken for analysis of renal acid base transporters on RNA and protein level.

Results and Discussion: At all time points, LPS injected rats showed a nearly compensated metabolic acidosis with an appropriate respiratory compensation. LPS injected rats showed after 12h urinary a massive phosphate loss ~10 fold higher than in control animals. No difference was seen after 48h. Pi levels in serum were the same at all time points and in all groups. After 48h LPS injected rats excreted high rates of bicarbonate despite acidosis. Urinary acid excretion in the form of ammonium was ~5-7 fold elevated at all time points indicating a partial renal compensation for the metabolic acidosis. Consistent with this, quantitative analysis of RNA showed in LPS injected rats after 48h a ~2 fold upregulation of two genes involved in renal ammoniagenesis, PEPCK and Phosphate-dependent Glutaminase (PDG). Analysis on RNA level of the Na^+/H^+-exchanger NHE3 and the Cl^-/HCO_3^--exchanger AE1 which play an important role for renal acid excretion, revealed a more than 2 fold downregulation in LPS injected animals which was present only after 12h and is consistent with the metabolic acidosis exhibited. All described differences were highly significant.

Conclusion(s): The results indicate a complex reaction by the kidney indicating loss of bicarbonate as a factor contributing to metabolic acidosis but also the ability of the kidney to counteract acidosis by ammonium excretion. Analysis on protein level in progress will provide further insight in the underlying pathophysiology.

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12AP2-5

Melatonin receptors mediate improvements of survival after polymicrobial sepsis in rat

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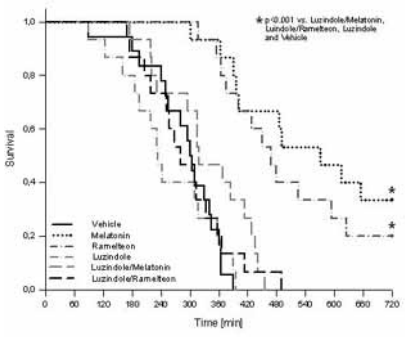
Background and Goal of Study: Exogenous administration of melatonin (MEL) has been shown to improve organ dysfunction after sepsis and hemorrhagic shock, via direct and indirect antioxidant effects. It was further demonstrated that MEL and selective melatonin receptor agonist ramelteon (RML) may improve survival after polymicrobial sepsis in rat. Yet, it remains unknown whether this beneficial effect may rely on melatonin receptor activation. Therefore, this study was designed to investigate whether improvements of survival following MEL or RML therapy may be antagonized by melatonin receptor antagonist luzindole (LZN), in a model of polymicrobial sepsis in rat.

Materials and Methods: After institutional review board approval, animals underwent cecal ligation and incision (CLI) for induction of sepsis, and remained under general anesthesia for evaluation of survival for 12 hours. After induction of CLI, animals were treated with vehicle, RML, MEL, LZN, LZN+RML, and LZN+MEL (each 1.0 mg/kg iv; n=15 per group). Blood gas analysis was performed every 2 hours, for measurement of hemoglobine (Hb), pH, base excess (BE) and lactate. Survival was analysed by a Kaplan-Meier log rank test, parametric data were evaluated by ANOVA followed by a Student-Newman-Keuls test and are given as mean ± standart deviation.

Results and Discussion: After induction of CLI, mean survival time was 290.0±14.6 min in animals treated with vehicle (Fig.1). Administration of RML or MEL significantly improved mean survival time (RML 502.9 min±36.7; MEL 550.8±40.8; both p<0.001 vs. sepsis/vehicle). This effect was completely antagonized by administration of LZN (LZN+RML 293.8±23.0; LZN+MEL 334.47 ± 23.9, both p<0.001 vs. corresponding groups without LZN). Blood levels of lactate and BE were significantly improved in MEL and RML treated animals, compared with all other groups (each p<0.05). Hb levels remained stable throughout the experiment in all groups.



Conclusion(s): Therapy with melatonin or ramelteon improves survival after polymicrobial sepsis in rat; this effect was completely abolished by luzindole, indicating that the protective mechanism of melatonin and ramelteon may rely on melatonin receptor activation, rather than direct antioxidant effects.

12AP2-6

Experimental sepsis is associated with significant changes in antimicrobial pharmacokinetics

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Background and Goal of Study: We have recently shown in a rat experimental model that sepsis is associated with impairment of glomerular endothelial glycocalyx and consequent increased urinary protein loss [1]. In the present study, we evaluated whether these changes were associated with alterations in distribution/elimination of two antimicrobials used for abdominal infections: ceftriaxone (CTZ), a highly protein-bound (> 80%) third generation cephalosporin, or colistin methanesulfate (COL), a low protein-bound (< 30%) antimicrobial [2,3].

Materials and Methods: At T0, **polymicrobial sepsis was induced by cecal ligation and puncture (CLP) in rats (n=10);** control animals (CTRL, n=4) received laparotomy only. At T1 (2h after T0), both CTRL and CLP rats were administered an antimicrobial (CTZ (100 mg/Kg, ip, n=7) or COL (30 mg/kg, ip, n=7)). At T2 (5h after T0), rats were sacrificed and CTZ and COL levels measured in plasma, urine, peritoneal fluid and several tissue samples (kidney, lung, mesentery, brain, etc). CTZ and COL concentrations were determined by the agar diffusion method, using *Escherichia coli* K12 in Mueller Hinton Agar (Oxoid, UK) and *E. coli* ATCC 25922 in Diagnostic Sensitivity Test Agar (Oxoid, UK) as test organisms, respectively.

Results and Discussion: Lower CTZ and COL levels in plasma and tissues were observed in septic rats than in sham rats. Changes were greater for the highly protein bound CTZ (decrease range 20-50%, p<0.01 vs sham) than for the low protein-bound COL (decrease range 5-20%, p<0.05 v sham).

Conclusion(s): Sepsis has a great effect on the antimicrobial PK of both high and low protein-bound antimicrobials, causing a significant decrease in drug concentration in plasma and tissues. These changes appear to be higher for highly bound molecules such as CTZ. Our experimental data are in accordance with clinical data indicating the need to increase doses and/or change the modality of antimicrobial administration to septic patients to achieve adequate antibacterial coverage.

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12AP2-7

Dexmedetomidine-ketamine combination mitigates pulmonary inflammatory response induced by ventilator-induced lung injury in septic rats

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Background and Goal of Study: Pulmonary inflammatory response is crucial in mediating the development of ventilator-induced lung injury (VILI) in septic animals. Dexmedetomidine and ketamine are two sedative agents with potent anti-inflammatory capacity. We sought to elucidate whether dexmedetomidine-ketamine combination could mitigate pulmonary inflammatory response induced by VILI in septic rats.
Materials and Methods: Thirty adult male rats were allocated to receive normal saline, endotoxin (lipopolysaccharide, LPS), LPS plus dexmedetomidine-ketamine combination (D+K), LPS plus VILI, or LPS plus VILI plus D+K (designated as the NS, LPS, LPS-D+K, LPS/V, and LPS/V-D+K group, respectively; n = 6 in each group). VILI was induced by high-tidal volume ventilation (tidal volume-20 mL/kg; respiratory rate-50 breath/min; FiO_2-21%). Sepsis was induced by LPS injection immediately after the commencement of mechanical ventilation. After being mechanically ventilated for 4 hours, rats were sacrificed and the levels of pulmonary inflammatory response were evaluated.
Results and Discussion: Endotoxin or endotoxin plus VILI induced significant pulmonary inflammatory response, as the total cell number, total protein concentration, and the concentrations of chemokine (e.g., macrophage inflammatory protein-2, MIP-2) and cytokine (e.g., interleukin-1β, IL-1β) in bronchoalveolar lavage fluid (BALF) of the LPS and LPS/V groups were significantly higher than those of the N/S group. The lung water content, leukocyte infiltration, and myeloperoxidase activity in lung tissues of the LPS and LPS/V groups were also significantly higher than those of the N/S group. The pulmonary inflammatory response induced by endotoxin or endotoxin plus VILI was significantly mitigated by dexmedetomidine-ketamine combination, as the total cell number, total protein concentration, and the concentrations of MIP-2 and IL-1β in BALF as well as the lung water content, leukocyte infiltration, and myeloperoxidase activity in lung tissues of the LPS-D+K and LPS/V-D+K groups were significantly lower than those of the LPS and LPS/V groups, respectively.
Conclusion(s): Dexmedetomidine-ketamine combination could mitigate pulmonary inflammatory response induced by VILI in septic rats.

12AP2-9

Overview on sepsis-induced protein alterations in serum, brain, heart, and liver using proteomics

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Background and Goal of Study: During the course of sepsis, a multiple organ dysfunction syndrome (MODS) occurs in 20-50 % of patients. A MODS is the major cause of mortality and morbidity in septic patients, but the underlying molecular mechanisms remain widely unclear. The present study provides an overview on alterations in protein expression of serum, brain, heart, and liver using proteomic techniques in a cecal ligature and puncture (CLP) model of rat sepsis.
Materials and Methods: After approval by the local institutional review board, N=62 male Wistar rats were investigated and assigned to three sham groups (n=16) and three sepsis groups (n=46). Rats of the sepsis groups and control groups were analyzed at 12, 24, and 48 hours after sepsis induction. Sepsis was induced by CLP and organs were removed immediately after decapitation. Two-dimensional gel electrophoresis (2D-PAGE) and mass spectrometry (MS) as well as bioinformatic network pathway analysis (Pathway Studio®, Ariadne Genomics, USA) were used to identify and interpret alterations in protein expression between septic and non-septic rats.
Results and Discussion: Mortality was 59 % in the CLP groups but no rat of the sham group died. In a total of 72 gels, altogether 1,277±10 protein spots per gel were discriminated with the proteomic method. 118 spots were differentially regulated (serum: n=55; brain: n=38; heart: n=12; liver: n=13) and proteins identified with MS. Using Pathway Studio, oxidative stress, cell death, and NO-biosynthesis as important cell processes were found to be associated with protein alterations. Additionally, bioinformatic analysis showed relations to inflammation, endothelial cell dysfunction, and diabetes mellitus.
Conclusion(s): The complete array of protein alterations indicates a strong association with inflammation and endothelial cell dysfunction. Oxidative stress and severely compromised cellular function following sepsis seem to play a major role for developing MODS.

12AP2-10

Impact of different fluid management strategies on the intestinal microcirculation in experimental endotoxemia

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Background and Goal of Study: There is an ongoing debate regarding the optimal fluid management in sepsis. A recent study (VISEP) suggested disadvantages of starch in comparison to crystalloid solutions. However, modern starch solutions may exert different effects within the microcirculation. Our objective was to study the effects of new starch solutions within the intestinal microcirculation during experimental endotoxemia using intravital microscopy.
Materials and Methods: We studied six groups of animals (Lewis rats, n=10 per group): healthy controls (CON; fluid therapy: 16 ml/kg/h lactated Ringer´s solution), LPS control animals (LPS: 15 mg/kg lipopolysaccharide; fluid therapy: 16 ml/kg/h lactated Ringer´s), LPS + 64 ml/kg/h lactated Ringer´s, LPS + 16 ml/kg/h starch 6% (200.000/0.5), LPS + 16 ml/kg/h starch 6% (130.000/0.42), LPS + 16 ml/kg/h starch 6% (130.000/0.38-0.45; balanced electrolyte composition). Intravital microscopy of the intestinal microcirculation was performed 2 hours after injection of saline or LPS in all animals.
Results and Discussion: We observed a significant increase of leukocyte adhesion in the intestinal submucosal collecting venules (CON 75.3±9.6, LPS 209.5.5±13.5; n/mm2, p<0.05). Capillary perfusion of the circular muscular layer of the intestinal wall was significantly reduced (CON 111.6±8.6, LPS 83.4±10.2; cm/cm2). Sufficient volume replacement (64 ml/kg/h lactated Ringer´s) improved capillary perfusion (115.9±5.9 cm/cm2) and reduced inflammatory leukocyte-endothelial interactions (156.5±19.4 n/mm2) siginificantly. These values were accentuated by the colloids. Starch 6% (200.000/0.5) reduced leukocyte adhesion even further (132.0±7.5 n/mm2). The most favourable effect on capillary perfusion was seen with the balanced starch solution (119.6±6.2 cm/cm2).
Conclusion(s): Our data demonstrated that administration of modern starch preparations improved intestinal microcirculation in experimental endotoxemia more effectively than volume-adjusted crystalloid fluid management. Future clinical studies are needed to define the clinical utility of starch solutions in fluid management in patients with sepsis.

12AP2-11

Blockade of NF-κB abrogates downregulation of angiotensin II type-I receptors and anticipates circulatory failure during septic shock

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Background and Goal of Study: Understanding the pathogenesis of septic shock with vascular hyporeactivity to vasopressors such as angiotensin II remains critical, because mortality from septic shock has still not improved. In this study, the role of proinflammatory cytokines in the pathogenesis of sepsis-induced circulatory failure with downregulation of angiotensin-II-type-I-(AT_1)-receptors was investigated.
Materials and Methods: In wildtype-mice and mice with deficiencies for proinflammatory cytokines sepsis was induced by cecal ligation and puncture (CLP) and mice were injected with TNF-α, IL-1β, IFN-γ, and IL-6. Septic animals were furthermore treated with the potent NF-κB inhibitor pyrrolidin dithiocarbamat (PDTC). Hemodynamic parameters and expression of AT_1-receptors were investigated.
Results and Discussion: CLP treatment resulted in a hyperdynamic circulatory failure and downregulation of AT_1 receptors. Proinflammatory cytokines also downregulated vasoconstrictor receptor expression, whereas blockade of single proinflammatory cytokines in cytokine knock out mice did not diminish CLP-induced vasoconstrictor receptor downregulation. In contrast, blocking of NF-κB, which is essential for the maximal secretion of multiple cytokines attenuated CLP-induced cardiovascular failure and downregulation of vasoconstrictor receptors as well as improved survival of septic mice.
Conclusion(s): Our data demonstrate that downregulation of AT_1-receptors during sepsis is due to multiple but not single cytokines and define a relevant role for NF-κB in the pathogenesis of septic shock.

12AP3-1

Evolution of neutrophil apoptosis in septic shock survivors and nonsurvivors

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Background and Goal of Study: To analyse, in patients with septic shock: i) the temporal evolution of neutrophil apoptosis; ii) the differences in the neutrophil apoptosis among 28-day survivor and 28-day nonsurvivor patients; and iii) to evaluate the use of neutrophil apoptosis as a mortality predictor.
Materials and Methods: Prospective multi-centre observational study carried out between July 2006 and June 2009. *Setting:*Four intensive care units (one medical and three surgical) and two hospitals in Valladolid. Spain. *Patients:*The study included patients in septic shock (n=80) who had at least two dysfunctional organs or systems at the time of enrolment, and 25 healthy volunteers (n=25). *Interventions:* The neutrophil apoptosis was assessed by PI and annexin V-FITC staining.
Results and Discussion: A significant decrease was observed in the percentages of neutrophil apoptosis at 24 hrs, 5 days and 12 days after the diagnosis of septic shock (14.8±13.4%; 13.4±8.4 % and 15.4± 12.8%, respectively, P<0.0001) as compared with the control group (37.6±12.8%). No significant differences were observed in the apoptosis between 28-day surviving and 28-day nonsurviving patients (P>0.05). The mortality rate in the study at 28-days was 53.7%. The crude HR (hazard ratio) of mortality for patients with septic shock did not differ according to the percentages of apoptosis (HR = 1.006; 95% CI 0.98-1.03, p = 0.60). The COX analysis adjustment factor (for Apoptosis, Activated protein C therapy, appropriate antibiotic therapy, steroids therapy, control of blood glucose levels below 150 mg/dL, APACHE II, SOFA, gender and age), only showed the correct antibiotic treatment as a risk factor independent from the mortality rate (HR= 3.73 [1.48-6.36]; p= 0.003) and APACHE II (HR:1.13[1.003-1.28]).
Conclusion(s): During the first twelve days of the evolution of septic shock, the levels of neutrophil apoptosis decrease and do not recover their normal values. No differences were observed between surviving and nonsurviving patients. In addition, the neutrophil apoptosis is not a mortality predictor.

12AP3-2

Resistant microbial strains in traumatic septic patients

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Background and Goal of Study: Traumatic and polytraumatic patients' wounds get contaminated from the beginning due to the exogenous or endogenous flora of the injured himself. Influencing factors are: patients general grave status, cavitary ruptured abdominal organs, non-adequate antibiotic therapy, etc.
Materials and Methods: This is a verification of total and resistant bacterial strains and frequency of sepsis in traumatic and polytraumatic patients after motor vehicle accidents, falling down off the stairs, falling from a construction site, etc. From 651 traumatic patients admitted to intensive care during ten months, 151 of them (23.2%) manifested the symptoms of sepsis with positive hemoculture. Average age was 37 years, with 126 being male and 25 being female.
Results and Discussion: Fever was present in 100% of patients as well as tachycardia, polypnea, etc. The isolated causes have predominated according to the following order: Klebsiella, E. coli, Pseudomonas, Staph aureus, Providentia, Acinetobacter, etc. 249 microbial strains have been identified, 205 (82.32%) gram negatives and 44 (17.67%) gram positive bacteria. The multiresistant strain frequency is 74.6%: on for antibiotics 14%, on five 31.7, on six 19.7 and on seven antibiotics 9.2%. Empiric therapy started with β-lactaminics and aminoglucosidics. Specific therapy started after the interruption of the empiric therapy in 65.56% of the cases, which was after 4 – 5 days. Supportive therapy: liquids, plasma, electrolytes in 100% of patietns, pentaglobine, parenteral and enteral nutrition. There were administered: mechanic ventilation, anti-H2 drugs in 100% of cases, vassal active drugs in the patients with hypotension, and mucolitics in 68.3% of the cases.
Conclusion(s): Sepsis was encountered in 23.2% of cases, nearly in [frac14] a mixed infection and in one third of them re-infection was detected. Gram negative bacteria occupied the main causes of the sepsis (82.32%). There was discovered a high percentage of resistant strains toward several antibiotics. Multi resistant strains were differentiated at a high frequency, 74.6%. Etiological structure and high frequency of multi-resistant bacteria indirectly indicate that a great part of the studied infections pertain to the hospital nature.
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12AP3-3

Severity of medical versus surgical course of sepsis – Clinical and laboratory analysis

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Background and Goal of Study: The occurrence of sepsis is increasing over time. A better understanding of population-based course of sepsis may be beneficial for therapy this potentially preventable complication. The aim of this study was to evaluate and compare surgical and medical patients diagnosed with sepsis.
Materials and Methods: The medical records of septic patients from 1st January 2005 to 31st December 2008 were reviewed retrospectively. Patients were divided into two groups:I- patients with surgical sepsis (S group),II- patients with medical sepsis (M group). Chosen clinical and laboratory data was entered into Statistica (Version 7.0.)and descriptive statistics were calculated (using arithmetic mean with standard deviation and median with range). Statistically significant results were those with p<0.05.
Results and Discussion: Study included 105 patients. Mean age for S group was higher than for M group (S: 52.9 ±16.9 vs M: 43.8 ±17.1 years; p=0.049). Male predominance was 60.9% for S group and 51.2% for M group (p=0.326). Mean arterial blood pressure was lower in M group (M: 87.3 ±11.9 vs S: 91.7 ±10.5 mmHg; p=0.04). M group of patients required larger infusion of mean adrenaline doses (M: 0.8 ±1.4 vs S: 0.2 ±0.1 μg/kg/min; p=0.031). Patients in M group had also significantly greater base deficit (M: 1.0 ±5.1 vs S: 2.5 ±3.7 mEq/l; p=0.002) and lower mean pH (M: 7.41 ±0.1 vs S: 7.45 ±0.1; p=0.0009) than the other patients. M group required higher oxygen concentration during mechanical ventilation (M: 41.2 ±14.8 vs S: 35.2 ±9.5 %; p=0.001) and also had lower oxygenation index (PaO2/FiO2) (M: 267.1 ±99.3 vs S: 309.6 ±67.9 mmHg; p=0.019). Maximal procalcitonin concentration (PCT) and mean C-reactive protein level (CRP) was greater in M group (PCT: M 36.8 ±41.9 vs S 16.9 ±23.9 ng/ml, p=0.044; CRP: M 166.4 ±71.5 vs S 135.0 ±55.2, p=0.015). Patients in S group had higher platelets level than in M group (S: 272.5 ±157.3 vs M: 197.1 ±150.5 tys/μl; p=0.002). Mean creatinine and urea concentration was greater in M group of patients (Creatinine: M 1.6 ±1.5 vs S 1.1 ±1.0 mg/dl, p=0.037; Urea: M 2.4 ±2.2 vs S 1.5 ±1,6 mmol/l, p=0.011). Mean APACHE II on admission was lower in S group (S: 19.3 ±8.8 vs M: 20.2 ±8.9; p=0.455). Patients in M group had higher mortality rate (34.2%) than patients in S group (14.1%) (p=0.015).
Conclusion(s): The analysis indicated that medical patients are at the higher risk for adverse outcome of sepsis than surgical patients.
Acknowledgements: Thanks to Prof. Leon Drobnik, Head of the Department, who provided general support.

12AP3-5

Use of a novel light technology for environmental disinfection within an intensive care unit

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Background and Goal of Study: Infections are a major cause of morbidity and mortality within intensive care units (ICU)[1]. Cross-infection from environmental contamination is recognised as a significant source of infection[2]. The *HINS-light Environmental Decontamination System (HINS-light EDS)* has been developed to provide continuous disinfection of air and contact surfaces. This paper presents early results on the use of the HINS-light EDS technology for reducing environmental contamination within an isolation room of an ICU.
Materials and Methods: Two ceiling-mounted HINS-light EDS units were installed in a single-bed isolation room and patients admitted and routinely treated. The levels of bacterial bioburden on various surfaces around the room were assessed using contact-plate enumeration. For this, 40-50 contact sampling sites were identified and sampled before (pre-HINS), during (HINS) and after (post-HINS) illumination. The HINS-light EDS units, controlled by automatic timers, were on continuously during daylight hours (approx 08:00 – 22:00) for the HINS phase. Studies were performed with a patient in the room at all times, and each study lasted between 3 and 7 days, with the HINS phase being 1-5 days depending on the patient's condition.
Results and Discussion: The contact-plate results demonstrated significant reductions in environmental bacterial contamination levels in the treated isolation room. Post HINS environmental bacterial counts were reduced by up

to 67% (P=0.0099). Post-HINS samples showed significant recovery of the bioburden to levels similar to those of the pre-HINS samples. The pervasive yet safe nature of the light emitted by the HINS-light EDS permits continuous treatment of air and all exposed surfaces/objects even during periods of intense human activity, and hence high bacterial transmission. This could be of benefit in ICU where the equipment and other 'hand-touch' sites make routine cleaning difficult.

Conclusion(s): In ICU, the HINS-light EDS will complement the standard prevention and control methods, by providing additional reductions in environmental levels of bacterial pathogens. This will contribute to controlling healthcare-associated infections resulting from cross-infection from environmental sources.

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12AP3-6

Antimicrobial usage in an intensive care unit – Indications, duration of therapy, culture results & associated changes in therapy: A prospective analysis

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Background and Goal of Study: Sepsis is a major source of Intensive Care Unit (ICU) morbidity and mortality. The use of antimicrobial agents as surgical prophylaxis or as treatment of a given septic focus therefore comprises a large component of the microbiological workload for ICU patients. These therapies need to be appropriate both in their antimicrobial cover and duration, with an awareness of the underlying causative organism(s) following culture results. By extension, antimicrobial stewardship is a key component of a multifaceted approach to preventing emergence of antimicrobial resistance.

Materials and Methods: We performed a prospective observational study of 51 ICU admissions over a three-month period and recorded the indications for antimicrobial therapy, specific agents used, changes in therapy and reasons for changes in therapy.

Results and Discussion: 51 (100%) of patients studied received some form of antimicrobial therapy. ICU personnel made significantly more changes in therapy than the primary team ($p < 0.009$). There were 102 changes in therapy during the study period; 41 (40.2%) for a lack of clinical response to initial therapy, 36 (35.3%) following the completion of a course of therapy and 25 (24.5%) in response to culture sensitivities. 24 patients received antimicrobial agents for surgical prophylaxis with a mean duration of 2.4 days.

Conclusion(s): In conclusion, all patients admitted to our ICU received antimicrobial therapy and the majority of changes in therapy were not culture-based. The duration of surgical prophylaxis was extended beyond current recommended guidelines.

12AP3-7

Trace elements, the systemic inflammatory response and outcome in critical illness

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Background and Goal of Study: Zinc and selenium are important in inflammation. Decreased plasma zinc and selenium concentrations in systemic inflammation may not best reflect tissue status (Shenkin, 1995). Despite this, many ICUs still base the decision to supplement trace elements on plasma concentrations. It has been suggested that erythrocyte micronutrient concentrations may better indicate status during inflammation (Quasim, 2005; Oakes, 2008). This study examined the relationship between trace element concentrations in plasma and erythrocytes and outcome in a critically ill population.

Materials and Methods: 126 critically ill patients were studied. Erythrocyte zinc and selenium concentrations were measured on admission and follow-up using ICP-MS. Plasma concentrations were also measured. Erythrocyte reference concentrations were obtained from 121 healthy samples.

Results and Discussion: Compared to healthy controls, erythrocyte concentrations of selenium were lower ($p<0.001$) while concentrations of zinc were higher ($p<0.05$) in the critically ill. Plasma zinc, selenium and erythrocyte zinc were significantly increased on follow up. Non-survivors had lower plasma selenium ($p<0.01$) but higher erythrocyte zinc ($p<0.05$). On multivariate logistic regression, erythrocyte zinc was found to be independently associated with hospital death ($p<0.05$). Changes in plasma and erythrocyte concentrations of zinc and selenium differ during the inflammatory response. Examining both extra- and intra- cellular concentrations is useful when determining status and need for supplementation.

Conclusion(s): The relationship between increased erythrocyte zinc concentrations and mortality may be of major clinical significance as many patients have zinc supplemented during critical illness. This association between raised intracellular zinc concentration and mortality requires further focused research.

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12AP3-8

Monitoring of infections in critically ill and postoperative patients: Evaluation of surface marker expression CD64 as septic marker

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Background and Goal of Study: Sepsis is one of the most frequent cause of admission in Intensive Care Unit (ICU) leading to high mortality. An early diagnosis is very important to treat the septic patient when multiorgan failure is not yet established, then the importance of septic markers. The classical septic marker are not specific neither reliable enough, especially in intensive care patients. We evaluated the surface marker expression CD64 on granulocyte/monocyte quantification as septic marker in intensive care unit.

Materials and Methods: From December 2008 to august 2009 we dosed CD64 and the other septic markers in two group of patients to evaluate their ability to distinguish septic picture from systemic inflammation: study group with septic patients in according to surviving sepsis campaign criteria and control group with patient after elective major surgery.

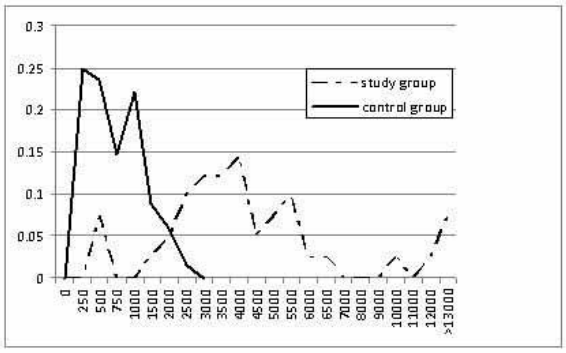
Results and Discussion: Table 1 reports general characteristic of the patient groups; table 2 reports the CD64 values, sensibility specificity and predictive values; graphic 1 represents the distribution curve of CD64. C reactive protein (CRP) and WBC count did not demonstrate any statistical difference between the two groups, and so were not useful to identify septic patient but highlightened only an not specific inflammatory response.CD64 is the only marker showing two different peak between the groups and high sensibility/specificity with cutoff of 2500.

demographics

	CONTROL GROUP	STUDY GROUP
GENDER (m/f)	30/20	46/15
AGE	65 + 11.8	58.4 + 17.2
Admission diagnosis	Neurosurgery 5 Cardiac surgery 43 Thoracic or abdominal surgery 2	Ictus cerebri 20 Respiratory failure 15 Politrauma 7 Hypovolemic shock 6 Cardiogenic shock 5 Postsurgery infection 5 Other 3

CD64 statistics

Cutoff point	sensibility	specificity	NPV	PPV
2000	88%	93%	88%	94%
2500	85%	99%	97%	94%
3000	76%	100%	100%	87%



Conclusion(s): CD64 is resulted better than other classical septic markers, and is an useful diagnostic marker for early identification of septic status, but further studies are necessary.

12AP3-9

Respiratory failure associated with hemodynamic failure is the main determinant of mortality in postsurgical patients with severe sepsis

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Background and Goal of Study: The aim of this study was to explore the relation of mortality, in postsurgical patients with severe sepsis, with characteristics of hospital admission and organ failure.
Materials and Methods: An observational, cross-sectional study was carried in a University Hospital in Madrid, Spain. We included all patients diagnosed with severe sepsis and septic shock, hospitalized in a Postsurgical Intensive Care Unit (PIC), from January 1st 2005 to December 31st 2008. Primary endpoint: mortality during hospitalization. As explanatory variables were studied: kind of surgery; (elective/urgent); length of stay; reintervention; hemodynamic, respiratory, renal, hematologic and digestive failure. Data were obtained from medical records. It has been realized a descriptive study of the main variables. To study the relationship between mortality and each independent variables, an bivariate adjusted sex- and age- Poisson regression was performed. The independent variables that were statistically significant in the bivariate analysis, were used in the multivariate adjusted sex- and age- Poisson regression analysis.
Results and Discussion: We recruited 228 patients with and average age of 68.87 years; 131 males (57.5%) and 97 females (42.5%). 201 (88.2%) underwent elective surgery and 27 (11.8%) underwent urgent surgery; 40 patients needed reintervention.199 (87.3%) patients suffered hemodynamic failure, 173 (75.9%) respiratory failure, 140 (61.4%) renal failure, 51 (22.4%) hematologic failure and 11 (4.8%) digestive failure. In the bivariate analysis, significant relationship was found between mortality and respiratory failure (p=0.002) and hemodynamic failure (p=0.021). In the multivariate analysis, both variables remain statistically significantly related.

Variables	Estimator	Lower CI	Upper CI	p
Length of stay	0.008	-.004	.020	0.196
Reintervention	.277	-.277	.831	0.327
Urgent surgery	-.278	-.919	.363	0.395
Elective surgery	.410	-.230	1.052	0.209
Respiratory failure	3.153	1.178	5.127	0.002
Hemodynamic failure	1.661	.255	3.068	0.021

Conclusion(s): No association between mortality and age, sex, kind of surgery or length of stay in Postsurgical Critical Care Unit was demonstrated in this study. A significant association between mortality, in postsurgical patients with severe sepsis, and the variables used in this study was demonstrated only for respiratory failure and hemodynamic failure.

12AP3-10

Implementation of a protocol based on surviving sepsis campain decreased 27% mortality in severe sepsis in a postsurgical intensive care unit

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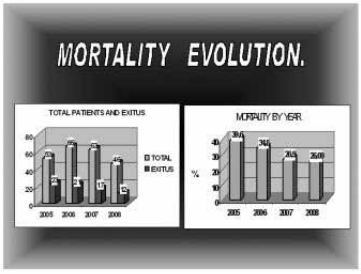
Background and Goal of Study: The main objective of the present study was to analyze the impact on mortality after the implementation of a protocol based on the bundle care recommended in the sepsis guidelines for shock septic and severe sepsis (SSC) in a Postsurgical Intensive Care Unit (PICU).
Materials and Methods: An observational, cross-sectional study was carried in a University Hospital in Madrid, Spain. We included all patients diagnosed with severe sepsis and septic shock, hospitalized in PIC, from January 1st 2005 to December 31st 2008**.** A diagnosis of severe sepsis was based on the presence of infection and at least one of the following findings Pao_2/fio_2 <300, renal dysfuntion (cr> 2mg/dl), thrombocytopenia (platelet <100.000), hyperbilirrubinemia (bilirrubin > 2 mg/dl).Septic shock was defined as acute circulatory failure (mean arterial pressure < 65 mm Hg) despite adequate volumen resuscitation. Data were obtained from medical records. To get our aim, it has been realized a descriptive study of the main variables, for continuous variables, average, standard deviation and 95% confidence intervals and, for categorical variables, the frequencies distribution. Differences in the incidence of mortality per year were analyzed by the chi-square test.
Results and Discussion: We recruited 228 patients, with and average age of 68.87 years; 131 males (57.5%) and 97 females (42.5%). The higher incidence of mortality occurred in 2005 (39.62%) and the year with a lower mortality rate was 2008 (26.44%). We found a high reduction of mortality (incidence ratio =0.68), despite not being statistically significative (p=0.372).



Conclusion(s): Clinical implementation of a standardized order set for the management of severe sepsis in the Postoperative Intensive Care Unit was associated with an outstanding reduction in mortality. No statistically significant decrease in mortality was demonstrates, as this study was not sufficiently powered to assess mortality benefits.

12AP4-1

Steroids administration during liver transplantion (LT) reduces the need for physiological support post operatively… More evidence for relative adrenal insufficiency in liver failure

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Background and Goal of Study: Hypothalamic pituitary axis activation is an important feature of a patient's response to severe stress. Recently adrenal insufficiency has been demonstrated in patients with liver failure.[1] Data from our unit suggests a high incidence of adrenal insufficiency in patients undergoing LT. It has become standard practice to administer corticosteroids to LT recipients during surgery. The benefit of such practise has not been quantified.We hypothesised that the administration of corticosteroids, prior to the reperfusion phase of LT, would reduce the requirement for post operative fluid and vasopressors by addressing this adrenal insufficiency.
Materials and Methods: We conducted a retrospective analysis of prospectively collected data from 90 consecutive patients undergoing LT, before (Group 1) and after (Group 2) the administration of 1000mg methylprednisalone in the anhepatic phase became standard practise. Demographic data and post operative requirements for fluids (12 hr and 48 hr ITU crystalloid and colloid requirement), vasopressors, renal replacement therapy, ventilation and total stay on the intensive care unit (ITU) were compared between groups.
Results and Discussion: Indication, MELD score and age were not significantly different between groups. There were significantly reduced requirements for fluid, vasopressors, renal replacement therapy, invasive ventilation and ITU stay in group 2 compared with group 1.

	Group 1 (no methyprednisaolone) n=45	Group 2 (methylprednisalone) n=45	P value
MELD score	16 (11-20)	16 (13-19)	NS
12 hr crystalloid (L)	1.2 (1.1-1.3)	1.2(1.1-1.4)	NS
12 hr colloid (L)	1.2 (.8-1.8)	0.75 (.5-1.5)	0.025
48hr crystalloid (L)	3.7 (3-4.3)	3.3 (2.8-3.7)	0.02
48hr colloid (L)	2.6 (1.7-3.2)	1.7 (1.4-2.7)	0.02
Post op vasopressors (Hrs)	12 (8-16)	7 (3-12)	0.01
Post op Ventilation (Hrs	10 (7-18)	7(5-11)	0.01
Post op RRT (n)	14	1	0.001
Total ITU stay (days)	3 (2.5-4)	2 (1.5-3)	0.02

expressed as medians (interquartile range)

Conclusion(s): The administration of methylprednisolone prior to liver graft reperfusion, significantly attenuates the ongoing haemodynamic sequelae that are often seen in liver transplant patients. This can be explained by the relative adrenal insufficiency of liver transplant recipients and their subsequent inability to mount an adequate response to reperfusion.

References:

1 P.E. Marik et al. The hepatoadrenal syndrome: A common yet unrecognised clinical condition. Crit Care Med 2005; 33: 1254-1259.

12AP4-2

Alteration in creatinine clearance following surgical treament of pseudomyxoma peritonei

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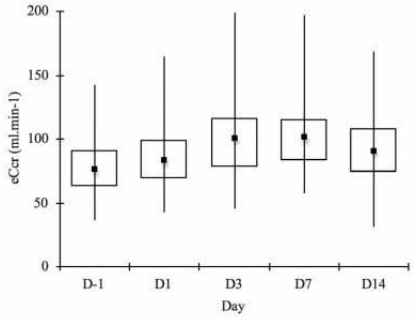
Background and Goal of Study: Pseudomyxoma peritonei is a peritoneal surface malignancy often treated by combined cytoreductive surgery (CRS) and heated intra-peritoneal chemotherapy (HIPEC). Despite previous studies into the effects of CRS and HIPEC on morbidity and mortality, none have specifically investigated its effect on creatinine clearance. We wished to investigate the changes in creatinine clearance that occurred in patients passing through our specialist unit.

Materials and Methods: We undertook a retrospective notes review of 162 patients who had treatment in our centre between 2000 and 2008. Following exclusions the case notes of 108 patients were studied to find the creatinine clearance as estimated (eCCr) by the modified Cockroft-Gault equation at days 0, 1, 3, 7 and 14. The median eCCr on these days was compared to the pre-operative value using the Wilcoxon Sign Rank test.

Results and Discussion: The median eCCr rose from 76.06 ml.min-1 to 81.85 / 100.11 / 101.31 and 89.64 ml.min-1 on post-operative days 1, 3, 7 and 14 respectively as shown in figure 1 (p<0.0001). In order for creatinine clearance to increase, either the rate of creatinine production must be reduced or its rate of removal from the plasma must be increased. We postulate that the large surface area burn caused by high power diathermy to the peritoneal cavity during these procedures results in a loss of creatinine via the peritoneum and ultimately the abdominal drains. This would explain the apparent improvement in eCCr seen in the first 14 post-operative days but further study would be needed to identify the level of renal function at a longer time interval. This is clearly an area in which further study is needed and the authors are currently preparing an investigation into the abdominal loss of creatinine in drain fluid and the longer term outcome of renal function in patients who pass through our unit.



Conclusion(s): The creatinine clearance following cytoreductive surgery and perioperative intra-peritoneal chemotherapy for pseudomyxoma peritonei in our unit is significantly higher for the first 14 post-operative days leading to the suspicion that there may be an extra-renal source of creatinine loss in patients undergoing this procedure.

12AP4-3

Resource implications of expanding the use of NHBD (non-heart-beating-donors) in liver transplantation

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Background and Goal of Study: Donation following cardiac death, NHBD, was seen as a way to increase the number of available organs for transplant[1]. For the period 2008/9, they accounted for 20% of donor liver grafts in the UK (110/646). There is evidence from the literature that long term outcome from NHBD is worse with a greater risk of graft failure[2] and a higher incidence of ischaemic cholangitits[3]. Currently there is little information relating to the intra-operative and early postoperative period and whether there are resource implications of increasing the use of NHBD as a source of liver grafts.

Materials and Methods: We compared NHBD LT recipients with a matched (MELD score, diagnosis) cohort of HBD recipients (n=16) over a 2 year period. Intraoperative data was retrospectively collected by stage for haemodynamics, blood gas analysis, TEG® and transfusion requirement. Postoperative ITU data of Noradrenaline requirement, ventilator hours, renal support (CVVHF) and stay length (LOS) was also collected.

Results and Discussion: NHBD LT was associated with profound post-reperfusion syndrome and clinically significant lysis (TEG®CLI >30%) requiring tranexamic acid. Postoperative LOS and ventilator days were longer and more required CVVHF. 2/16 NHBD recipients were retransplanted for 1^{ry} graft failure, 90 day survival was 100% in both groups.[table1]

Conclusion(s): There are significant resource implications of using NHBD grafts both in the short and long term which result in substantially increased financial costs and patient morbidity. This raises important questions especially as there are indications that the NHBD resource for liver grafts may be increasing at the expense of the HBD pool.

References:

1 Merion RM et al. *Ann Surg* 2006; 244:555-62.
2 Pine JK et al. *Liver Transpl* 2009; 15:1071-82.
3 Skaro AL. *Surgery* 2009; 146:552-3.

	HBD (n=16)	NHBD (n=16)	P value
Age	52 (43-57)	54 (41-62)	NS
MELD	16.5 (13-20)	18 (13.5-21)	NS
Cold Ischaemic Time (mins)	488 (431-589)	397 (361-423)	0.015
Time with systolic BP <100 post reperfusion (mins)	0	45 (30-64)	0.0001
Tranexamic acid %	0	43	0.003
Total ITU Norad hours	9.5 (5-16)	20.5 (12-37)	0.002
Total ITU ventilator hours	11 (7-19)	22 (10-113)	0.026
ITU length of stay (days)	2 (1.5-3.5)	3.75 (2.5-6.5)	0.021
CVVHF (n)	0	3	0.01

Results [All data presented as median (IQR)]

12AP4-4

Early efficacy of furosemid-dopamine vs furosemid-mannitol in the acute oligoanurias treatment

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Background and Goal of Study: Acute renal failure (ARF) is a clinical syndrome characterized by complications resulting from failure of the kidneys to regulate fluid and electrolyte homeostasis and to excrete nitrogenous waste products. The disorder can be either oliguric or nonoliguric. The use of combined diuretic is the most common strategy of the oliganurias treatment, before the dialyze indications. We observed the comparison of the efficacy and the speed of return to normal urine output in the first 24 hour, attained by two types of treatments: furosemid-dopamine vs. furosemid-mannitol.

Materials and Methods: The study included patients with oligoanuria of different etiology, excluding those with chronic renal failure and heart failure. After correcting the probable volume depletion, was administered Furosemid 60 mg bolus IV, than patients received Furosemid infusion 15 mg/hour for 8 consecutive hours, then infusion 20mg/hour. Furosemid infusions were combined in the first 24 hours in two ways: (Gr 1) with dopamine 3 mcg/kg/min; and (Gr 2) with 2 boluses of mannitol (12, 5 g tid). The patients were followed up by monitoring the urine output in 8/16/24 hours after the initiation of the treatment, as well as by observing the hemodynamic parameters

Results and Discussion: The mean age was 57±7, 5 years. Urine output in mannitol group after the treatment was 3, 9±0, 7 l/24h^{-1} while in the other group was 4, 1±1, 1 l/24h^{-1}. No significant side effects were recorded in both groups. The normal urine output was noticed earlier in the first group. Despite this, the ARF and additional requirements for dialyze was almost similar in the both groups.

Re-establishment of normal Diuresis in both groups in the first 24 hours of treatment

Groups	Nr of patients	normal diuresis in 8 hours	normal diuresis in 16 hours	normal diuresis in 24 hours	Dialyze
Gr1	27	10	13	17	4
Gr 2	29	6	8	13	5

Conclusion(s): Continued furosemid infusion, combined with dopamine is more efficient treatment in attaining faster the normal urine output in the first 24 hours of oligoanurias

References:
1 Olivia V. Anesth Analg 2003; 97:1222-12.

12AP4-5

Determinants of postoperative acute kidney injury after hepatectomy

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Background and Goal of Study: Development of acute kidney injury (AKI) after surgery is associated with increases in morbidity and mortality. Our aim was to evaluate the incidence and determinants of postoperative AKI after hepatectomy.
Materials and Methods: This retrospective cohort study was carried out in the multidisciplinary Post-Anaesthesia Care Unit (PACU) with five intensive care beds. Out of 1597 intensive care patients admitted to the PACU, 54 were submitted to hepatectomy and admitted to the intensive care unit (ICU) beds over 2 years. After admission patients were followed for the development of AKI, defined as proposed by The Acute Kidney Injury Network (increment of serum creatinine ≥ 0.3 mg/dL or 50% from baseline within 48 hours or urine output < 0.5 mL/kg/hr for > 6 hours despite fluid resuscitation when applicable). Patient preoperative characteristics, intraoperative management and outcome were evaluated for associations with acute kidney injury using an univariate logistic regression analyses.
Results and Discussion: A total of 54 patients were studied. Eight patients (15%) met AKI criteria. Univariate analysis identified congestive heart disease (OR 8.2, 95% CI 1.6-43.5, p=0.013) as an independent preoperative determinant for AKI in the postoperative period. Patients that developed AKI had higher Simplified Acute Physiology Score (SAPS) II (OR 1.1, 95% CI 1.0-1.1, p=0.036) and Acute Physiology and Chronic Health Evaluation (APACHE) II (OR 1.2, 95% CI 1.0-1.3, p=0.036), higher hospital length of stay (LOS) (OR 1.1, 95% CI 1.0-1.1, p=0.043), higher mortality at 6 months follow-up(OR 13.2, 95% CI 1.8-99.0, p=0.012).
Conclusion(s): In this study congestive heart disease is a risk factor for the development of AKI after hepatic resection. AKI has serious impact on PACU length of stay in the hospital and in mortality.

12AP4-6

A comparison between the performance of "RIFLE" definition of acute kidney injury and a new definition based on creatinine kinetics

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Background and Goal of Study: The Acute Dialysis Quality Initiative's RIFLE criteria have become the most widely used definition of acute kidney injury (AKI). These are based mainly on percentage increases in serum creatinine (sCr) over a baseline value. The time required to reach the arbitrary thresholds (150%, 200% and 300% for classes R, I and F respectively), was not settled in the original definition. Recently, a new definition and clasification system based on creatinine kinetics (CK) has been proposed (1). This new definition considers absolute increases in sCr (from 0,3 mg/dL to 1,5 mg/dL) over pre-specified periods of time (from 24 to 48 hours). The aim of the present study was to compare both definitions, in terms of sensitivity and time to diagnosis, in the setting of postoperative cardiac surgery.
Materials and Methods: We performed a retrospective analysis of our Cardiac Anaesthesia Database. All patients operated on of major cardiac surgery between 2002 and 2007, were considered. Only patients with complete creatinine values during the first postoperative week (pow) were included. Receptors of a renal transplant and patients on preoperative dialysis were excluded. To analyze the sensitivity of both classifications the whole incidence of AKI as well as the incidence of each severity category were compared. The time elapsed in days (d) since surgery till a patient reach a sCr value to be clasified as AKI was considered the time to diagnosis. Categorical variables were compared with Pearson's X^2 test. Continuous variables were assessed for normality and compared with Student's t-test, or with non-parametric tests in case of non-normality distribution. A P value ≤ 0,05 was considered statistically significant.
Results and Discussion: Of 2181 major cardiac surgeries performed during this 6-year period, 327 patients (15%) had complete sCr data during the first po week. Global incidence of AKI was lower (39,4% vs 59,9%, p<0,001) for the RIFLE clasification and the same applied for the 3 severity categories (R vs 1: 20,5% vs 30%; I vs 2: 13,1% vs 19,9%; F vs 3: 5,8% vs 10,1%). After excluding 29 patients treated with RRT, no changes were observed in terms of global incidence of AKI (34,6% for RIFLE vs 56,4% for CK). Time to diagnosis was shorter for the CK clasification system (1,8 d ± 1,5 vs 2,7 ±2,4).
Conclusion(s): AKI defined by a creatinine kinetic model performed better than the RIFLE system, detecting more patients and earlier in this biased sample of cardiac surgical patients.

References:
1 J Am Soc Nephrol 20: 672-679, 2009.

12AP4-7

Hyperchloremic acidosis in patients undergoing liver transplantation

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Background and Goal of Study: An increase of the plasma chloride ion concentration can produce a smaller plasma strong ion difference (SID) leading to an increased hydrogen ion concentration and hyperchloremic metabolic acidosis. The objective of this trial was to determine whether the administration of serum saline 0.9% had an effect in postoperative chloride levels and an increase in the clinical complications in patients undergoing liver transplantation.
Materials and Methods: For this retrospective study we enrolled thirty nine patients who received serum saline 0.9%. Patients with abnormal renal function (creatinine >1.4 mg/dl) and or moderate coagulation disorders (Quick <50%, platelets <50.000) were excluded. We collected the amount of intravenous fluid, analysis of arterial blood gases, electrolytes and serum lactate in the preoperative and postoperative period. Also, we calculated the SID in the preoperative and postoperative period. 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 hyperchloremic metabolic acidosis. We determined the percentage of patients who presented hyperchloremic acidosis (A group) and the percentage of patients who didn´t present it (B group); and the clinical repercussions (transfusion, renal function) in both groups.
Results and Discussion: Thirteen patients presented hyperchloremic acidosis (33.3%). Significant difference was seen in the volume of normal saline administered between groups (A group: 939 mL, B group: 735 mL; p: 0.006; *t-Student*). The need of transfusion was similar between groups. But the increase of chloride levels was associated with clinical complications (*Sperman correlation*).

Need of transfusion

Transfusion	Group A	Group B	p-value
RBCt (mL)	2191	1672	0,53
Platelets (mL)	276	244	0,76
EBL (mL)	5153	4760	0,82

RBCt: red blood cell transfusion, EBL: estimated blood loss

Correlation: chloride levels and complications

Correlation	RBCt	FFPt	Platelets	EBL	Quick	UO
Coefficient	-0,20	-0,22	-0,10	-0,34	0,29	0,04
p-value	0,10	0,08	0,27	0,01	0,03	0,38

RBCt: red blood cell transfusion, FFPt: fresh frozen plasma transfusion, EBL: estimated blood loss, UO: urine output

Conclusion(s): Although more studies are necessary to determine the effects of hyperchloremic acidosis in patients undergoing liver transplantion, we think that the administration of fluids with balanced composition can be a better option.

12AP4-8

Determinants of coagulation disorders after hepatectomy

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Background and Goal of Study: Patients undergoing liver resection may have marginal preoperative liver function, extensive intraoperative blood loss and perioperative hepatic dysfunction. Our aim was to evaluate incidence, determinants and outcome in patients that develop coagulation disorders after hepatic resection.
Materials and Methods: This retrospective study was carried out in the multidisciplinary Post-Anaesthesia Care Unit (PACU) with five intensive care beds. Out of 1597 intensive care patients admitted to the PACU, 54 were submitted to hepatectomy and admitted to the intensive care unit (ICU) beds over 2 years. Patients were followed for the development of coagulation disorders defined as an aPTT (activited partial thromboplastin time) greater than 40 secs or a PT (partial thromboplastin time) greater than 15 secs, during PACU stay. Patient's demographics, intraoperative and postoperative data were collected. We also

recorded PACU and hospital length of stay (LOS) and mortality. Pearson Chi-square test was used to compare proportions and predictors of postoperative coagulation disorders were evaluated using univariate regression binary logistic analysis with an odds ratio(OR) and its 95% Confidence Interval (95%CI).
Results and Discussion: A total of 54 patients were studied. Twenty-six (48%) patients developed coagulation disorders. Duration of anaesthesia (OR 1.91, 95% CI 1.15-3.18, p=0.013 for each anaesthesia in hours), intraoperative erythrocytes administered (OR 3.63, 95% CI 1.29-10.20, p=0.015), temperature at PACU admition (OR 0.48, 95% CI 0.29-0.77, p=0.003) were considered independent predictors for development of coagulation disorders in the postoperative period. APACHE II was significantly higher in these patients (p<0.001). They stayed longer in the PACU (median LOS in hours: 43 versus 21, p=0.019) and in the hospital (median LOS in days: 15 versus 7, p=0.016). The hospital mortality and mortality at 6 months follow-up was not different compared to those patients without postoperative coagulation disorders.
Conclusion(s): This study shows that duration of anaesthesia, amount of perioperative erythrocytes and temperature at PACU admission are risk factors for the development of coagulation disorders after hepatic resection. Coagulation disorders have serious impact in hospital and PACU LOS, but not in patient's mortality.

12AP5-1

Patients admitted in ICU for an extra abdominal, medical disease and operated on of emergency laparotomy have significant survival

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Background and Goal of Study: Limited data is available concerning patients admitted in ICU for an extra abdominal, medical disease and operated on of emergency laparotomy (EL) (1). We investigated whether such ICU patients had benefit of EL.
Materials and Methods: EL was performed in 48 ICU patients admitted for an extra abdominal, medical disease over the 2008 year. The following variables were compared between "survivors (discharged alive from hospital) and non survivors": (a) sex ratio, BMI; (b) preexisting comorbidities considered in seven additive categories: cardiac, respiratory, renal, gastro intestinal, hepatic, diabetes, malignancies, and corticosteroid therapy; (c) preoperatively: IGS II score, mechanical ventilation (MV), vasopressor or extrarenal epuration, abdominal signs (obstruction, tenderness, contracture, compartment syndrom), records of computed tomography (CT) and ultrasonography; (d) intraoperative findings: perforation, infection, ischemia or necrosis of a visceral organ, pancreatitis, bowel obstruction, biliary disease, no finding. T, MannWhitney-U, Chi square tests (P < 0.05), and multiple regression analysis (P < 0.1) were used.
Results and Discussion: Out of 48 patients, 26 survived. EL was decided because of abdominal signs in 35 patients, clinical deterioration or lack of improvement of one or several organ failures in 44 patients, specific signs on CT scan, and/or ultrasound examination (active bleeding, subphrenic collection, bowel obstruction, pneumoperitoneum) in 22 patients, or non specific signs (free intraabdominal fluid, gallbladder or bowel distension or thickening) in 29 patients. EL did not identify any surgical cause in 10 patients. Groups did not differ in intraoperative findings (P=0.2), preoperative creatinine level (P=0.3), and preoperative anuria requiring extrarenal epuration (P=0.2). Groups differed in preoperative MV (P=0.04), vasopressor requirement (P=0.02), lactate levels (P=0.03); IGS II (P=0.0003), and preexisting comorbidities (P=0.04). No such correlation was found in multivariate analysis (All P>0.15).
Conclusion(s): In ICU patients treated for medical diseases, neither clinical nor laboratory variables, or operative findings whatever their severity predicted death following EL for suspected abdominal focus. Survival rate was high enough to warrant surgical exploration of suspected intra abdominal focus. Taking into account a longer period is warranted to confirm these results.
References:
1 Sutherland FR, et al. J Trauma 1989; 29: 1982-86.

12AP5-2

The prognostic value of procalcitonin and C-reactive protein in critically ill patients: A comparison with APACHE II and SOFA scores

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Background and Goal of Study: We aimed to compare the prognostic value of serum procalcitonin (PCT) and C-reactive protein (CRP) levels at the admission to ICU and at the 24th hour with APACHE II and SOFA scores between groups of patients with traumatic, postoperative and medical illness.
Materials and Methods: In this prospective observational study we enrolled 67 consecutive patients aged 15-94 with various diagnosis admitted to ICU. Patients were classified into 3 groups as trauma, medical ilness, postoperative accodind to the causes of ICU admission. Serum PCT and CRP leves were assessed at ICU admission and after 24 hours. Patients APACHE, SOFA scores, duration of mechanical ventilation, length of ICU stay and outcome were recorded.
Results and Discussion: The number of patients in the groups of trauma, medical ilness, postoperative were 7:33:27. Mean age 60±19 was years, male: female ratio was 37:30 of overall study population. Number of patients that APACHE II score ≥ 20 was 40 (%59.7), SOFA score ≥ 6 was 27 (%40.3). Median duration of mechanical ventilation and ICU stay were 10, 13 days respectively and were higher in nonsurvivors than survivors (p<0.05). 38 (%56.7) patients died. Trauma patients were younger than the other groups (p<0.05). In all groups PCT and CRP values at 24th hour (PCT24 and CRP24) are increased compared to admission values in cases resulted with death (p<0.05). APACHE II and SOFA scores were higher in died patients than in survivors (p<0.05). There was a positive correlation between PCT24 and SOFA scores in cases with medical ilness (p<0.05). PCT24 had a positive correlation with APACHE II (p<0.05) and SOFA (p<0.01) scores; and a negative correlation with duration of mechanical ventilation (p<0.05) in postoperative patients. There was a positive correlation between CRP24 with SOFA and APACHE II scores in cases with medical ilness. (p<0.05, p<0.01, respectively). CRP24 had a positive correlation with SOFA, APACHE II scores and length of ICU stay in postoperative cases (p<0.05, p<0.01, p0.05).

Comparison between PCT24, CRP24, APACHE II, SOFA

	PCT24	CRP24	APACHE II	SOFA
Area under curve	0.648	0.651	0.889	0.81
Sensitivity	76.3	100	86.8	57.9
Specificity	55.2	6.9	75.9	82.8
Positive predictive value	69	58.5	82.5	81.5
Negative predictive value	64	100	81.5	60

Conclusion(s): We concluded that increase in PCT level at 24th hour compare to admission values can be helpful to estimate prognosis of critically ill patients evaluated with APACHE II and SOFA scoring systems.

12AP5-3

Pre-admission physiological parameters & their correlation with mortality, in patients requiring ICU admission – Pilot study

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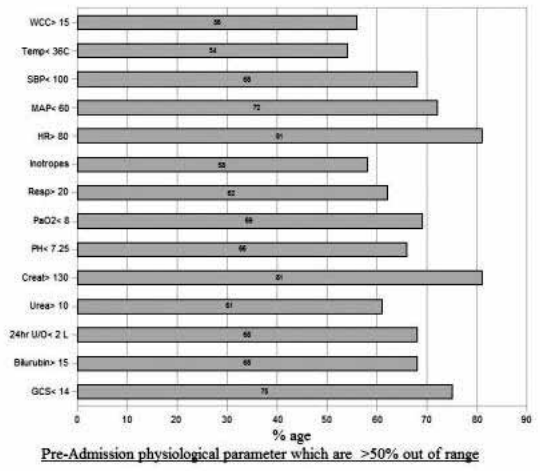
Background and Goal of Study: ICU scoring systems are validated tools which correlate abnormal physiology with mortality, based on data collected post-admission. However, it would be ideal to have a scoring system which reliably correlates pre-admission physiology to mortality, in the climate of limited ICU capacity. Aim of this study was to identify the pre-admission physiological parameters, which could be used to devise a scoring system, that will reliably estimate mortality, in patients requiring ICU admission.
Materials and Methods: This retrospective, observational study, carried out in a large teaching hospital ICU over 6 months, included patients who died, having >90% predicted mortality post-admission, based on ICNARC. Medical notes were reviewed to record various physiological parameters, for up-to 24hours prior to ICU admission.



Pre-Admission physiological parameter which are >50% out of range

Results and Discussion: 41 patients (18 males, 23 females) with good case-mix were included. WCC >15,000cm^3 & lowest temperature <36^{0}C was recorded in 56% & 54% respectively. S.B.P.<100mmHg, M.A.P<60mmHg & Heart Rate> 80 was recorded in 68%, 72% & 81% respectively. 58% needed pre-admission inotropes & 62% had respiratory rate>20/min. PaO_2<8kPa & pH<7.25 was recorded in 69% & 66% respectively. Creatinine>130mmol/L, urea>10mmol/L & 24-hours urine output<2L, found in 81%, 61% & 68% respectively. 68% had bilirubin>15 & 75% had lowest GCS<14. However, highest temperature, serum Na^+ & K^+, hematocrit & platelets seemed to have no correlation with mortality.

Conclusion(s): This study indicates that various pre-admission physiological parameters influence ICU mortality. It identifies the need for a larger RCT to devise a pre-admission scoring system that reliably correlates with mortality.

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1 A new risk prediction model for critical care: the Intensive Care National Audit & Research Centre (ICNARC) model. Harrison DA, Parry GJ, Carpenter JR, Short A, Rowan K. Crit Care Med. 2007 Apr;35(4):1091-8.

12AP5-4

Quality control of the anaesthesiologists' discharge reports in a postoperative ICU

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Background and Goal of Study: When a patient is discharged from an ICU, it is crucial to write a complete discharge report containing the most relevant information about the anaesthetic procedure, the surgery, the ICU-stay and the postoperative treatment to be followed in the ward. The aim of this study was to analyse the levels of completeness of the anaesthesiologists' discharge reports in our ICU.

Materials and Methods: This retrospective, descriptive study collected over a period of four months all discharge reports of patients who stayed at least 24 hours in our unit. The levels of completeness of the following variables were measured: patient and doctor identification, admission/discharge dates, written in one or two languages, admission reason, preoperative coexisting diseases, allergies, toxic addictions, treatment at home (TH), active principle of drugs in TH, kind of surgery (S), airway management, surgery time, preoperative hematocrit, bleeding, antibiotic prophylaxis (ATB), disease causing surgery, patient's evolution in ICU, pain control, diagnosis, discharge treatment (DT), active principles in DT, ECG and chest x-ray results. Levels of completeness less than 75% were considered unsatisfactory. Data are presented as percentage of completeness.

Results and Discussion: Two hundred consecutive discharge reports were included. The levels of completeness measured were the following: patients' identification, admission reason and kind of surgery obtained 100%; admission/discharge dates and disease causing surgery 98.5%; evolution in ICU and allergies were written in 97% of the reports; hematocrit, preoperative coexisting diseases and surgery time were observed in more than 95% of the cases; DT, ATB and toxic addictions: > 90%; only one language was used in 87% of the reports; diagnosis, TH and the name of the doctor: > 80%. Deficient levels of completeness (< 75%) were: bleeding 61.7%, active principles in DT 41.1%, pain control information 30.3%, chest x-ray results 25.3%, active principles in TH 13%, airway management 10.3% and finally ECG 6.5%.

Conclusion(s): In our daily discharge reports, seven of the studied variables didn't reach satisfactory levels of completeness. Data concerning the airway management, pain control, ECG, chest x-ray and drugs in active principle form should be improved. A carefully completeness of discharge reports may improve the quality of patient's care. This is a preliminary study leading to the construction of a mnemonic device for preventing omissions of relevant information in our ICU discharge reports.

12AP5-5

Prognostic markers in the acute phase of myocardial infarction

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Background and Goal of Study: The aim of the study was to assess the prognostic value of heart rate variability, arrhythmias and left ventricular systolic and diastolic function for the course and the outcome of myocardial infarction (MI).

Materials and Methods: We prospectively studied 57 consecutive patients admitted to the Intensive Care Unit of the Department of Cardiology of Kaunas Medical University Hospital between 2002 and 2008 with acute MI. The study protocol included 24-h ECG monitoring on the first and the third day of admission and echocardiography performed at days 2-4. In-hospital prognostic endpoints were death and non-fatal events: post-infarction angina, progressive heart failure, pulmonary edema and cardiogenic shock. Heart rate variability (HRV) was assessed at day 1 and 3 by a 24h recording using "HeartLab" system. Logistic regression model was used to select the combination of statistically significant variables and predict the complications.

Results and Discussion: In our model statistically significant independent variables for prediction of in-hospital myocardial infarction complications were HRV frequency domain parameter low frequency power (LF) on day 3, left ventricular end-systolic volume (LV ESV), atrial fibrillation/flutter and inotropic agent administration on day 1. According to the results presented in the table atrial fibrillation/ flutter (odds ratio 25.6), increased LV ESV (odds ratio 1.067 (6.7%) for increase in 1ml) increase the probability of in-hospital complications, while increased LF on day 3 (odds ratio 1.29 for 1000 units), no administration of inotropic drug on day 1 (odds ratio 34.5) decrease the probability of in-hospital complications. The average efficacy of prognostication reached 96.5%; the presence of complications was correctly predicted in 88.9% of cases, and the absence of complications – in 100% of cases.

Conclusion(s): HRV parameter LF on day 3, LV ESV, atrial fibrillation/flutter and inotropic agent administration on day 1 are statistically significant independent predictors of in-hospital complications of MI with the average predictive efficacy of 96.5%.

12AP5-6

Effect of social deprivation on the uptake of welfare attorney registration in Scotland

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Background and Goal of Study: When a critically ill patient lacks capacity the relatives are involved in decision making. The Adults with Incapacity (Scotland) Act 2000 allows a person to appoint a Welfare Attorney (WA) to act on their behalf should they lose capacity. The WA is required to make decisions, as the appointing person would have[1]. Over 120 000 WAs have been registered with the Public Guardian's (PG) office since the implementation of the Act in 2002. Deprivation is associated with poorer health, as well as with reduced access to health information and other services. We have investigated uptake of WA registration and the influence of social deprivation on this.

Materials and Methods: A list of all 203 postcode sectors for the NHS GGC area was sent to the PG's office. Against these were matched the number of WAs registered for each sector at 24/09/09. The population and deprivation category for each sector was obtained from the 2001 census returns[2]. The number of WAs for each deprivation category was calculated as a percentage of population in that category. The PG indicated whether the patient had a WA registered at the time of admission to our ICU or had registered one since ICU discharge.

Results and Discussion: There were 1152 patients admitted from April 2006 to May 2009. The mean age was 53.7years, 61% were male and mean APACHE II score was 19.7. The mean LOS 6.7 days, predicted hospital mortality 35%, ICU mortality 26.7%, actual hospital mortality 34.4% and SMR 0.94. Twelve (1%) patients had a WA appointed prior their ICU admission and 11 (1%) had appointed a WA since hospital discharge. There were 19710 WAs registered to postcodes sectors in the NHS GGC area. The total population is 945295, so 2% have a WA appointed. This varied from 6% in deprivation category 1 to 0.7% in deprivation category 7. Despite large numbers of people registering their WA, very few ICU patients have a WA and social deprivation class appears to influence the uptake with a very small proportion of patients in deprivation categories 5 to 7 making use of this process.

Conclusion(s): Education processes designed to improve the uptake of the Welfare Attorney will have to take account of social deprivation.

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12AP5-7

The introduction of an oral surgical service in an intensive care unit serving a deprived inner city population – Evaluation of the first 100 patients

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Background and Goal of Study: The population of Greater Glasgow exhibits poor oral health[1]. Poor oral hygiene is associated with the development of ven-

tilator associated pneumonia (VAP) as acknowledged in NICE (National Institute for Health and Clinical Excellence) guidelines[2]. We serve an inner city population with widespread socioeconomic deprivation. Following a recent survey of Scottish ICUs, which demonstrated that no ICU incorporated a dental review into their care[3], we introduced an oral surgical review into our routine practice.

Materials and Methods: An oral surgeon experienced in oral care provision in the critically ill performed ward rounds over a 6 month period. Patients expected to be intubated for >48 hours were examined. Patients were excluded if they were expected to be intubated for <48 hours, survive for <48hours, and where oral cavity examination was not possible (e.g. facial burns). Oral health was assessed and interventions documented including: advice to nursing staff on oral hygiene, debridement of oral debris, dental extraction and referral to the Community Dental Service on discharge.

Results and Discussion: One hundred patients were examined. Mean age was 53.5 years. 67 patients (67%) were current or ex-smokers, and 37 patients (37%) consumed >30 units of alcohol per week. 47 patients (47%) underwent oral surgical intervention. 13 patients (13%) required dental extraction. 24/53 patients (45%) who did not require oral surgical intervention were edentulous. One patient, with marked periodontal disease, was diagnosed with VAP during their stay. The patients reviewed are typical of the population in this ICU. Risk factors associated with poor oral hygiene are prevalent and dental health is poor.

Conclusion(s): Our findings suggest that oral care needs of this patient group may not be adequately met by routine oral hygiene protocols. Further work is required to determine the optimal way to provide such a service, its cost effectiveness and any impact on VAP prevention.

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12AP5-8

Delirium as a predictor of hospital mortality after surgery

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Background and Goal of Study: Patients admitted to surgical intensive care unit (ICU) are at high risk for delirium. In this context delirium is a common yet underdiagnosed form of organ dysfunction, and its contribution to patient outcomes is unclear. The aim of the study was to determine if delirium is an independent predictor of hospital mortality among surgical ICU patients.

Materials and Methods: Prospective study carried out in the multidisciplinary Post-Anaesthesia Care Unit (PACU) with five intensive care beds. Out of 230 intensive care patients admitted consecutively to the PACU among a period of 3 months after noncardiac and non neurological major surgery, 194 were enrolled in the study. Patient´s demographics, intraoperative and postoperative data were collected, including PACU and hospital length of stay (LOS), development of Acute Kidney Injury (AKI), Major Cardiac Events (MCE- acute myocardial infarction, pulmonary oedema, ventricular fibrillation or primary cardiac arrest and complete heart block) and mortality. Simple and multiple logistic regression analysis with an odds ratio(OR) and its 95% Confidence Interval (95%CI) were performed to determined the associations between in hospital mortality and preoperative characteristics, intraoperative management and postoperative data.

Results and Discussion: Fifteen patients (8%) died during hospital stay. Twenty-nine patients (15%) developed delirium at some point during the ICU stay. Univariate analysis identified age (OR 4.3, 95%CI 1.2-15.9, p=0.027), emergency surgery (OR 7.0, 95%CI 2.1-23.6, p=0.002), duration of anesthesia (OR 0.57, 95%CI 0.37- 0.88, p=0.011), development of postoperative delirium (OR 16.8, 95%CI 5.2-54.5, p<0.001), AKI (OR 19.3, 95%CI 5.8-64.0, p<0.001) and MCE (OR 9.0, 95%CI 1.4-58.9, p=0.022) as predictors of hospital mortality. Multivariate analysis identified development of postoperative delirium (OR 11.6, 95%CI 3.2-42.1, p<0.001) and AKI (OR 12.5, 95%CI 3.2-48.6, p<0.001) as independent predictors of hospital mortality. SAPS II was significantly higher in patients with delirium (p<0.001) and they had a longer ICU stay (65 vs. 26 hours, p<0.001).

Conclusion(s): Delirium was an independent predictor of hospital mortality in surgical ICU patients and patients with delirium had longer PACU stay.

12AP5-9

Predictors of length of stay at hospitals and post-anesthesia care units in patients with bowel obstruction surgically managed

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Background and Goal of Study: Bowel obstruction is a mechanical or functional intestinal obstruction that prevents normal transit of digestion products. The existence of early markers for post-operative complications could be helpful in order to decide whether is appropriate an early surgical treatment. This study aims to determine the relationship among the perioperative variables of patients who had bowel obstruction surgically treated and their post-anesthesia care unit (PACU)and hospital length of stay. Finally,a formula was set up for calculating the amount of time spent in hospital and PACU units considering given values of influence variables.

Materials and Methods: Using a retrospective descriptive design,80 patients who had surgical treatment of bowel obstruction from 2006 to 2007 were included. Obtained from our patients database were measures of clinical,demographic,and biochemical variables. Then,a multiple logistic regression was performed so all quantitative variables considered in the model were transformed into categorical using percentiles.If an odds ratio below 0.05(p<0.05)was obtained the variable was introduced in the model, whereas variables with an odds ratio above 0.10(p>0.10)were dismissed. For those variables in the middle they were introduced one by one until the best length of stay prediction was achieved. A lengthy period of post-anesthesia care unit stay was considered for stays above 1 day (75 percentile was 1 day): *N=21/79; P=26.58%; CI=18.09–37.24%.* However, a lengthy period of hospital stay was considered for stays above 15 days(75 percentile was 15 days): *N=11/79; P=13.92%; CI=7.95–23.23%.*

Results and Discussion: Attending to **PACU length of stay** the following correlated variables were found: Obstruction etiology (benign or tumoral), location (stomach/duodenum,large or small intestine), necessity for catecholamines during post-operative period.Thus a 90% percent of PACU length of stay variability was explained. Attending to **hospital length of stay**, the following correlated variables were found:Obstruction etiology, necessity for catecholamines. Hence a 60% percent of the hospital length of stay variability was explained. A formula was obtained for each lenght of stay.

Conclusion(s): Obstruction etiology, location and the need for catecholamines administration during post-operative period are correlated with a prolongued period of PACU and hospital stay. Therefore,it may be possible to set up a formula to predict the length of stay by taking such variables into account.

12AP6-1

Controversial issues of end-of-life treatment decisions: A Korean national survey

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Background and Goal of Study: Korea is one of the few industrialized countries that still does not have guidelines/regulations regarding withholding and withdrawing end-of-life treatments. Due to the recent process that led to the Supreme Court's ruling that honored the presumed wishes of an elderly woman in persistent vegetative state and ordered the medical staff to withdraw ventilatory support, end-of life treatment issues have been under the spotlight. We tried to evaluate what Koreans thought about this issue and also about some of the controversies surrounding this issue.

Materials and Methods: We surveyed Koreans who do not work in healthcare and Korean healthcare professionals and asked for their thoughts on the following issues. 1) Do you consider ventilator-dependent PVS patients as candidates for end-of life treatment decisions? 2) Do see withholding and withdrawing EOL treatment as equivalent decisions? 3) If an unconscious terminally ill patient's wishes regarding EOL treatment are unknown, on what grounds should EOL decisions be made? 4) If there is disagreement between or amongst medical staff and the patient's family on EOL decisions, how should this discrepancy be settled?

Results and Discussion: One thousand Koreans not working in healthcare and 500 healthcare professionals responded to the survey. Fifty-seven percent of Koreans not working in healthcare and 67% of Korean healthcare professionals agreed that ventilator-dependent PVS patients should be considered as candidates for EOL treatment decisions. Only one quarter of all respondents thought of withholding and withdrawing EOL treatment as the same thing. Among the >75% of respondents who agree to respecting the presumed wishes of the unconscious terminally ill patient, just over 50% thought that EOL treatment decision should be made through discussions between the physician and the patient's family. When asked about preferred ways of settling disagreements, 75% of Koreans not working in healthcare preferred direct settlement between the medical staff and the patient's family while 55% of healthcare professionals preferred calling in the hospital ethics committee.

Conclusion(s): Korea is yet to reach a consensus on a number of EOL treatment decision issues. Unsettled issues include whether to include ventilator-

dependent PVS patients as candidates of EOL treatment decision or not and how to sort out disagreements regarding EOL treatment decisions. We also identified the interesting phenomenon of viewing withholding and withdrawing EOL treatment issues differently.

12AP6-2

Epidural analgesia in intensive care: Our experience

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Background and Goal of Study: Few data has been published reporting the use of epidural analgesia in the seeting of intensive care.[1] Avoiding high systemic doses of opioids, reduces several complications as withdrawal syndrome, mental status changes and gastrointestinal dysfunction.[2] Despite this benefits, management of epidural analgesia is controversial. ICU patients often have usage contraindications: sepsis, coagulopathy, difficulty in neurological assessment and technical execution.[3] The aim of this study is to describe the use of epidural analgesia in an ICU.

Materials and Methods: The clinical records of the patients who received epidural analgesia between November of 2007 and October of 2009 were retrospectively reviewed.

Results and Discussion: During the study period 958 patients were admitted to the ICU and 16 patients (1,86%) performed epidural analgesia. 10 were male and 6 female. The average age was 56 (±4). Mean APACHE II was 18,5 (±13). Relative contraindications were found in 12,5% of the patients. Accountability was attributed to hemostasis disorders (corrected before epidural placement) and recent bacteriemia. Major contraindication precluded the technique. Epidural placement was performed by anesthetists or intensivists with anaesthetic background. Epidural puncture level was dictated by the dermatomes to be blocked: thoracic (2) and lombar epidural (14). Main admission diagnosis were multiple trauma, sepsis, postoperative of aortofemoral bypass and cystectomy. Main duration of in-situ catheter days was 4.7. Epidural analgesia was induced with 0.2% ropivacaine and opioids (continuous infusion or intermittent bolus administration). No associated complications with epidural performance occurred.

Conclusion(s): We believe that epidural analgesia can have an important role in the critically ill patient despite being an underused technique in ICU. Although indications for its use must be carefully chosen, a well-conducted regional analgesia reduce many side effects observed when intravenous medications are used: reduces several complications as withdrawal syndrome, mental status changes and gastrointestinal dysfunction. High-quality nursing care and well-trained physicians are essential to use these techniques safely in the critical care environment.[3] Further research is needed to prove epidural benefits in this setting.

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12AP6-3

Post-operative critical care of patients following bariatric surgery, an audit

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Background and Goal of Study: We started to provide a bariatric service in 2007 and have a dedicated multi-disciplinary specialist team consisting of metabolic physicians, anaesthetists & surgeons, as well as specialist nurses, psychologists and nutritionists. Our aim was to audit critical care admissions and hospital stay for these patients to improve quality of care and patient experience.

Materials and Methods: A retrospective audit was carried out for patients undergoing surgery between July 2008 & July 2009. Data was collected from theatre and critical care databases.

Results and Discussion: 99 patients had a bariatric surgical procedure; the majority (65%) a laparoscopic Roux-en-y gastric by-pass (LGBP). 98% of LGBP were admitted to post-operative ITU, 64% for 2 days (overnight) or less. Of these, 84% required HDU level care or less & 25% did not require any critical care nursing. 45% of patients admitted for more than 2 days had 1 or more days without HDU/ITU level nursing care. There was no difference in mean BMI or co-morbidities for those admitted for more than 2 days when compared with patients admitted for 2 days. 4 patients required post-operative critical care following a gastric band. The median duration of hospital stay after a LGBP was 4 days (range 2-45). 66.7% of patients admitted for more than 5 days had a documented reason or complication.

Conclusion(s): The majority of patients do not require post-operative critical care following a LGBP and could be managed on an acute post-operative surgical ward with a high standard of nursing care. Strict criteria should be a prerequisite for admission to ITU. We are already achieving this with gastric bands, only admitting those with a specific requirement for post-operative critical care. Implementation of an enhanced recovery pathway for bariatric surgery, with the incorporation of Critical Care admission and discharge criteria, may be of benefit for improving patient experience and quality of care.

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12AP6-4

Patient temperature and re-warming on admission to intensive care; an audit of practice

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Background and Goal of Study: Low temperature has been linked with poor outcomes. Hypothermia can result in immunosuppression, poor wound healing, bleeding and coagulopathy and cardiovascular compromise. Unless part of a specific therapeutic intervention, patients in intensive care units (ICU) should have temperatures maintained above 36 degrees centigrade (0C).

Materials and Methods: The temperature of all patients admitted to the ICU at the Victoria Infirmary as well as their previous location was audited over a 3 week period. Where the temperature was less than 36 0C, the time taken to achieve 360C and the intervention used to achieve this was also documented. The results were expressed as a percentage (%).

Results and Discussion: During the audit period there were 17 admissions to the unit. 6 (35%) came from the emergency department (ED), 4 (23%) from the high dependency unit (HDU), 3 (18%) from theatre, 2 (12%) from the coronary care unit and 2 (12%) from other hospitals via direct ambulance transfer. There were 6 (35%) cases where temperature on arrival was less than 360C. 4 cases (67%) came from the ED (67% of the total ED admissions). 1 case was from theatre and 1 the result of an inter-hospital transfer. The mean time spent with a temperature of less than 360C in ICU was 2.29 hours (range 2 to 5 hours). In ICU re-warming was accomplished via several means: no additional interventions (2 instances), blankets only (1 instance), forced air warmers (2 instances) and the combination of warmed fluids and forced air warmer (1 instance). When no intervention was performed the mean rise in temperature to 360C was 0.1750C per hour. When a forced air warmer was used the mean rate of increase was 0.290C per hour. When blankets only were used the rate of temperature increase was 0.160C per hour and when the combination of warmed fluids and a forced air warmer was used the rate of increase was 0.60C per hour.

Conclusion(s): The re-warming of patients in ICU has been done in an inconsistent way, with the most efficient method being used only once. The majority of patients admitted hypothermic come from the ED and more could be done to address this at that site. A co-ordinated protocol between the ED and ICU should be drawn up utilising the combination of forced air warmers and warmed fluids should be instituted and a repeat audit should be performed with this in place.

12AP6-5

Intensive postoperative care in vascular surgery – Retrospective analysis

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Background and Goal of Study: Vascular surgery is associated with high rates of cardiovascular morbi-mortality compared with other types of major non-cardiac surgery. Risk reducing strategies include adequate postoperative vigilance (often in ICU) due to high incidence of major cardiovascular events (MCE).(1) This study's goal is to describe the population of patients who underwent vascular surgery and were admitted to intensive care recovery unit in a tertiary hospital.

Materials and Methods: Retrospective analysis of electronic records of patients who underwent vascular surgery admitted to ICU for postoperative recovery, between January/2006 and June/2009. Demographic data, physical status (ASA), type of surgery, APACHE II and SAPS II scores, ICU length of stay

(LOS) and post-operative complications were collected. Statistical analysis was made with SPSS®17.0 and variables compared with Mann-Whitney-U test.
Results and Discussion: Six hundred and sixty nine patients were included, 79,7% male gender, mean age 66,4 (SD±11,9), mostly ASA III, mean SAPS II score 20,2 (SD±10,7), mean APACHE II score 8,9 (SD±4,41). Scheduled surgery was present in 85,7%, unscheduled in 13,3%. Most frequent procedures were carotid endarterectomy (36,5%), aortofemoral bypass (26,9%) and abdominal aortic aneurysmectomy (11,1%). Mean LOS was 1,8 days (SD±2,42) with 2,8% admitted for less than 24h. Complications in ICU occurred in 20,9% of patients, mostly significant wound bleeding that motivated re-intervention (5,1%). Acute coronary events were present in 0,9% (n:6) and postoperative newly diagnosed cerebrovascular events in 2,4% (n:16) – 0,3% after noncarotid surgery. Mortality rate in ICU was 2,2% (n:15) caused by fatal bleeding (n:8), limb ischemia (n:3), respiratory failure (n:2) and stroke (n:2). Patients who died in ICU had longer ICU LOS and worst mean APACHE II and SAPS II scores (p<0,001).
Conclusion(s): Patients undergoing vascular surgery have multiple cardiovascular comorbidities and are submitted to agressive procedures with large blood losses being at risk for major postoperative complications.(1,2) Most of the complications and MCE occurred in the first postoperative hours, stressing the importance of the decision on the appropriate level of postoperative care.(3) Case fatalities had higher severity of disease scores and stayed longer in ICU.
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12AP6-7

Total serum protein, albumin and cholesterol evaluation for the risk complication assessment after major urologic surgery

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Background and Goal of Study: Radical cystectomy with urinary diversion is a major urologic procedure associated with significant intraoperative bleeding, perioperative stress and postoperative food restriction.Promotion of the perioperative complication risk assessment would improve morbidity and mortality of this procedure. The objective of this study was to evaluate perioperative levels of total serum protein, albumin and cholesterol, as a prognostic factor for the complication risk assessment with patients experiencing a major urologic procedure.
Materials and Methods: This retrospective study involved 32 patients with radical cystectomy with urinary diversion. Total serum proteins, albumin and cholesterol were measured preoperatively, on the first, third and fifth day in the intensive care unit. We divided patients into two groups according to the level of each parameter, with a limit for serum protein at 63g/l, for albumin at 35g/l, for cholesterol at 3,85mmol/l. Complications were defined as surgical complications that led to the patients' relaparatomy.The data was analyzed using c2 – test, Fisher's exact test, Mann-Whitney U Test.
Results and Discussion: The average age of the patients was 64±6,82 years and there was more men among patients (81,25%).There was no significance in the complication frequency between the group of patients with lower protein compared to the group with normal serum protein level preoperatively (Fisher's exact test: p=0,502; p>0,05 or NS). The median albumin value was lower in the group of the patients with which complications developed (Me=30,9g/l) compared to the group without complications (Me=33,5g/l), however, there was no statistical significance in complication frequency between the group of patients with lower albumin compared to the group with the normal albumin (c^2=0,161; p=0,688; p>0,05 or NS). Greater occurrence of complications was in the group of patients with lower level of cholesterol (80%). A difference in complication frequency between normal and low preoperative cholesterol level group was statistically significant (Fisher's exact test: p=0,021; p<0,05).
Conclusion(s): Preoperative hypocholesterolemia is an important parameter in the complication risk assessment with patients with a major urologic procedure.

12AP7-1

The higher the lactic acidosis, the higher the morbidity in postoperative abdominal surgical patients

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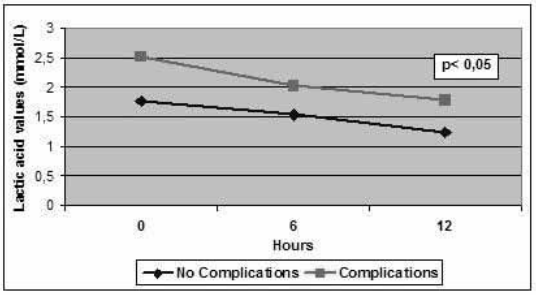
Background and Goal of Study: High values of lactic acidosis are shown to be correlated with bad outcomes in septic shock, cardiac failure and in major trauma patients (1, 2). The aim of our study has been to analyze the relationship between lactic acid values and the presence of complications in postoperative abdominal surgical patients.
Materials and Methods: We studied 307 patients that underwent scheduled surgery with standard anesthesia (38,8% colorectal surgery). The mean age was 64,6±13,8 years old (33,5 % females, 66,5% males).We included ASA I-IV patients without acute liver failure who were sent to the Critical Care Unit. We registered lactic acid values each 6 hours from the moment the patient arrived at the Unit for 12 hours. We also registered morbility until the patient left the hospital. We analyzed our data with SPSS version 15.0 and used a Chi-Square test for non- dependent samples with a type error of 0.05.
Results and Discussion: In the Graph we asses the differences of postoperative lactic acid values between patients with and without complications during hospital stay.



Conclusion(s): Patients who developed hospital complications had statistically significant higher lactic acid values in the first 12 postoperative hours than non-complicated postoperative patients.
Acknowledgements: None.
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12AP7-2

Sedation in intensive care: An audit of the effect of airway and sedation choice on ward round sedation scores

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Background and Goal of Study: Sedation is used routinely in intensive care units (ICU), however the choice of sedation both as a baseline and for periods of agitation can vary widely in a unit. Sedation may be used to treat acute psychosis and be required to facilitate nursing, allowing for airway management and endotracheal tube (ETT) tolerance. The purpose of this audit was to examine current sedation practices within our unit.
Materials and Methods: The Victoria infirmary uses a modified Ramsay score to assess sedation in the ICU. It aims to have patients with a score of 3-4 (1-2 being over sedated and 5-6 being agitated). Data was collected from 66 consecutive patient days, suffering from a variety of medical and surgical conditions, examining the airway device in use, sedation score at ward round and baseline sedation in use.
Results and Discussion: There were 36 instances (55%) where a sedation score of 3-4 was achieved on the ward round. In 16 cases (44%) a tracheostomy was the choice of airway control, while an ETT was present in 13 cases (36%). No airway support was required in the remaining 7 cases (20%). In 10 cases (28%) no regular sedation was prescribed. 5 (14%) had regular Lorazepam, 2 (6%) Lorazepam and Haloperidol, 3 (8%) had Diazepam only, 1 (3%) had Haloperidol only 2 (6%) morphine infusions only, 2 (6%) remifentanil infusions only, 6 (17%) propofol and morphine infusions and 4 (11%) propofol and remifentanil. There were 28 instances (42%) of a sedation score of less than 3 recorded at the ward round. 4 of these events (14%) occurred when a tracheostomy was insitu. The remaining 24 patients had an ETT. In 5 cases (18%) there was no associated sedation being given. 2 patients (7%) were on a morphine infusion, 8 on propofol only (29%), 4 on propofol and morphine (11%) and 9 on propofol and remifentanil (32%). There were 2 instances of agitation (sedation score greater than 4). 1 airway had an ETT and the other had a tracheostomy. 1 was sedated on a combination of propofol, morphine and diazepam and the other remifentanil only.
Conclusion(s): There is wide practice in baseline sedation. A majority of patients are appropriately sedated. When a sedation score of 3-4 is not achieved, patients are far more likely to be over sedated than agitated. The presence of an ETT does not preclude achieving a sedation score of 3-4, and is comparable in achieving this with a tracheostomy. The presence of an ETT is more likely to be found in an over sedated patient. The use of propofol is also more likely to be found in over-sedated patients.

12AP7-3

Low protein C concentrations are associated with postoperative complications after emergency surgery of the intestine

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Background and Goal of Study: Protein C is a natural anticoagulant exibiting also profibrinolytic and antiinflammatory properties. It has been shown that low levels of protein C correlate with negative outcome in severe sepsis patients. The aim of the study was to evaluate the time courses of protein C in patients undergoing emergency surgery of the intestine and their relationship with the developement of postoperative complications and outcome.
Materials and Methods: Prospective observational study of 41 adult patients undergoing emergency bowel surgery. Septic shock, chronic hemodialysis, preoperative coagulopathy or corticosteroids were exclusion criteria. Protein C concentrations were determined chromogenically (normal range 70-130%) preoperatively and on postoperative days 1-3 and 5 along with C-reactive protein (CRP) and procalcitonin (PCT). The patients were followed for infectious and other complications. Data were tested for normality and expressed as mean ± SD. The differences between patients with and without complications were compared using a t-test.
Results and Discussion: Patients without (**comp.-)** and with complications (**comp.+**) were comparable regarding the age, sex and ASA status. The SAPS II score was higher in comp.+ group (39,1±13,1 vs. 30±7,1; p=0,014). Preoperative CRP (mg/L) and PCT (mg/L) were not significantly different between the two groups. Max. postoperative CRP was higher in comp.+ patients (265,9±70,8 vs. 197,3±84; p=0,007) as was max. postoperative PCT (16,7±22,4 vs. 3,9±4,9; p=0,009). Comp.+ patients had significantly longer hospitalization and a mortality rate of 33%.

Preoperative and postoperative day 1-5 protein C concentrations (%) in patients without and with complications

	Preop. protein C	Day 1 protein C	Day 2 protein C	Day 3 protein C	Day 5 protein C
Patients without complications (N=20)	107,8±16,1	84,3±17,1	81,1±17,0	80,5±15,3	88,1±18,5
Patients with complications (N=21)	78,6±23,8*	59,6±12,8*	54,0±13,4*	53,0±11,7*	62,6±10,9*

*Statistically significant difference between patients without and with complications p<0,001; Repeated measures ANOVA p<0,001 in each group over time

Conclusion(s): In emergency bowel surgery, low preoperative and early postoperative protein C is associated with the developement of complications and increased mortality. Protein C added to the more common markers of inflammation and infection can contribute to an earlier diagnosis of postoperative complications.
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12AP7-4

Quality of life and delirium after major surgery

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Background and Goal of Study: Delirium has been associated with poor outcomes including mortality and functional decline. Patients in the Intensive Care Unit (ICU) are at very high risk for the development of delirium. Examining patient's quality of life before ICU admission will permit to study its relationship to other outcome variables after surgery. Our aim was to evaluate if development of delirium after major surgery was related to a worse quality of life before surgery.
Materials and Methods: This prospective study was carried out in the multidisciplinary Post-Anaesthesia Care Unit (PACU) with five intensive care beds. Out of 230 intensive care patients admitted consecutively to the PACU among a period of 3 months after noncardiac and non neurological major surgery, 194 were enrolled in the study. Before surgery patients were contacted to complete a Short Form-36 questionnaire (SF-36) and to evaluate their dependency in Activities of Daily Living (ADL). After surgery delirium was screened with Intensive Care Delirium Screening Checklist. Mann-Whitney, t test for independent groups, chi-square or Fisher's exact test were used to make comparisons.
Results and Discussion: Delirium occurred in 29 patients (15%). Before surgery 8% and 20% of patients were dependent in at least one activity in instrumental and personal ADL, respectively. Patients dependent in at least one ADL had more frequently delirium after surgery (31 % versus 11%, p=0.004) but mortality and length of hospital and PACU stay was not higher from other patients with no dependency in ADL. Patients with postoperative delirium had worse scores in three SF-36 domains before surgery: physical function (p<0.001), bodily pain (p=0.011) and social functioning (p=0.045).
Conclusion(s): This study shows that patients with dependency in ADL have more frequently delirium after surgery. Patients that develop delirium after surgery had worse scores in some SF-36 domains.

12AP7-5

Delirium in the post-operative cardiac patient: An audit

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Background and Goal of Study: Delirium is a common, probably underdiagnosed, complication following cardiac surgery and is associated with increased morbidity, mortality and costs. There is no optimal regime defined for its treatment. The goal of our audit was to look at incidence, risk factors, implications and treatment of delirium in the cardiac ICU.
Materials and Methods: We retrospectively audited 101 consecutive patients, aged 66 (11) [23-82] in the period of January to July 2009. We collected data on: delirium score (ICDSC- Intensive Care delirium screening checklist), past-medical history, pre-op medications, CPB time, X-clamp time, circulatory arrest time, type of operation, consequences and treatment received. The statistical tests used were chi-squared test with continuity correction for nominal categorical data and logistic regression for continuous data.
Results and Discussion: 26/101 (26%) patients developed delirium, defined as delirium score ICDSC of 4 or more. Data in Table 1 are number (%) or mean (SD). The most common implications secondary to delirium were non-compliance with oxygen therapy 20/26 (76%) and medications 15/26(57%), removal of lines 10/26 (38.4%), drains 2/26 (7.7%) and assault to the ICU staff 3/26(11.5%). There was no consistency in treatment and no regular medication regime following an episode of delirium. 21/26 of patients received pharmacological treatment. Our study may be too small to show any other risk factors for developing delirium.

Delirium vs non-delirium

	Delirium (n=26)	Non-delirium (n=75)	P value
Age (y)	69 (10)	65 (11)	0.17 (N/S)
Urgent procedure	7 (28%)	5 (7%)	0.016
Procedure involving a valve	15 (60%)	25	0.05 (N/S)
Psychiatric history- (pre-op depression)	7	5	0.016
Renal Disease	3 (12%)	7 (9%)	1.0 (N/S)
Resp. disease pre-op	7 (28%)	12 (16%)	0.35 (N/S)
Diabetes	8 (32%)	18 (24%)	0.67 (N/S)
Endocrine disease pre-op	5 (20%)	14 (18%)	1.0 (N/S)
Smoking	5 (20%)	9	0.47 (N/S)
Alcohol intake pre-op	8 (73%)	34 (57%)	0.45 (N/S)
CPB time (min)	154 (83)	117 (39)	0.013
Cross-clamp time (min)	121 (77)	92 (35)	0.029

Conclusion(s): More pharmacological trials are awaited, the mainstay of treatment remains minimizing the risk factors. We have to look at other potential risk factors, such as anaesthetic drugs or inflammatory, metabolic markers. Regular medications should be prescribed. Prophylactic use of medications in high risk population has no evidence so far.
Acknowledgements: Dr M. Malar Dr M. Poojary Cardiff University, UK.

12AP7-6

Professional exposure and environmental pollution for sevofluroane, in postoperative units, during inhalatory sedation with the conservative device of anesthesia (AnaConDa®)

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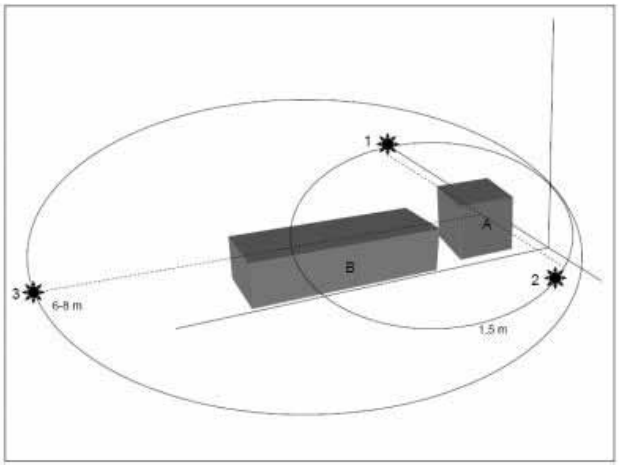
Background and Goal of Study: Chronic exposure levels to sevofluorane do not have to exceed 2 parts per million (ppm). Our goals were (1) to value levels of environmental pollution and professional exposure to sevofluorane in the reanimation during inhalatory sedation, (2) to quantify levels of sevofluorane issued and (3) to propose preventive measures.
Materials and Methods: We evaluated environmental pollution and professional exposure to sevofluorane, during inhalatory sedation in mechanical ventilation, using AnaConDa® in different suppositions. First determination (Case A) was the control. Second one (Case B) was using gases extraction. And the third (Case C) was with scavenging device: contrafluorane. SKC-575-002 monitors, of passive catchment, were placed in recovery room for the environmental study and trace concentrations were measured from the breathing zone of the nurse who handle the AnaConDa® for professional exposure study. Analysis of monitors has been made according to OSHA 29 procedures. (Figure shows distribution of passive monitors placed in reanimation room. Letter A represents the mechanical ventilator and B, the bed of patients).



Results and Discussion: Characteristics corresponding to the sedation carried out and physical conditions are in table 1. Results of monitor analysis are in table 2.

	Case A	Case B	Case C
Minute volume ventilator	6,2	9,2	7,4
Time of sedation (hours)	2	2,5	2
Average speed on sevofluorane (ml/h)	5,2	4,8	5
Sevofluorane total consumption (ml)	10,5	10,7	9,5
Number of staff	6	8	8
Volume Unit (m3)	144	270	270
Renewals of Air (rph)	10	10	10
Temperature (ºC)	24	22,3	21
Humidity (%)	45	47	45

	Case A	Case B	Case C
ENVIRONMENTAL POLLUTION			
1. 1,5 meters right radium	4,4	0,25	0,3
2. 1,5 meters left radium	1,2	0,25	0,3
3. 6-8 meters radium	1,1	0,25	0,45
PROFESSIONAL EXPOSURE			
4. Personal monitor	1,4	0,25	0,3

Values in ppm. Difference of the average of ranks (p<0.05) is shown by Kruskal-Wallis test

Conclusion(s): Professional expossure to sevofluorane not exceed limits o 2 ppm during inhalatory sedation with AnaConDa® in recovering room. Application of gases extractors and contrafluorane reduce levels of environmental sevofluorane.

12AP7-7

Delirium after major surgery: Incidence and risk factors

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Background and Goal of Study: Delirium in the postoperative period is associated with increased length of stay (LOS), more frequent medical complications and increased mortality. In the Intensive Care Unit (ICU) it can be difficult to identify delirium as many factors influence a clear clinical diagnosis. Early recognition of delirium and treatment of the underlying cause is the key component in reducing its duration and negative outcomes. Our aim was to evaluate incidence and determinants of delirium after major surgery.
Materials and Methods: This prospective study was carried out in the multidisciplinary Post-Anaesthesia Care Unit (PACU) with five intensive care beds. Out of 230 intensive care patients admitted consecutively to the PACU among a period of 3 months after noncardiac and non neurological major surgery, 194 were enrolled in the study. Patient´s demographics, intra and postoperative data were collected. We also recorded PACU and hospital length of stay (LOS) and mortality. Tools used were the Intensive Care Delirium Screening Checklist for delirium and Richmond Agitation and Sedation Scale. Patients were followed for the development of delirium. Pearson Chi-square test was used to compare proportions and risk factors were evaluated using simple and multiple binary logistic regression analysis with an odds ratio(OR) and its 95% Confidence Interval (95%CI).
Results and Discussion: Delirium occurred in 29 patients (15%). Univariate analysis identified age, history of hyperlipidemia, congestive heart disease and ischemic heart disease, ASA physical status, emergency surgery and total Revised Cardiac Risk Index (RCRI) score as predictors for development of delirium in postoperative period. Multivariate analysis identified age (OR 5.5, 95%CI 1.7-18.0, p=0.005 for age ≥ 65 years), history of hyperlipidemia (OR 2.9, 95% CI 1.1-7.6, p=0.031), congestive heart disease (OR 4.9, 95%CI 1.8-13.0, p=0.002) and emergency surgery (OR 15.6, 95%CI 3.1-77.7, p=0.001) as independent predictors for development of delirium in the postoperative period. SAPS II (p<0.001), in hospital mortality (67% vs. 11%, p<0,001) and ICU stay (65 vs. 26 hours, p<0.001) were significantly higher in patients with delirium.
Conclusion(s): This study shows that age, hyperlipidemia, congestive heart failure and emergency surgery are independent risk factors for the development of delirium after major surgery. Delirium has serious impact in PACU length of stay and in mortality.

12AP8-1

Desferrioxamine prevents postoperative lung injury following hepatic ischemia-reperfusion and hepatectomy in the swine

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Background and Goal of Study: Ischemia-reperfusion and partial resection of the liver can result in postoperative lung injury. We tested whether iron chelation with desferrioxamine (DF) can alleviate oxidative stress and improve lung injury after major hepatectomy.
Materials and Methods: We subjected 12 pigs to liver ischemia for 150 min, 65-70% hepatectomy and reperfusion for 24 hours. The animals remained under general anesthesia with ketamine (4-5 mg/kg/h) and fentanyl (10-15 mcg/kg/h) throughout the experiment and were randomized to DF group (*n*=6), which received intravenous desferrioxamine in a total dose of 100 mg/kg and a control group (group C, *n*=6). Serum interleukin-6 was analyzed at 0h, 6h, 12h and 24h of reperfusion. Pulmonary tissue was evaluated histologically and for its nitrotyrosine content. Statistical analysis was performed with repeated measures and multivariate ANOVA.
Results and Discussion: Significant improvements were observed in group DF in serum total bilirubin and lactic dehydrogenase. In parallel, the decrease in systemic oxygenation was partially prevented, with the PaO_2/FiO_2 ratio being significantly higher compared to group C at 24h (356 ± 104 vs. 203 ± 86, p<0.05). At the same time, the increase in pulmonary vascular resistance was prevented in group DF (at 24h; group C: 434 ± 100 vs. group DF: 227 ± 165 dynes·sec^{-1}·cm^{-5}, p<0.05). A significant increase of serum interleukin-6 was induced in group DF at 12 and 24h following reperfusion (p<0.05). Histological evaluation revealed less alveolar collapse and infiltration by inflammatory cells in group DF (p<0.05), and less nitrotyrosine content of the lung compared to controls (89 ± 28 vs. 139 ± 25 nM/mg protein, respectively; p < 0.05).
Conclusion(s): Iron chelation after hepatectomy resulted in improved pulmonary function and was accompanied by reduced inflammation and oxidative stress in the lung. The efficacy and simplicity of the treatment support further research on the role of DF during hepatic resection surgery and postoperative care.

12AP8-2

Difficult weaning of temporary circulatory assistance: Interest of levosimendan

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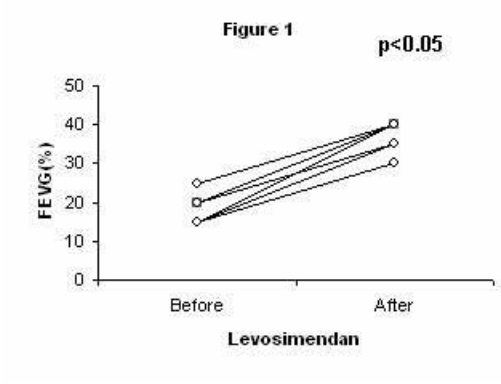
Background and Goal of Study: Levosimendan is a new inodilator agent which exerts positive inotropic effects by binding to cardiac troponin C and sen-

sitizes myofilaments to calcium. It has also vasodilatory properties by opening ATP-dependent potassium channel and anti-ischemic effects [1]. Its usefulness has been described in cardiac surgical patients with poor LV function and who had difficulty weaning from cardiopulmonary bypass [2].This beneficial effect results in an improvement of global hemodynamics and optimized ventriculoarterial coupling. Its use in the withdrawal of temporary cardiac assist in cardiogenic shock remains less documented. In this report, we report our experience with the use of levosimendan in this indication.

Materials and Methods: Seven cardiac surgical patients (17-63 yr) requiring temporary circulatory support (ECMO type) for postoperative refractory cardiogenic shock have been studied. All these patients received at least one infusion of levosimendan (0.2 µg/kg/min for 24 hours without bolus dose) because difficult weaning from circulatory support despite high doses of catecholamines. A paired t test of Student was used ($p < 0.05$).

Results and Discussion: The levosimendan was given 5 ± 2 days after the beginning of circulatory assistance. Figure 1 shows the LV ejection fraction changes before and after levosimendan therapy ($P<0.05$). In three patients, a second infusion of levosimendan was required (5 days after the first one). Circulatory support could be successefully weaned in all patients 6 ± 5 days after the levosimendan infusion. All patients had successful outcome and survived to leave hospital alive.



Conclusion(s): Our findings suggest that levosimendan, in refractory cardiogenic shock requiring temporary circulatory support, could improve left ventricular function and thus facilitate circulatory support withdrawal. Interestingly, some patients required additional infusion of levosimendan. A large-scale randomized controlled trial still requires to confirm these encouraging results.

Acknowledgements:

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12AP8-3

The role of a unique protocol for weaning from mechanical ventilation in the ICU

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Background and Goal of Study: In many hospitals there is no established weaning protocol and mechanical ventilation (MV) is managed according to personal experience and/or intuition of doctors without a well accepted protcol. Based on this, we implemented an unique protocol in ICU, comparing the timing of mechanical ventilation.

Materials and Methods: The purpose of the study is to avaluate the effects of an unique weaning protocol in ICU regarding: 1. Total longlasting time in MV. 2.VAP. 3.Mortality. 4.Cocts. This was a randomized prospective study introduced in ICU. The study enrolled 143 patients under MV. The patients were divided in two groups. Control group (CG) and weaning protocol group. Both groups had no gender, age, APACHE II and ISS differences. We studied patients ≥16 years treated for ≥24 hours in MV. In the control group all the patients were treated routinely in ICU. In the weaning group was established a single protocol adopted for our ICU centre. Criterias for involvement and weaning were established.

Results and Discussion: 1. The overall time under mechanical ventilation was reduced from 272 hours in CG to 178 hourt in WG, p=0.01538. 2. In total we found 27 cases with VAP in CG and 12 cases in WG, p=0.02444. 3. The overall costs were reduced significantly, p = 0.0019. 4. Mortality was similar to both groups, p = 0.70068.

Conclusion(s): 1.The introduction of the weaning protocol reduces the overall time under MV without negative effects. 2. The icidence of VAP is reduced. 3. The unique weaning protocol reduces the total treatmet costs in MV patients. 4. The protocol do not interfere in mortality rate.

References:

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12AP8-4

Does tracheotomy reduce the time spent in the post surgery intensive care unit?

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Background and Goal of Study: Tracheotomy is suggested to prevent laryngeal injury in cases of long-term translaryngeal intubation, and to improve tracheal hygiene, decrease the dead space and reduce the time spent in intensive care units. With the large and increasing population of mechanically ventilated patients, critical care physicians frequently face the dilemma of whether to perform tracheotomy. The decision is a complex one, requiring a detailed understanding of the risks and benefits of both tracheotomy and prolonged translaryngeal intubation (TLI). It also must be individualized. The goal of the study was to clear the situations in which the tracheotomy should be carried out to prevent laryngeal injury in cases of long-term translaryngeal intubation.

Materials and Methods: For two groups of patients in post surgery reanimation, we compared the mechanical ventilation, disconnection time, the infectious / respiratory complications, and the mortality rate.

Results and Discussion: All patients were presented with the same disconnection system (SIMV + PC). The average age was 73.5 for group A and 73 for group B. Out of a total of 2,700 patients that were admitted in the unit, 40 of them required prolonged mechanic ventilation, 16 were tracheotomized after an average of 11,8 days of mechanical ventilation (group A) i.e. a late tracheotomy was performed, and 24 were not tracheotomized (group B). The tracheotomized patients (Group A) were in the unit for an average of 29.3 days, and: 8 of them had infectious complications (50%); 14 had respiratory complications (pleural spillage, atelectasia and neumotorax) (87.5%); 2 died (mortality 12.5%). The 24 patients that were not tracheotomized (Group B) were in the unit for an average of 23.9 days, and: 4 of them had infectious complications (16.6%); 12 had respiratory complications (50%); 3 died (mortality 12.5%).

Conclusion(s): In our post surgery unit, the tracheotomized patients, contrary to other studies, had longer stays than the non tracheotomized patients, and presented more infectious and respiratory complications. The global mortality was similar in both groups. The result might be related to the fact that the tracheotomized patients had late tracheotomies. The decision to perform a tracheotomy should be taken early in the process, since, otherwise, the number of infectious and respiratory complications is larger than in the case of patients with prolonged orotracheal intubation.

Acknowledgements: Dr. Javier Fidalgo. Health Service Inspector. Asturias Health Regional Authority.

12AP8-5

The volotile anesthetic sevoflurane attenuate ventilator induced lung injury in rabbit model

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Background and Goal of Study: Ventilator-induced lung injury (VILI) is characterized by an initial inflammatory phase such like granulocyte activation, hyaline membrane formation, increased vascular permeability, and pulmonary edema. Volatile anesthetics might have anti-inflammatory effect. Therefore, we investigated whether the volatile anesthetic seovoflurane attenuates ventilator-induced lung injury.

Materials and Methods: Twelve male rabbits were anesthetized and were mechanically ventilated with 50% oxygen, PIP; 10 cmH_2O, I:E ratio; 1:4, PEEP; 5 cmH_2O. All animals were randomly assigned to one of three groups: ventilated with 10 cmH_2O of PIP (Sham group, n=4); ventilated with 30 cmH_2O of PIP (Contol group, n=4); ventilated with 10 cmH_2O of PIP and 0.8 vol% sevoflurane (Sevoflurane group, n=4) during the 5h. After the protocol, the wet weight/dry weight (W/D) ratio and histopathology of the lung, and number of granulocyte, concentration of IL-8 in bronchoalveolar lavage fluid (BALF), and Western blot analysis of the lung tissue were measured.

Results and Discussion: The W/D ratio, expression of IL-8 and phosphorylation of ERK 1/2 and ARK were decreased significantly in sevoflurane group compared with the control group. Inflammatory changes in histopathology were detected in the control group, but the sevoflurane group showed almost normal lung architecture.
Conclusion(s): Sevoflurane attenuate the ventilator induced lung injury in rabbits mainly by inhibiting expression of IL-8 and phosphorylation of ERK 1/2 and ARK might be possible pathway in protection.

12AP8-6

Effect of curcumin on LPS-induced neutrophil activation and acute lung injury

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Background and Goal of Study: Curcumin is a natural phytochemical present in turmeric, extracted from the rhizome of the plant *Curcuma longa***.** It has antioxidant, antitumor, and anti-inflammatory properties. Neutrophils play an important role in the development of organ dysfunction associated with severe infection. This study was performed to evaluate the effects of curcumin on lipopolysaccharide (LPS) – induced neutrophil activation and acute lung injury.
Materials and Methods: To assess the anti-inflammatory effect of curcumin on LPS induced neutrophil activation, neutrophils from human blood were incubated with various concentrations of curcumin (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 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 attenuated LPS – induced neutrophils activation including expression of p38, JNK, NF-κκB, IL-6, 8 and TNF-α. Mouse treated by Curcumin were protected from LPS-induced lung injury, as determined by wet/dry weight ratio, lung injury score and IL-6, 8 and TNF-α in bronchoalveolar lavage fluid (BALF) levels and mortality.
Conclusion(s): Curcumin can attenuate LPS – induced acute lung injury and mortality via the attenuation of neutrophil activation caused by LPS.

12AP8-7

Evaluation of a novel motility capsule for gastric emptying in a porcine model of acute lung injury

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Background and Goal of Study: The aim of this study was to evaluate a novel wireless motility capsule for gastric emptying in a large animal model of acute lung injury. We hypothesized that the capsule detects gastroparesis in all animals.
Materials and Methods: All experimental procedures were approved by the Laboratory Animal Care and Use Committee of the District of Unterfranken, Germany and adhere to the NIH guidelines for ethical animal research. In seven anesthesized pigs, ventilated with high-frequency oscillation a pH, pressure and temperature sensing capsule (SmartPill™, SmartPill Corp., Buffalo, NY) was positioned with a capsule delivery device (AdvanCE™, US Endoscopy, Mentor, OH) into the stomach. The capsule data were transmitted to a recorder attached to the abdomen. Gastric emptying of the capsule can be calculated by measuring the time required for the pH to the change from the acidic stomach to the alkaline duodenum as well as a change in pressure patterns. The location of the capsule was confirmed by autopsy after the animals had died due to the ARDS.
Results and Discussion: In total 8640 data sets were obtained. The capsule pressure recordings ranged from 2 to 4 mmHg [2.6 ± 0.5 mmHg (mean ± SD)] and pH ranged from 2.3 to 5.6 [3.7 ± 1.6 (mean ± SD)]. There was no change in pressure patterns or pH recordings greater than 6 during 24 hours. All animals had a gastroparesis with bloated stomach. All capsules were located in the stomach as indicated by the pressure and pH data and confirmed by autopsy.
Conclusion(s): The preliminary data show that motility capsule technology has considerable potential for evaluating real-time gastric emptying in a critical care setting.

12AP8-8

Efficacy and safety of sedation with sevoflurane administered by the device AnaConDa in ARDS: A experimental study

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Background and Goal of Study: The only treatment that reduces mortality in the acute respiratory distress syndrome (ARDS) is the lung protection strategy, treatment that requires patients sedation. Usually we used in ICU intravenously anesthetics, alternative sedation is sedation with volatile anesthetics. The greatest advantage is that they are eliminated by the lung, this together with minimal metabolism provides for precise control of sedation. The pharmacokinetic and pharmacodynamic properties of sevoflurane have become the agent of choice in ICU thanks to a new dispositive, the AnaConDa, that allows us to administrate liquid volatile anesthetic. Sedation in previous studies[1] with this device has proven safe and effective, yet no study of its use in patients with ARDS. Our goal is to demonstrate that sevoflurane could be a valid alternative to sedate in ARDS conditions.
Materials and Methods: We designed a prospective study. After ethics committee approval, we included 16 pigs. Were ventilated in volume controlled (9 ml/kg, respiratory rate for etCO_2<45mmHg, PEEP 5). After anesthetic induction, ARDS was performed by saline lavage, once PaO_2/FiO_2<200 we started sedation in two randomized groups, sevoflurane(et 1,5%) and propofol(6mg $k^{-1}\,h^{-1}$). We monitorized respiratory parameters with CO_2SMO(Respironics) and hemodynamic with PiCCO(Pulsion). Data were taken in 4 times after ARDS: 10,60,150,240 min. We used SPSS 15.0 (SPSS Inc, Chicago MC, 2006) for statistical tests(ANOVA) and Bonferroni for multiple comparisons, significance when p<0.05.
Results and Discussion: The table shows the M±SD of main data. Sedation with sevoflurane compare to propofol is an alternative for sedation in ARDS situations with no differences in haemodynamic, oxygenation or ventilatory parameters except for Vdf. Probably because the AnaConDa dead space (87ml) is higher than other antimicrobial filters.

	IC	PaO2/FiO2	Complianze	Vdf
T1Sev	4,2±1,2	124±36	17±4	293±52*
T1Prop	3,9±0,7	129±26	16±3	273±32
T2Sev	4,2±1,0	174±36	17±3	339±29*
T2Prop	4,0±0,5	155±18	17±2	285±28
T3Sev	3,7±1,0	167±54	16±3	347±33*
T3Prop	3,8±0,5	147±27	16±2	306±38
T4Sev	3,9±0,5	156±52	15±4	358±37*
T4Prop	3,5±0,3	148±43	16±3	320±28

Data described as mean ± standar desviation. Sev: sevoflurane, Prop: propofol, IC: cardiac index, Vdf: physiologic dead space. *: p<0,05 in each time between groups

Conclusion(s): Sedation with sevoflurane compare to propofol is a valid and safe alternative for sedation in ARDS conditions.
References:
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12AP8-9

How could I do a weaning with NAVA ventilation mode?

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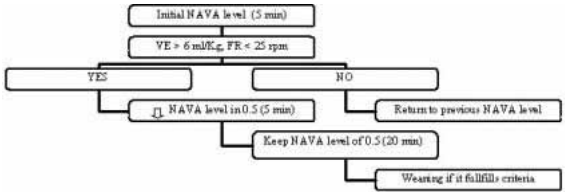
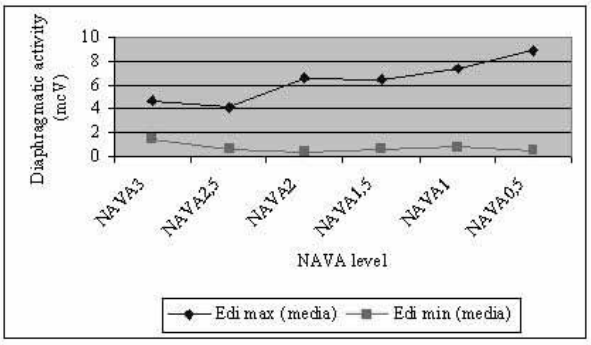
Background and Goal of Study: NAVA (Neurally Adjusted Ventilatory Assist) is a new assisted ventilatory mode which assists in a proportional and synchronous way to the patient´s electrical diaphragmatic activity (Edi), registered by esophagical electrodes (Edi catheter). In previous studies the use of NAVA has been focused on decreasing the respiratory work in patients with long mechanical ventilation, but a weaning protocol has not been studied yet. The objective was to establish a weaning protocol in NAVA mode and to evaluate the safety NAVA level for weaning.
Materials and Methods: We have planned a prospective study in patients admitted to the critical care unit, with less than 24 hours of mechanical ventilation, approved by the ethical committee. The weaning of the patients was made with the Maquett´s servo-i ventilator. The proposed weaning protocol is shown in Figure 1 For the statistical studies SPSS 15.0 Windows Vista has been used. We have performed a descriptive clinical study: media, standard deviation, maximum and minimum.



Results and Discussion: The patients included in the study were between 33 and 76 years old. The placement of the Edi catheter has been simple and without any complications. The figure shows the maximum and minimum diaphragmatic activity in each NAVA level: NAVA level of 0.5 during 20 minutes provides a successful weaning in our patients, without any reintubation needed. The media time employed in each NAVA level was 5 minutes (minimum 5 minutes, maximum 11 minutes). The media total time for weaning was 49+/- 7 minutes. These results make possible to propose the use of shorter time in the middle NAVA levels in later studies.



Conclusion(s): The proposed weaning protocol with NAVA provides a safety ventilator disconnection. Nevertheless, this protocol should be validated with a major number of patients to establish a definitive protocol.

12AP8-10

Non-surgical treatment in iatrogenic tracheal rupture

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Background and Goal of Study: We suggest an algorithm for management iatrogenic tracheal rupture (ITR)in intubated critical patients and define a selection criteria for surgical or conservative treatment.

Materials and Methods: The purpose of this study is to examine five cases(Table 1, 2) of ITR related to orotracheal intubation treated at our institution in a period of 18 months, who requiered ventilatory support at the time of diagnosis for different reasons.Due to the high mortality of surgical treatment in ventilated patients and the absence of complications in patients undergoing conservative treatment, we chose the latter in all cases based in our experience and the literature published.Antibiotic coverage was established, parenteral nutrition individualized to each patient.Orotracheal tube was introduced over a flexible fiberoptic bronchoscope to prevent breakage, and high pressures were avoided by using tidal volumes of 5-6 ml/kg. Daily checks were conducted with fiberoptic bronchoscopy in order to assess the evolution and resolution.

DEMOGRAPHIC AND PATIENT DATA

PATIENT	AGE/ SEX	HEIGHT (cm)	REASON FOR INTUBATION	INTUBATION TUBE	DIFFICULT AIRWAY	LENG OF TEAR(cm)	CARINE DISTANCE (cm)
1	49/F	158	CET	SL	NO	2.5	1.5
2	82/F	160	ARI	SL	YES	7	2
3	72/F	161	ABDOMINAL SURGERY	SL	NO	3	3
4	66/F	163	trACHEAL SURGERY	SL	NO	4.5	2.5
5	85/F	160	ARI	SL	NO	3	3.5

F=Female;CET= Craneoencephalic traumatism;ARI= acute respiratory failure;SL= single lumen

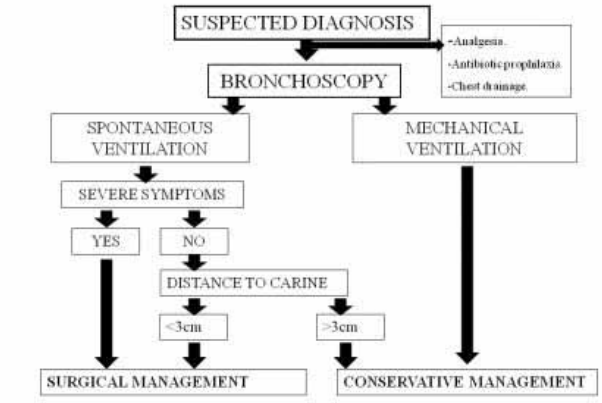
SYMPTOMS

PATIENTS	INTERVAL TO DIAGNOSIS(hours)	SYMPTOMS
1	20	A,B,C
2	1	A,B,C
3	10	A,B
4	1	B
5	1	A,B

A=emphysem;B=pneumothorax;C=acute respiratori failure

Results and Discussion: In all patients treated conservatively were able to solve the problem of ventilation. Four of the five patients were extubated when checking through fiberoptic vision solution trachea rupture once solved the box respiratory distress, and discharge monitoring and plant every 7,15,24 and 30 days. The fourth patient died from causes unrelated to the resuscitation episode of tracheal rupture.

Conclusion(s): Conservative treatment in iatrogenic tracheal rupture is the first choice in mechanically ventilated patients, regardless of lesion size, location, radiographic evidence or the presence of severe symptoms.



Resuscitation and Emergency Medicine

13AP1-1

Application of trauma care guidelines in Catalonia

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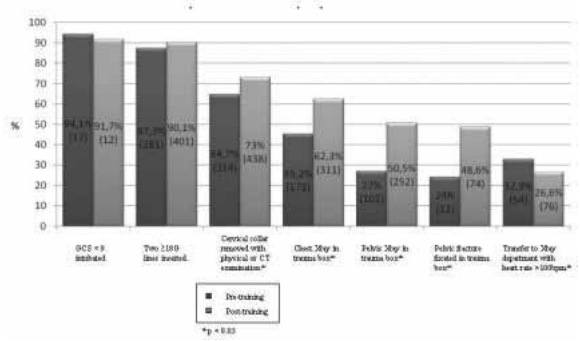
Background and Goal of Study: Injuries are the most frequent cause of death under the age of 45 yo in most developed countries. Guidelines developed to ameliorate the management of trauma patients clearly demonstrated to improve their outcome. The aim of the study was to evaluate the effect on the use of 6 standard procedures on the management of trauma patients before and after a specific training period.

Materials and Methods: Prospective multicenter data collection of all trauma patients older than 12 yo admitted to an intensive care unit of several Catalan Hospitals. Data was collected in two separated periods (1st: December 2007 to March 2008 and 2nd: November 2008 to April 2009), between them a specific training was performed. Variables recorded included demographic data, mechanism of injury, pre-hospital and hospital admission vital signs, type and severity of injuries, ISS score, treatments required, complications, deaths and the application of 6 universal trauma care standards: (intubation in Glasgow Coma Score below 9, cervical collar removal with a prior physical examination

or diagnostic test, haemodinamically unstable patient can not be transferred to a X-ray department, insertion of 2 peripheral lines greater or equal to 18-gauge in the resuscitation room, performance of chest-XR and pelvis-XR in box of trauma, unstable pelvic fracture must be fixed in the resuscitation room). Results of the two periods were compared.

Results and Discussion: 378 patients were included in the first period and 501 patients in the second one. No statistical difference on demographic data, mechanism or severity of injuries was observed. Educational training induced a clear improvement on the application of the standard care guidelines, especially on standards with lower fulfilment. No differences in mortality was observed between groups.



Conclusion(s): Unfortunately, some generally accepted procedures for the management of trauma patients are still not currently followed in our country. However, specific training of the trauma team significantly improved their implementation. We do believe, that periodical training is useful to improve management of trauma patients, especially on those measures that are applied sparingly.

13AP1-2

Trauma, alcohol and illicit drugs. Intrahospital surveillance

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Background and Goal of Study: The role of illicit drugs in determining trauma is frequently reported, even if there is a relevant variability in the frequency of the causal connections between illicit drugs and traumatic events. The aim of this study was to analyze in a systematic way the severity of trauma, the type of commonly used drugs and the possible connections with trauma in injured patients admitted to first aid department.

Materials and Methods: 13372 traumas have been examined at the Emergency Department Padua Hospital (2006 -2009). 8887 major traumas (66,5 %) involved patients aged 16 -50 years. Both the pre-hospital and in-hospital trauma evaluation have been analysed using quantitative severity scores such as GCS, RTS and ISS. The use of illicit drugs was detected by using quick urine tests mmunochemical,spectrometric techniques conducted by Forensic Tox- Lab.

Results and Discussion: The most common trauma was brain injury (6151 pts, 46.6%); 36% was associated with other traumas. 54% of trauma patients were admitted with a GCS score of 13-15, 12% of them with a GCS of 9-12, and 34% with GCS 3-8. The mean RTS was 7,8 and ISS 9-15.As far as the abuse substances are concerned, alcohol has been the most frequently detected substance (45.9%) in the 6151 severely traumatised subjects, followed by cannabis, cocaine and opiates.873 individuals (6.5%) affected by severe trauma were positive for both alcohol and illicit drugs. 60% (873) (523 pts) had assumed only one drug, while 40% (350) were positive for multiple drug assumption.

Conclusion(s): Dealing with severe polytrauma is still an important burden for first aid physicians.Young population, in weekends, at night time, in certain period of the year are preferentially involved in road accidents. At variable frequency and degree assumption of illicit drugs may contribute to increase the risk of accidents. The management of severely injured and "intoxicated" patients require the understanding of possible relationships between the alterations of metabolic status and the specific consequences of trauma. Alcohol, cannabis, cocaine, are involved in almost half cases of serious injuries. Even though in most patients blood alcohol concentration was less than 1 g/l (percentage allowed by law is <0,5 g/l), this might not decrease the risk of mental status impairment and the consequent risks. An extensive screening on accidents victims has revealed a great incidence of abuse while driving, often multiple contemporary assumptions.

Acknowledgements: Molinari ME.

13AP1-3

First record of the epidemiology and management of trauma patients in Catalonia

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Background and Goal of Study: Trauma are the most frequent cause of death under the age of 45 in most developed countries, as well as a major financial burden. Many dataset have been created in several countries to know their own profile. However, this information is still not available in our country. The goal of the study was to record and analyse the epidemiology, severity, hospital management and prognosis of trauma patients in Catalonia.

Materials and Methods: Prospective multicenter data collection of trauma patients older than 12 yo admitted in an intensive care or high-dependence unit of several Catalan Hospitals in 10 months. Variables recorded included: demographic data, mechanism of injury, pre-hospital and hospital admission vital signs, type and severity of injuries, ISS score, treatments required, complications and deaths.

Results and Discussion: 879 patients included, 76% men, mean age 43±19 yo. Most common mechanisms of injury: motorcycle accident 20.4%, car accident 18.3%, falls 16.2%. The mean of pre-hospital and admission vital signs were all normal. Pre-hospital cardiopulmonary resuscitation (CPR) was applied in 2.3%, and in-hospital CPR in 1.8%. Pre-hospital intubation was done in 28% patients, in-hospital in 19%. Anatomical areas with blunt injuries: 63% head/face, 45.8% chest, 36.7% column, 28% abdomen, 7.5% neck, 51% skin, 52.7% limbs, and with penetrating injuries: 2.6% head/face, 3.1% chest, 4.2% abdomen, 1.4% skin and 2.2% limbs. Severity of trauma: 64.4% injury severity score (ISS) > 14 (2.4% ISS > 50, 27.5% ISS> 25). Main treatments required: transfusion: 35.1%, surgery 48.5% (63.8% of it urgent) Most common complications: 22.9% respiratory, 9.5% neurological, 8.1% renal, 6.4% infections, 6.2% haematological, 4.9% abdominal, 4.7% cardiovascular, 8.8% multiorganic failure. 101 patients (11.6%) died: 47.5% neurological aetiology, 32.7% multiorganic failure.

Conclusion(s): Our results are mostly comparable with other countries in terms of demography, aetiologies, severity, complications and percentage of death as other countries. From now on, the database will help to optimise resources and streamline the management of these patients in our country in order to improve outcomes.

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13AP1-4

The effects of resuscitation fluids on hemodynamics and blood biochemistry of rats bled to hypovolemia

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Background and Goal of Study: In this current work, we aimed to investigate the effects of low molecular weight starch solution, hypertonic saline with dextrane or transfusion on systemic hemodynamic recovery, coagulation, acid-base status and arterial blood gas parameters in rats bled to hypovolemia.

Materials and Methods: Experiments were performed with male albino Sprague Dawley rats, weighing 200–250 g. Both iliac arteries were catheterized with a PE-10 catheter attached to PE-50 polyethylene tubing. Arterial blood pressure was recorded on a polygraph (Grass Model 7, USA) via a pressure transducer (Grass). The heart rate was monitored via a tachograph (Grass Model 7P44D, USA). Blood pressure and heart rate was monitored for 10 min then, the rats were bled through left iliac artery for 20 min in three successive steps until the mean arterial pressure fell to and stabilized at approximately 20 mm.Either HSD (4 ml/kg; i.v.) or LMWS solution (4 ml/kg; i.v.) was injected or transfusion (2ml/100 g; i.v.) was performed. Analysis of variance for repeated measures (two-way) and Bonferroni post test were used to analyse the effect of solutions on mean arterial blood pressure or heart rate. Paired Student's t-test was used to compare pre- and post-bleeding biochemical values.

Results and Discussion: In rats treated either with whole blood or HSD, the MAP values were found to be higher than the rats treated with LWS. Neither of the solutions displayed any quick restoration of MAP values within 10 min like whole blood. In heart rate values but no significant difference of time was detected. LWS treatment prolonged prothrombin time (PT; p=0.0091) and international normalized ratio (INR; p=0.0062) and LWS treatment was found to be

different HSD and whole blood treatments in terms of coagulation parameters (p<0.01). Base excess has not been found to be different in terms of pre- and post-treatment values or treatment groups. According to the pH values, we observed metabolic acidosis in HSD treatment group (p=0.0292). Lactate was detected to be lower in rats treated with whole blood (p=0.03). The comparison of partial pressure of blood gases and oxygen saturation did not produce any significant diffrence among three resuscitation fluids.
Conclusion(s): In this study, we demonstrated HSD restores MAP and cougulation as whole blood does in near fetal model of hemorrahagic shock. HSD and whole blood combination may be a good choice for fluid resuscitation of hemorrahagic shock.

13AP1-5

Effects of preoxygenation on desaturation time during hemorrhagic shock in pigs

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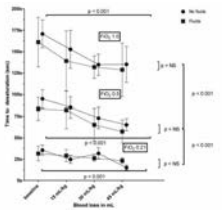
Background and Goal of Study: Prehospital intubation of major trauma patients has been associated with adverse outcomes including death; insufficient preoxygenation could be a neglected factor. Our hypothesis was that the time window for intubation (time to peripheral SpO2 to ≤70%) was significantly affected by (1) FiO2, (2) severity of hemorrhagic shock, and (3) fluid resuscitation in a porcine hemorrhagic shock model.
Materials and Methods: A hemorrhagic shock model was established with 15, 30 and 45 mL/kg blood loss. 15 Pigs were randomized to standard fluid resuscitation or no fluids. At each shock levels, three experiments (in randomized order) with 21%, 50% and 100% FiO2 for 5 minute preoxygenation intervals were performed. After preoxygenation, ventilation was discontinued, and the time to SpO2 ≤70% was measured.
Results and Discussion: During normovolemia, peripheral oxygen desaturation to <70% occurred after 33 ± 7 sec (FiO2=0.21), 89 ± 12 sec (FiO2=0.5), and 165 ± 22 sec (FiO2=1.0; P<.001). During increasing blood loss, peripheral oxygen desaturation to <70% occurred significantly (P<.001) faster compared to normovolemia, but no effect of fluid resuscitation was observed. With 45 mL/kg blood loss, pe-ripheral oxygen desaturation to <70% occurred after approximately 15 sec (FiO2 0.21) to 65 sec (FiO2 0.5) to 140 sec (FiO2 1.0).



Time to Peripheral Oxygen Desaturation of SpO2=70% with FiO2 of 1.0, 0.5, and 0.21 vs. Normovolemia, 15 mL/kg, 30 mL/kg and 45 mL/kg Blood Loss.

Conclusion(s): A five-fold increase in time to peripheral oxygen desaturation <70% could be achieved when securing adequate preoxygenation with 100% oxygen in comparison to an FiO2 of 0.21. With a greater degree of hemorrhagic shock, peripheral oxygen desaturation occurred significantly faster independently of fluid resuscitation and the degree of preoxygenation.

13AP1-6

A non evaporation layer combined with insulation is the preferred method for prevention of prehospital hypothermia

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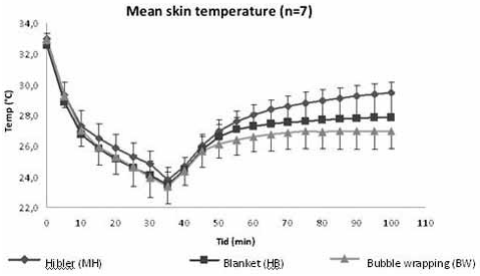
Background and Goal of Study: Hypothermia increases morbidity and mortality to the traumatized patient. Prehospital hypothermia is difficult to treat, but easy to avoid. Active prehospital revarming, are nearly never used in a prehospital setting in Norway. Various methods for wrapping the patients are in use, but “bubble wrapping” is most commonly used. The aim of the study was to compare the two most frequently used methods of wrapping of a cold and wet patient in addition to a new concept.
Materials and Methods: Seven healthy volunteers, equally dressed and connected to skin temperature-electrodes, were cooled down in a laboratory for 30 minutes, then wrapped by either Modified Hiblers method (MH), (neck-to-toe covering in a plastic bag, sealed with plastic tape, covered in hospital blankets), bubble wrap (BW) or single use of hospital blankets (HB). They were then observed for one hour. The volunteers underwent all three methods in a randomised order in three subsequent days. General Linear Model (GLM, Repeated Measures, ANOVA), SPSS 15.0 were used for analysis. Significance level p=0.05.
Results and Discussion: The test subjects in the plastic bag combined with hospital blankets (MH) had a significantly higher difference in mean skin temperature (MSK) compared to bubble wrapping and single hospital blankets, (MH: 5,70 C, HB: 4,3 C, BW:3,7 C, p< 0,01). **Discussion** Bubble wrapping, the most frequently used method in Norway today, is not effective and we need a change in prehospital practice and understanding of the hypothermic patient.



Conclusion(s): The insulation method of plastic and hospital blankets is cheap, easy to use, has low volume and has the best effect.

13AP2-1

Traumatic gastric rupture and pneumoperitoneum: An unusual complication of lay person cardiopulmonary resuscitation

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Background and Goal of Study: Cardiopulmonary resuscitation is a life saving procedure and basic life support training is offered to lay persons in many countries. We discuss a rarely reported complication of lay person cardiopulmonary resuscitation.
Materials and Methods: A 40 year old man with a background of opioid abuse suffered a respiratory arrest and the neighbour initiated chest compressions before paramedics arrived. In the emergency department, the patient was tachypnoeic with a saturation of 98% on oxygen. Trachea was central with decreased air entry into both lung bases. His heart rate was 140/minute with a blood pressure of 145/98mmHg. The chest X ray revealed gas under right hemi diaphragm as well as grossly distended stomach. A provisional diagnosis of bowel perforation was made. His blood gas study showed a pH of 7.245, PO2 27.9kPa, PCO2 7.3 kPa, HCO3 22.9mmol/L and base deficit of 4.7mmol/L. The patient underwent laparotomy which showed a gastric perforation and two lacerations on the lesser curvature of the stomach with bulging mucosa. He stayed 24 hours in the intensive care unit before went to the ward.
Results and Discussion: Gastric rupture is uncommon and can lead to life threatening peritonitis. The incidence of gastric rupture following resuscitation is about 0.1%. The greater curvature of the stomach is more prone to rupture following accidents. Lesser curvature of the stomach is affected during cardiopulmonary resuscitation as this site is least elastic. Pressures between 120- 150mmHg are required to cause rupture of normal gastric wall. This corresponds to an intra gastric volume of 4 litres. High pressures can be reached with less volume due to various causes such as gastric insufflation during bag and mask ventilation, oesophageal intubation, previous fundoplication or carbonated drinks. Interestingly one study has demonstrated that resuscitation performed by bystanders does not increase the risk of adverse incidents [1]. However, high index of suspicion is needed in similar cases. The measures such as using laryngeal mask airway and a chest x ray after successful resuscitation could potentially limit complications.
Conclusion(s): Cardiopulmonary resuscitation performed by inexperienced lay persons could potentially cause life threatening complications. High index of suspicion and measures to limit or identify the complications could limit the bad outcome.
References:

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13AP2-3

Lipid resuscitation from amiodarone overdose in pigs

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Background and Goal of Study: Toxicity of local anesthetics has been succesfully treated with intravenous (i.v.) lipid emulsion which binds lipophilic drugs[1]. Amiodarone, an antiarrhytmic drug often given i.v. in acute situations, is also lipophilic. We investigated whether i.v. lipid emulsion binds amiodarone and prevents its hypotensive side-effect[2].
Materials and Methods: After approval by the National Committee for Animal Experimentation, 20 pigs were randomized to receive either 20% lipid emulsion (ClinOleic®)(group L, n=10) or Ringer's solution (group C, n=10) as a 1 min bolus (1.5 ml/kg) followed by a 30 min infusion (0.25 ml/kg/min) during 1% isoflurane anesthesia. A 20 min infusion of amiodarone (Cordarone®)(1 mg/kg/min) started immediately after the lipid bolus. Six additional pigs, monitored also by transthoracic echocardiography, received only lipid.
Results and Discussion: In group L amiodarone concentrations in plasma was, on average, 2.3, 3.2 and 4.5 times higher than that in group C after 5, 10 and 20 min of amiodarone infusion, respectively (fig. 1). Mean arterial blood pressure (MAP) decreased in group C, but it remained constant in group L (p=0.001, fig. 2). Heart rate was unchanged in both groups. Infusion of the lipid alone caused a small rise in MAP for the first 10 min of infusion (p<0.01) with no change in left ventricular ejection fraction. This coincided with a transient 6 % decrease in end-tidal isoflurane concentration (p=0.036), possibly due to the binding of the lipophilic isoflurane to the lipid.

Fig. 1

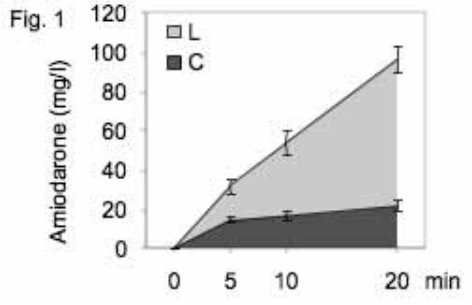
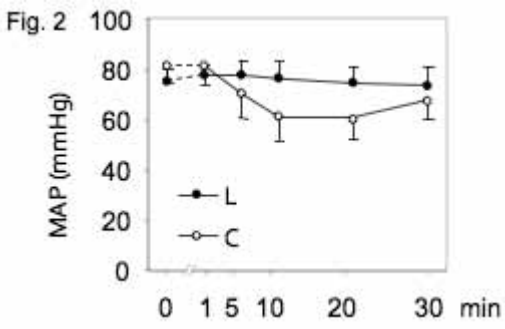


Fig. 2



Conclusion(s): Amiodarone was bound to the lipoid plasma to an extent which eliminated its hypotensive side-effect. Lipid binding of the potentially hypotensive ingredients of the drug formulation might have contributed to the hemodynamic stability.
References:
1 Cave G, Harvey M. Acad. Emerg. Med. 2009;16;815-824.
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13AP2-4

Lung injury secondary to resuscitation using mechanical external chest compression devices (LUCAS vs AUTOPULSE). Histopathology study

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Background and Goal of Study: External chest compression devices used for cardiopulmonary resuscitation can produce lung injury. The purpose of this study is to compare two different external chest compression devices (LUCAS and AUTOPULSE) and to assess if there are differences in the lung injury produced comparing both chest compression devices.
Materials and Methods: Experimental study in twenty-four Yorkshire pigs. The animals were randomized into two groups (GL= LUCAS; GA=AUTOPULSE). Ventricular fibrillation (VF) was induced with the pigs anaesthetized. After 5 min of cardiac arrest without treatment, resuscitation manoeuvres were started. ECG, IAP (carotid artery), Swan-Ganz catheter (CVP, PAPm, CPP, CO, CI, SVR, PVR) and the CPP (MAP – DAP) were measured during the resuscitation period (before VF and after 5, 15, 30 and 45 min of resuscitation) in the supine position. After the resuscitation time (45 min), a lung biopsy via minithoracotomy was obtained (lower lobe, right lung). Histological study (hematoxylin-eosine) was performed for the study of the samples. Statistics: The haemodynamic data were exported and analyzed with SPSS statistical software version 13.
Results and Discussion: 1)The haemodynamic data showed no statistical difference in MAP comparing both methods. 2)The CO media along time was in GL= 0,636±0,061 mmHg and GA=0,399± 0,038 mmHg. There was statistical significant difference (p<0,05) in the CO generated being higher using LUCAS versus AUTOPULSE. 3) The findings observed in all the samples studied were an heterogeneous interstitial infiltrate and vascular congestion which is similar to that found in the ventilator associated lung injury. We have not found differences between the two different chest compression devices. In two samples we found intersticial emphysema like with the barotrauma injury in young people (both in GA). Only in one sample, bone marrow embolism was found probably secondary to sternal fractures (GL).
Conclusion(s): The two external chest compression devices generate comprable MAP not finding statistical significant differences. Although, LUCAS system generate higher CO than AUTOPULSE. We can not see differences in the lung injury observed comparing each type of chest compression device.

13AP2-5

Influence of lay rescuers age on quality of chest compression and fatigue during continuous chest compression (UCPR) and conventional cardiopulmonary resuscitation (CPR)

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Background and Goal of Study: 2008 the AHA recommends compression-only cardiopulmonary resuscitation (UCPR) for the lay rescuer under certain conditions. In contrast, the ERC prefers the conventional CPR technique. We demonstrated that in adults both resuscitation methods differ in the quality of chest compression (CC) and physical fatigue over time [1]. Since there are no data available concerning possible differences in performance of these two methods of CPR between adolescents and adults we investigated the ability of these two populations to deliver CC of adequate depth and rate. Furthermore fatigue levels and heart rate (HR) of the subjects during the performance of UCPR and CPR on manikin were evaluated.
Materials and Methods: 40 volunteers (22 adult 22 to 27 years, 18 adolescents (14 to 16 years) with comparable experience in BLS were randomized to perform five minutes of CPR and UCPR after a rest period of one hour on a resuscitation manikin (Laerdal). Average rate (ACR) and depth (CD) of CC were evaluated every minute (T1-T5) during resuscitation. HR of the volunteers was evaluated every minute before (T0), during the resuscitation (T1-T5) and 5 minutes (T6-T10) after CPR/UCPR. Perception of fatigue (PF) was assessed with a modified Borg RPE Scale at T1-T5. Data as Mean ± Standard Deviation. Statistical differences as t-test und (repeated measure) ANOVA.
Results and Discussion: Compared with adults in adolescents performing UCPR CD was significant lower at every time point and out of the requested range of 38-51 mm. Furthermore in adolescents CD during UCPR decreased from T1 (34.34 ± 5.2 mm) to T5 (30.92 ± 7.4 mm). In contrast during CPR there was no significant difference of CD between adolescents and adults, but adolescents did not reach the requested depth of compressions. There was no difference in ACR. HR of adolescents was always significant higher in comparison to adults, but there were no differences in HR during the performance of both CPR techniques. PF of adolescents during CPR and UCPR was about 2 points higher on the Borg RPE Scale than in the corresponding adult CPR/UCPR group. Compared with adults in adolescents index values describing hard or very hard exertion occurred earlier during the resuscitation period independent of the use of CPR or UCPR.
Conclusion(s): CPR and UCPR are more exhausting to adolescents than to adults. Furthermore quality of CC is worse than in adults. Thus, we assume that UCPR might not be an appropriate action for younger rescuers in Adult Basic Life Support.
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13AP2-6

Use of automated external defibrillators in the occupational setting

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Background and Goal of Study: Automated External Defibrillators (AED) are well-established in Emergency Medical Services (EMS). They became increasingly popular in subways, railway stations and airports. However there are no data available about the provision and use of AED in the occupational setting.
Materials and Methods: Initially we contacted occupational physicians throughout Germany. After obtaining the physicians willingness to participate we send them a standardised questionnaire. The physicians were chosen at random by public available lists.
Results and Discussion: 232 questionnaires were returned to us. Most of the answers came from manufacturing companies (58%) followed by service companies (25%). Nearly 40% of the companies employed more than 1000 employees. 67% of the companies (n=155) reported to provide at least one AED. Most AED (50%) were positioned at the occupational physicians office or near other healthcare professionals. 41% were positioned at the companies gates. Canteens or other places of high foot traffic were underrepresented. Emergencies requiring the use of an AED were reported in 64 cases. In 66% (n=42) of these cases an return of spontaneous circulation (ROSC) was established on the emergency scene. In 20 of these 42 patients (48%) ROSC was established before the EMS arrived.
Conclusion(s): Patients suffering an cardiac arrest within the companies premises have a high chance for an ROSC if an AED is provided. Nearly every second patient gained an ROSC by the companies AED before the arrival of the EMS. Trained company first-aid responders and the implementation of AEDs in companies emergency plans can be a strong support in the chain of survival and should be supported.
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13AP2-7

Quality of in-hospital cardiopulmonary resuscitation

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Background and Goal of Study: The survival rate after in-hospital cardiac arrest is variable (1), and the quality of CPR in clinical practice, is often suboptimal and not in compliance with international guidelines, which recommend that compression rate, depth, incidence of incomplete chest release and duration of duty cycle should be 100 min^{-1}, 40-50 mm, 0% and 50 %, respectively (2). The use of CPR feedback device improves the quality of CPR, and may be beneficial (3).The aim of this study was to measure the quality of in-hospital CPR and the adherence to the 2005 resuscitation guidelines performed by intensive care unit resuscitation team with real time automated feedback.
Materials and Methods: All 71 patients who experienced in-hospital cardiac arrest in Tampere University Hospital, Finland, between November 2008 and October 2009 were included in this prospective study. Adherence to international CPR guidelines was evaluated by analysis of the parameters related to CPR quality. They were recorded by a defibrillator with a quality CPR–technology (Philips, HeartStart MRx Q-CPR™).
Results and Discussion: Mean (±SD) length of the episode was 11.5 ± 8 min. Analysis of each resuscitation by 30-s segments revealed that average compression depth was 50.4 ± 9mm and median (IQ range) percentage of compressions with adequate depth showed up in 97 (23-100)%. Compression rate was 107 ± 8 min^{-1}. Incomplete chest release was seen in 4 (0-61) %. Median duty-cycle was 40 (31-47)%. The time without chest compressions was 13 (0-52)% and the total number of compressions 92.5 ± 11 min^{-1}. In 46% of cases the recommendations for two minute cycles were not followed. Primary survival rate was 49% and one month secondary survival rate 20%. On the average, the quality of CPR and secondary survival rate were at a good level in this study.
Conclusion(s): Real time automated feedback during CPR is useful, and it appears to assure the good quality of CPR. It may also improve patient outcome.
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13AP3-1

The role of net fluid accumulation in predicting outcome

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Background and Goal of Study: Outcome measures are the first step in determining the consequences of health care. They include mortality, morbidity and quality of life. Because major burns are life-threating conditions, the main priority in discussing outcome measures is mortality as a problem-specific measure. Many studies have shown that mortality seems to be predominantly determined by many variables obtained at admission" predictors" as well as many variables obtained during the hospital course.Net fluid accumulation(NFA) is one of many important factors that correlate with clinical outcome.The purpose is to evaluate NFA during resuscitation with Ringer Lactate (LR) and its relationship with mortality. We hypotheses that rigorous monitoring of the fluid replacement therapy can result in lower fluid retention and this can be effective in the prognosis of the severe burned patient.
Materials and Methods: This is a prospective randomized study.Patient are divided in two groups with 55 cases each. In LR group 1 patients are resuscitated conform Parkland formula for adults and Shriner's Galveston for children without modifications, while in LR group 2, the formulas are utilized as a starting point only and the amount of fluid is modified in each case conform clinical situation and urinary output.
Results and Discussion: There is statistically significant difference regarding NFA in two groups. (p=0,001).There is statistically significant difference between amount of fluids given and complications (p=0, 08).The majority of cases that has deceased (70 % of them) have been accompanied with higher values of NFA in the period of resuscitation. There is statistically significant difference between mortality and TBSA(p=0,036),coo morbidities(p=0,015),cause of burn (p=0,004),inhalatory injury (p=0,027).The degree of NFA correlate with a linear positive relationship with morbidity (Kendall's tau_br =0,143, p=0,019) and with a negative relationship with mortality (Kendall' tau_br=0,234, P=0,001).Mortality as the primary endpoint of outcome is 16% in group1 and 9% in group 2.
Conclusion(s): Giving the smaller amount of fluids necessary for adequate resuscitation can be effective in creating a successful and specific therapy for each burn patient. In morbidity and in mortality influence predictor factors as well as method of resuscitation maintaining constant values of NFA.

13AP3-2

Binge drinking and substance misuse: Prehospital care

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Background and Goal of Study: In recent years emergency teams have to deal with an increasing number of young acutely affected by alcohol and social drug related manifestations. Alcohol/drug use are important risk factors for unintentional road injuries potentially associated with major public health problems and high economic-socital cost. Binge drinking is a pattern of heavy drinking (in particular among students18 -25 years) that can be defined as episodes of alcohol consumption up to five (male) or four (female) drinks in the space of about 2 hours, or, "drinking too much, too fast". Binge drinking in particular has led to premature mortality in younger and economically productive ages, mainly due to alcohol intoxication, road traffic injuries, and cardiovascular fatalities. Death can occur when blood levels range 300- 400 mg/dl.
Materials and Methods: A retrospective review investigation was conducted to determine the injury pattern and crash circumstances of road injuries of young people admitted to first aid Padua hospital. All charts of prehospital and intrahospital care of individuals between 18 -25 years of age were reviewed. Demographic, and medical correlates are evaluated.
Results and Discussion: The study population consists of 8777 cases of alcohol intoxication. 11% of them required admission because of intoxication "per se" while 89% were involved in trauma. Patients who needed acute care because of alcohol abuse were preferentially younger than 21 years (>70%). 14% of <21 abusers necessitate ACLS. 88% were male and 12% female. The greatest incidence of intoxication occurred during the weekends (49,2%). The month of august, and spring were the periods were the prevalence of positive alcoholometric results were ascertained.
Conclusion(s): Binge drinking is still a spreading bad habit of young population. Besides the high risk of death for excessive assumption, dangerous consequences of binge drinking include motor vehicle collisions, loss of productivity and suicide attempts. It is also frequently associated to abnormal behaviours such as not to wear helmet while motorbiking, not to wear seatbelt while driving, have promiscuous sex and consume illicit drugs. Identification of minor clinical syndrome in emergency departments is possible by a comprehensive clinical examination and through accurate patient history-taking; in case of significant trauma this kind of intoxication requires additional skill to appropriately manage both organ damage and alcohol side effects.
Acknowledgements: Molinari ME,

13AP3-3

A hand-held electronic device to calculate fluid resuscitation requirements for burns

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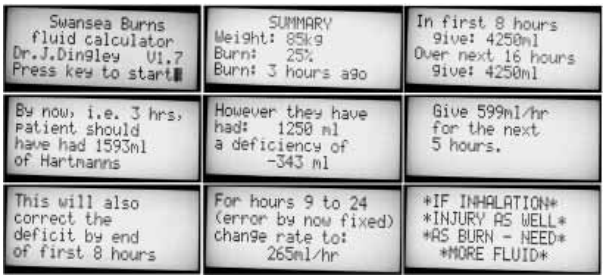
Background and Goal of Study: The Parkland formula is used to *guide* initial fluid resuscitation in major burns. 4 ml/kg/TBSA burn of lactated Ringer's solution is given over 24 hours from the time of burn, half over the first eight hours, the remaining half over the next 16. On arrival at a burns unit, patients may be several hours post-burn and may have received either too much or too little fluid prior to or during transfer. In addition to the above calculations, doctors may therefore plan a correction of this excess/deficit. We wished to investigate whether it would be possible to construct a dedicated hand-held electronic device to perform this task. The device should be as simple as possible to use, require no external computer, and suggest corrections for fluid excess/deficits.
Materials and Methods: A microcontroller (Arduino **Duemilanove 328** open-source) was programmed using "C." This embedded software is upgradeable to incorporate alternative formulae. Data input was via numeric keypad, output was via a backlit liquid crystal display. Fig 1 The only other controls were power and system-reset buttons to keep the user interface straightforward. Fig 2 Selected key screen views during a calculation (read from left to right). Reminders are given e.g. concerning burn area in children. The device was used to calculate fluid requirements in ten simulated burn scenarios. In five scenarios, insufficient fluid had been administered prior to arrival, in five an excess had been given. The device output was compared with manually calculated infusion plans, any errors being recorded.



Results and Discussion: No deviation from the manual calculations was seen, and all corrections of excess/deficit were appropriate.
Conclusion(s): The device could be a useful aid to reduce human error in such calculations. In addition to burn centres it might have application for paramedics, accident and emergency, training and military use.

13AP3-4

The pain assessment scales in the emergency departments: A meta-analysis and a systematic review

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Background and Goal of Study: Pain is a common problem in the EDs, with 60% to 80% of patients having pain as part of their presenting complaint. Current guidelines for good pain management practice state that pain must be assessed and documented on a regular basis using pain assessment scales. However, there is no evidence of which pain assessment scale to use in the EDs. The aim of this meta-analysis was to determine the most effective scale for the assessment of acute pain in hospital and out–of–hospital EDs.
Materials and Methods: MEDLINE, PUBMED, SCOPUS and COCHRANE databases were consulted for comparative trials of two or more pain-rating scales in the EDs. The methodological quality evaluation of retrieved studies was assessed using the Methodological Index for Non-Randomized Studies criteria. We performed analyses with comprehensive meta-analysis software. Heterogeneity and subgroups analyses were assessed using the Q statistics and I^2 test. Publication bias was examined through funnel plot. Overall acute pain-rating scales were compared using the Comparative Meta-analysis forest plot method.
Results and Discussion: Seven trials met inclusion criteria. The three commonly used pain-rating scales were the Visual Analogue Scale (VAS), the Numerical Rating Scale (NRS) and the Verbal Rating Scale (VRS). The analysis of the studies comparing VAS vs. NRS demonstrated that, for the same range of pain intensity, the NRS overestimated it or, in other words, the VAS underestimated the same pain intensity in ED's patients. The trials comparing VRS to either VAS or NRS showed that the mean of values of each numerical scale were nearly the same for mild and moderate pain intensity subgroups. Whereas, in severe pain subgroup, there was a meaningful difference between the values of sub cited numerical scales.
Conclusion(s): Currently, there is a lack of uniformity between the studies exploring pain assessment scales in EDs. Although, there is evidence that, using the VAS, pain intensity would be underestimated, while the NRS overestimates pain intensity when used as a pain assessment scale in the EDs. The VRS is inadequate to evaluate severe pain in the EDs.

13AP3-5

Evaluation of prehospital mechanical ventilation by arterial blood gas analysis

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Background and Goal of Study: Usually, prehospital ventilation of the critically ill or injured patient is set according to the patient's body parameters. Further adjustment often occurs in response to end-tidal carbon dioxide monitoring (etCO2). This study evaluates the quality of prehospital ventilation by means of arterial blood gas analysis.
Materials and Methods: Prospective data including indication for ventilation, etCO2, arterial partial pressure of CO2 (PaCO2), and arterio-alveolar CO2 difference (AaDCO2) were collected at two urban Austrian prehospital emergency medical systems. Ventilation was adjusted according to etCO2. After a minimum of 10 minutes of constant ventilation, an arterial blood gas sample was taken to determine AaDCO2.
Results and Discussion: From July 2008 to June 2009, 38 samples were collected. 12 were excluded for several reasons (use of non invasive ventilation, consecutive measurements in the same patient, lack of documentation). The median age of the 19 (73.1%) male and 7 (26.9%) female patients was 68.5 years (Min: 22 ys, Max: 88 ys). Main indications for prehospital ventilation were cardiopulmonal resuscitation (42.3%), respiratory insufficiency (23.1%) and cerebral lesions or traumatic brain injury (TBI) (23.1%). 16 patients (61.5%) presented with hypercapnia (PaCO2 > 45 mmHg), 4 patients (15.4%) with hypocapnia (PaCO2 < 35 mmHg). The mean PaCO2 was 50,6 mmHg (Min: 30, Max: 75, SD: 12.9 mmHg), the mean AaDCO2 was 12 mmHg (Min: 0, Max: 37, SD: 10 mmHg). Under stable cardiopulmonary conditions, the AaDCO2 is 2-5 mmHg. For prehospitally ventilated emergency patients our results show higher, not individually predictable values for AaDCO2 and, thus, an often inadequate ventilation, similar to studies conducted earlier [1]. Inadequate ventilation in the early treatment has been proven an independent factor in worsening outcome, e.g. for TBI [2,3]. The impact on other critical illnesses and injuries has yet to be examined.
Conclusion(s): In prehospitally ventilated emergency patients there is no predictable correlation between etCO2 and PaCO2 and therefore a high risk for inadequate ventilation. The routine use of arterial blood gas analysis in the prehospital setting could lead to an essential improvement of prehospital ventilation.
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13AP3-6

Cardiopulmonary resuscitation: Knowledge and attitude of the population of a German city

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Background and Goal of Study: Early bystander-initiated cardiopulmonary resuscitation (CPR) has been shown to increase survival after cardiac arrest. The intention of this study was to determine knowledge and willingness of Munich citizens to perform CPR.
Materials and Methods: A questionnaire with open and multiple choice questions was sent to 1500 randomly selected Munich citizens. Data analysis were performed using PASW Statistics 17.0 (SPSS Inc., Chicago, IL, USA).

Results and Discussion: Response rate was 35%. The respondents were between 18-95 years of age (mean 56.8 yrs) with a female ratio of 43.4%. In case of a medical emergency 78.9% of participants would dial the correct emergency telephone number 112, 16% would call the police. 80.6% of participants had previously attended CPR class, but only 3.4% within the last year. 7.6% had been involed in CPR before. Only 49.7% of respondents associated CPR with chest compressions and mouth-to-mouth ventilation, only 54.3% knew the correct compression site. 10.9% knew the correct compression-ventilation ratio of 30:2. Mentioned compression rates varied from 2 to 100/min. with most readings between 2 to 10/min. 64.2% of participants would perform CPR until the arrival of emergency medical services, but 35.8% would stop before. Attending a CPR course in the past did not enhance the rate of right answers. Being confronted with a resuscitation situation in public, 68.8% of respondents would start resuscitation, although only 23.6% of them felt confident how to help. Main reasons for omitting CPR were fear of doing something wrong (30.9%) and judicial consequences (4.8%) as well as disgust of blood and vomit (6.3%). 86.7%, 85.5%, and 77.3% of participants would perform CPR on a relative, on a well known neighbour and a teenager at sports ground, respectively. 74.3%, 65,0%, and 59,6% of respondents would help if the victim was a stranger in a supermarket, an unkempt person at a bus stop and a supposed drug addict, respectively.

Conclusion(s): In accordance with studies from other countries, state of knowledge regarding CPR was weak among the respondents. Fear caused omission of resuscitation efforts.Training and regular and frequent repetition of learnt measures might improve state of knowledge and skills among population concearning CPR and reduce fear of doing harm instead of helping.

13AP3-7

Comparison of helicopter emergency medical services (HEMS) accident rates in different international air rescue systems

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Background and Goal of Study: In comparison to the early years of Helicopter Emergency Medical Services (HEMS), both accident rates and fatal accident rates have decreased. Nevertheless, each year approximately 2 to 4 HEMS crashes do occur in Germany. To facilitate comparisons, “10,000 missions” or “100,000 flying hours” were common denominators. The aim of the present study was to compare crash rates and fatal crash rates in Germany to rates of other countries.

Materials and Methods: To retrieve published data on accident rates in different international HEMS systems, a Medline® search (http://www.pubmed.com) was performed using combinations of the keywords “HEMS”, “rescue helicopter”, “accident”, “accident rates”, “crash” and “crash rates”. Analysis was limited to the years 1970 to 2009 to facilitate comparisons. Data were compared on the basis of 10,000 missions completed and 100,000 helicopter flying hours. These data were allocated to the specific time frames.

Results and Discussion: Overall 14 studies were identified. Six studies (3x Germany, 2x USA, 1x Australia) analyzing HEMS accidents on the basis of 10,000 missions were identified. Crash rates per 10,000 missions ranged between 0.4 and 3.05 and fatal crash rates between 0.04 and 2.12. In addition, 12 studies (8x USA, 3x Germany, 1x Australia) used 100,000 flying hours as a denominator. Crash rates per 100,000 flying hours ranged from 1.7 to 13.4 and fatal crash rates between 0.91 and 4.7. Data and accident rates were inhomogeneous and differed significantly.

Conclusion(s): Published data of three countries were identified with the Medline® search. Data analysis was impeded by publication of mean data, the use of different time frames, and differences in the HEMS systems.

13AP3-8

Airway control wearing antichemical protection gear: Laryngeal tube suction compared with endotracheal intubation

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Background and Goal of Study: Healthcare facilities need to be prepared to treat victims of mass causalities resulting from conventional combustion caused by toxic agents or chemical warfare agents. Endotracheal intubation (ETI) is the standard of care for airway management in mass casualty events. However, successful ETI requires skilled providers who might be lacking in a case of a mass casualty. In addition, wearing full antichemical protective equipment affects the ability to perform ETI. The use of a supraglottic airway device was suggested for faster airway control in such circumstances. The Laryngeal Tube Suction Disposable (LTS- D) (VBM Medizintechnik Gmbh, Sultz, Germany) is a further development of the Laryngeal Tube. It is a second generation supraglottic device allowing separation of the respiratory and alimentary tract. The objective of this study was to compare the speed and success rate of performing ETI or LTS- D insertion in an airway mannequin, by anesthesiologists wearing full antichemical protective equipment.

Materials and Methods: Two attendant anesthesiologist inserted a size 4 LTS- D and a 8-mm cuffed endotracheal tube (ETT) (Portex, SIMS Ltd, Hythe, Kent, UK) in an airway management mannequin. (Laerdal Airway Management Trainer Laerdal, Oakleigh, Norway). 30 insertions for each device were performed in a random sequence. Successful insertion/intubation was defined as satisfactory placement of the device based on adequate chest expansion of the mannequin’s lungs with the application of positive pressure ventilation using an bag-valve device. Unsuccessful insertion was defined as an ETT or LTS-D insertion attempt that lasted 60 seconds or more or misplacement of the device. Effective airway control time was measured from the moment the anesthesiologist stopped the ventilation with the bag-valve device until manual positive pressure ventilation was achieved. A maximum of 2 attempts to insert the devices was allowed.

Results and Discussion: Time to achieve and effective airway was 33.48 ± 10.96 seconds for the ET and 14.41 ± 2.26 seconds for the LTS -D. (p= 0.0001) One misplacement occurred with the ET witch was successful at the second attempt.

Conclusion(s): Anesthesiologists wearing full antichemical protection equipment obtain a more rapid airway control in an airway mannequin when inserting a LTS-D as compared to ETI. The LTS- D may have a possible role in the airway management in the scenario of a toxic mass casualty event. Further investigations in humans are warranted.

13AP3-9

The use of lung ultrasonography in prehospital emergency medicine: A case series

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Background and Goal of Study: Since the introduction of portable handheld ultrasound devices in the late 1990s, their use for abdominal, lung and cardiac sonography as rapid diagnostic tools in intensive care units has been validated in numerous studies. Here, we report a preliminary series of 3 cases of lung sonography in prehospital emergency medicine, which has not been studied before.

Materials and Methods: In the setting of a physician-staffed prehospital emergency medical service, the ambulance vehicle was equipped with a portable ultrasound device with a 2-4MHz microcurved probe. The emergency physicians received an introductory training of 2 hours, and every use of the device was documented.

Results and Discussion: The first patient, a 67-year-old male with COPD stage IV and coronary artery disease presented to the prehospital emergency physician with shortness of breath, but no characteristic crackles. Ultrasound scan of the lung revealed B-Lines indicative of pulmonary edema and allowed targeted treatment of the pulmonary congestion with anti-hypertensives. The second dyspnoeic patient with a history of COPD and congestive heart failure presented with ankle edema and rales over both lungs, but sonography of the lungs showed A-lines and a positive lung sliding phenomenon. Thus, pulmonary edema was considered unlikely and the patient was treated for exacerbated COPD with prednisolone and nebulized terbutaline, which lead to immediate clinical improvement. In the third case, the prehospital emergency physician was called to a young man in panic with shortness of breath, retrosternal pain and dyspnoe. Sonography displayed the absence of lung sliding on the left, but not on the right side (Figure1) indicating a left-sided pneumothorax, which was confirmed and treated in the receiving hospital.

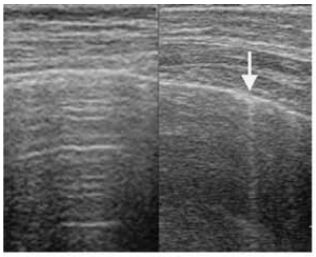

Figure1: No lung sliding on the left side (arrow)

Conclusion(s): This case series demonstrates that lung sonography may be a useful diagnostic tool in the prehospital setting. Further studies are needed to assess necessary training intervals for emergency physicians and possible outcome benefits.

Acute and Chronic Pain Management

14AP1-1

The effect of stellate ganglion block on the cerebral vasculature changes measured by magnetic resonance angiography

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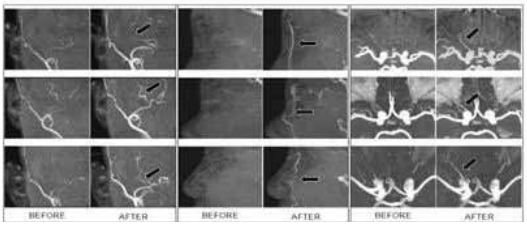
Background and Goal of Study: Stellate ganglion block (SGB) is a type of sympathetic blockades. Although there is much interest in the effects of autonomic control on the cerebral vasculature, controversy still exists regarding the physiological outcome of sympathetic blockade on these vessels. The purpose of the present study was to investigate the effect of SGB on the cerebral vessels using magnetic resonance angiography (MRA).
Materials and Methods: Nineteen healthy female volunteers (mean age±SD of 46.4±8.9) participated in the study. After obtaining informed consent, MR imaging was performed before and after SGB using a 1.5T MRI scanner (Avanto, Siemens, Germany). Time-of-flight (TOF) MRA and magnetization transfer rapid acquisition gradient echo (MPRAGE) were utilized to investigate the vascular changes induced by SGB, to identify abnormal anatomical brain structures. A blind technique for SGB was used and the success of the block was determined by the appearance of Horner syndrome.
Results and Discussion: Substantial changes were observed in the main trunk of the external carotid artery (ECA) and its branches, e.g., superficial temporal artery (STA). In the signal intensity change measurements of the major arteries, a significant signal increase was observed in the main trunk of the ECA ipsilateral to the SGB site (11.16±5.76%; P<0.001). In addition, we observed striking changes in the ipsilateral meningeal artery(MA) and facial artery(FA), which were rarely detectable by routine MRA prior to SGB (Figure 1(a) and (b)). The MA and FA were not quantitatively analyzed due to the inability to visualize these vessels before SGB administration in several subjects. Representative ophthalmic artery(OA) images before and after SGB are also displayed in Figure 1(c).



MRA images in the (a) meningeal, (b) facial, and (c) ophthalmic arteries of three subjects before and after SGB.

Conclusion(s): We have demonstrated that MRA can be used to observe the overall changes in the cerebral blood vessels due to SGB treatment, especially in the flow and diameter of the extracranial arteries and the OA of the intracranial arteries. Our findings suggest a possible relationship between the therapeutic effects of SGB and vessel changes induced by SGB, a mechanism which has not been clearly elucidated.

14AP1-2

Spinal cord stimulation in patient with FBSS and aracnoiditis: Case report

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Background and Goal of Study: The Spinal Cord Stimulator (SCS) is an evidence- based therapy implanted for the treatment of refractory neuropathic pain, particularly failed back surgery syndrome(FBSS).
Materials and Methods: A 60 –year-old man, with hypertension, had been operated 4 years ago for erniated disk at the level L3-L4. After the surgery he developed aracnoiditis L2-L5 and important epidural fibrosis with radiculitis at the legs, heavy low back pain (VAS 8-9) and Cauda equine syndrome(CES). The conservative therapy was almost unsuccessful. In the past two times the SCS had been not implanted because terrible pain of the patient during the procedure in local anesthesia, probably for the low approach (L3-L4). In 2009 a Medtronic quadripolar electrocatheter was implanted by percutaneous technique in epidural space T12-L1 for optimal painful area cover.
Results and Discussion: After 21 days, the patient had a good pain relief (VAS 3- 4) and clear improvement of CES symptoms. This condition was present all the time of trial (30 days) with important satisfaction of the patient and the definitive device (Synergy Versitrel) was implanted. Pre-implantation and follow up evaluations are according to De Benedictis Italian Pain Questionnaire (QUID).The patient achieved good pain relief, with a reduction in concomitant pain medication.
Conclusion(s): The case report prove that SCS is an effective choice for the treatment of patients affected by severe and complicated neuropathic pain resistant to pharmacologic therapy like Failed back surgery syndrome. It's important to consider also clinical social and economic point of view.
References:

1 Kumar K,Nath R,Wyant GM.Treatmentof chronic pain by epidural spinal cord stimulation: a 10 years experience. J.Neurosurgery 1991;S:402-407.

14AP1-3

Long term follow-up of patients with complex regional pain syndrome treated with spinal cord stimulation

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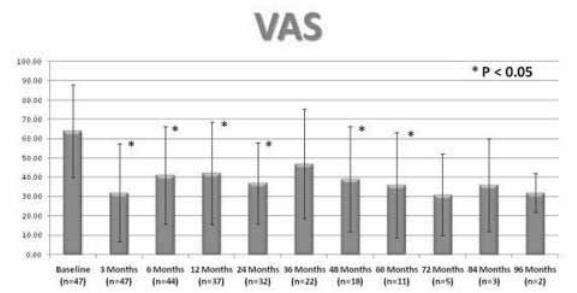
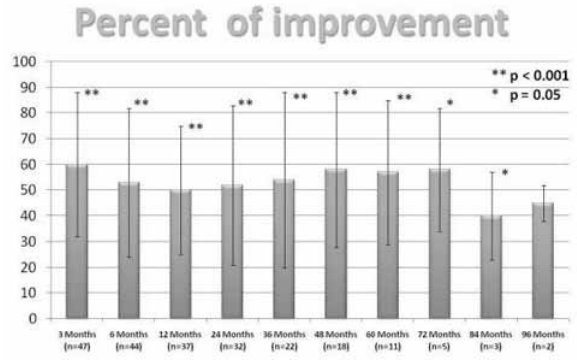
Background and Goal of Study: Spinal cord stimulation (SCS) has been shown to be safe, effective, and cost-effective in a randomised study on complex regional pain syndrome (CRPS)[1]. Whether pain alleviation is maintained in the long-term is still debatable [2]. We report on a 8 years follow-up of patients treated with SCS for CRPS.
Materials and Methods: Data were extracted from the institutional neuromodulation registry. Patients with CRPS (I and II) treated with SCS from 01.01.1999 to 30.11.2009 were analysed for changes in pain intensity (VAS) and subjective improvement. Measurements were available for a decreasing number of patients at baseline, 3, 6, 12, 24, 36, 48, 60, 72, 84 and 96 months after implantation of SCS.
Results and Discussion: The mean follow-up time was 33.8 months (range 3-96). The figures summarise the changes in VAS (figure 1) and subjective improvement (figure 2) over time. A statistically significant decrease in VAS was observed until 60 months, except at 36 months. The subjective improvement that reflects the satisfaction with the treatment is also significantly increased until 60 months.





Conclusion(s): This study finds a decreased VAS compared to baseline and more than a 50 % subjective improvement at five years follow-up in patients with CRPS treated with SCS. These results are consistent with previous observations.
References:

1 Kemler et al. NEJM 2000 Aug 31;343(9):618-24.
2 Kemler et al. J Neurosurg. 2008 Feb;108(2):292-8.

14AP1-4

Adequate pain relief in patients with osteoarthritis of the knee

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Background and Goal of Study: To determine the effectiveness of pharmacopuncture for the treatment of acute and chronic pain syndrome in patients with knee joint osteoarthrosis deformans stage 1-2.
Materials and Methods: For the period from 2005 to 2009 we treated 635 patients. The mean age of patients was 56 years old, women with overweight prevailed. Patients underwent neuroorthopedic examination, laboratory tests, X-ray and MRI examination. The intensity of pain was assessed by the rank scale and amounted to 7 – 8 scores on the average. Pain duration ranged from 3 to 9 months. All patients were divided into 3 groups. The course of treatment was 3 weeks. Re-examination was conducted on days 7, 14, 21 and 28 and after 6 months. The first group of patients received conventional treatment: a combination of non-steroid anti-inflammatory drugs with muscle relaxants, the use of knee-guard during walking and dosage curative gymnastics. In the second group there was used a combination of physical therapy with curative gymnastics and knee-guard. In the third group pharmacopuncture of trigger points with small doses of non-steroid anti-inflammatory drugs on the local anesthetic was applied. The procedure was carried out 3 times a week for 3 weeks. Doses of the NSAID and anesthetic were selected individually. The treatment was combined with the use of knee-guard on loading and dosage therapeutic exercises.
Results and Discussion: In the first group of patients within the first week a good effect was achieved. It was manifested by a significant decrease in pain and improvement in the range of motion. However, more than 60% of the group noted discomfort in the gastrointestinal tract, 4 patients felt weakness and dizziness when using muscle relaxants. Four weeks after the end of treatment 70% of patients began experiencing the former complaints again. In the second group of patients the effect was achieved by the end of week 2 of the treatment, 15% of patients experienced exacerbation during procedures 4-6 which disappeared with continued treatment. The therapeutic effect lasted from 1 to 4 months. In the third group of patients the therapeutic effect occurred during procedures 2-3 and persisted until the end of treatment in 70% of patients, 30% of patients felt relief at the end of the 3d week. The therapeutic effect lasted 3-6 months in 80% of patients. 20% of patients began to feel the former symptoms 2 months after the treatment.
Conclusion(s): Thus, an adequate pain relief with the help of pharmacopuncture is effective and safe.

14AP1-5

The spread of medication in a single shot epidural steroid injection versus a targeted epidural steroid injection via radiopaque spring reinforced catheter in a patient with cervical spine pathology

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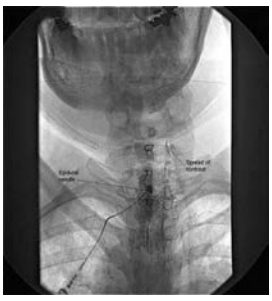
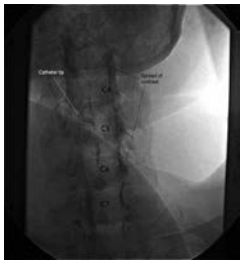
Background and Goal of Study: In the treatment of cervical degenerative disc disease, high thoracic Epidural Steroid Injection (ESI) is frequently used instead of needle insertion at higher cervical levels which may carry significant added risk of dural puncture and/or spinal cord injury. Therefore, medication spread may not be appropriate with this approach. We demonstrated the difference in contrast spread between the traditional high thoracic single shot versus catheter delivered targeted injection in the same patient with a cervical disk pathology.
Materials and Methods: The same patient with C4-5 disc herniation had conventional T1-2 interlaminal midline single shot ESI via epidural needle (Figure-1) and a radiopaque spring reinforced catheter delivered injection to the lateral recess of the affected level (Figure-2) under fluoroscopy guidance. After equal amount of X-ray contrast dye injection, 4 ml steroid solution was administered and fluoroscopy was used to demonstrate the subsequent contrast spread.





Results and Discussion: The catheter delivered injection clearly spread to the C4-5 area while the single shot did not spread beyond the top of the C7 level. An additional advantage of the catheter delivered injection may be the anterior epidural spread. Administration of lower volume may be necessary to maximize steroid deposition at the affected level and prevent spread to healthy cervical disks. Further prospective studies needed to evaluate the clinical benefit and possible added risks of the targeted cervical ESI via the catheter.
Conclusion(s): We demonstrated more accurate delivery of medication at the site of patient's pathology using the radiopaque spring reinforced catheter cervical ESI. However, it remains questionable whether the targeted deposition of medication makes clinically significant improvement in the treatment of cervicalgia and cervical radicular pain related to cervical spine disease.

14AP1-7

Venous component as one of the constituents of secondary headaches

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Background and Goal of Study: The aim of our work was to study doppler characteristics of blood flow (mainly a venous component) in the extracranial segment vessels in patients with secondary headaches caused by degenerative-dystrophic changes in the cervical spine.
Materials and Methods: The program of study included 36 patients, 23 (63.9%) women and 13 (36.1%) men) aged from 18 to 45 years (mean age 37 ± 7 years) with degenerative-dystrophic changes in the level of the cervical spine. All patients sought treatment in the department of pain syndromes therapy due to complaints of headaches. To quantify the hemodynamic parameters duplex scanning of brachiocephalic arteries and veins was performed in all patients.
Results and Discussion: The state of blood flow in the main extracranial arteries of the head was characterized by relatively low incidence of stenotic lesions. Only in 25% (9) were signs of stenosis of carotid or vertebral arteries. The rate of blood flow through the vessels of the carotid arteries systems was within normal limits, and in the arteries of the vertebro-basilar system it was slightly reduced. The study of internal jugular and vertebral veins showed that the veins in all patients were patent. In 30 patients (83.3%) there was noted an increase in the diameters of vertebral veins -3.0-5.0mm which was limited by the size of the openings of the transverse processes of vertebrae and vertebral plexuses. Three patients showed expansion of the internal jugular vein up to 17-23mm. The investigation of the venous outflow through the vertebral veins identified its deficiency in 88.9% (32 patients), which is manifested by dilatation of vertebral veins with the acceleration of blood flow. In 19 subjects (52.8%) there was revealed a vertebral veins dilatation the degree of which was approximately equal to that of acceleration of the linear velocity of blood flow up to 75-80m / sec. 9 (25%) patients had venous congestion due to exstravascular compression of the left vertebral vein, in 4 patients (11.1%) there was noted a change in hemodynamics in the right vertebral vein. It was observed that often there was a simultaneous compression of homologous arteries and veins of the vertebro-basilar system [in 29 (80.6%) subjects].
Conclusion(s): Our data enable not only to clarify individual aspects of the pathogenesis, but also can contribute to more accurate diagnosis and pathogenetic therapy of pain syndromes of cervicocranial localization.

14AP1-10

Effectiveness of classical corporal acupuncture in complex treatment of tension headaches

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Background and Goal of Study: To estimate the effectiveness of the classical corporal acupuncture in complex treatment of tension headache.

Materials and Methods: 70 patients were examined (51 (73%) female and 19 (27%) men) aged from 16 to 69 years. Disease duration ranged from 1 month to 3 years. All the patients were divided into two groups: study and control (by 35 people in each). Patients of the control group received conventional therapy with central muscle relaxants and antidepressants from the group of selective inhibitors of serotonine reuptake. Patients of the study group, in addition to the described treatment, received classical corporal acupuncture 2-3 times per week, a course of 7-14 sessions every 2 months. The following investigation methods were used: neuroorthopedic examination, radiography of the cervical spine, algologic testing using VAS and McGill pain questionnaire. Evaluation of treatment results was carried out at the initial visit, after 1, 3 and 6 months of treatment.
Results and Discussion: At the neuroorthopedic examination 31 (89%) patients of the study and 30 (85%) people of the control group had marked and moderate myofascial disorders of the cervicocranial zone. In 8 (23%) patients of the study group and 7 (20%) patients of the control group, degenerative-dystrophic changes in the cervical spine were revealed. The intensity of headaches before the study was 4.5 ± 1.8 points by VAS among the patients in the control group and 5.1 ± 2.3 points in the study group. In accordance with the McGill pain questionnaire before treatment in the control group the sensory rank pain index (RPI) was 4.81 ± 0.91 points, affective RPI -2.81 ± 0.39 points, the total RPI – 7.63 ± 1.13 points, while the corresponding figures in the study group amounted to 5.05 ± 0.84; 2.69 ± 0.56, and 7.74 ± 1.29 points, respectively. One month after the start of treatment the intensity of pain in the control group was 4 ± 0.5 points by VAS, 3 months later 3.3 ± 0.7 points, 6 months later 2.7 ± 0.7, in the study group was 2.9 ± 1.7 points, 2.0 ± 0.6, points 1.3 ± 0.5 points.Against the background of the treatment, the patients in the study group reported a significant regression of painful sensations by descriptors of the McGill pain questionnaire. Patients of the control group also showed a similar positive trend, but to a lesser extent.
Conclusion(s): The use of the classical corporal acupuncture in complex treatment of tension headaches is an effective and safe method of impact at all stages of treatment.

14AP2-1

Post herpetical neuropathic pain treated by epidural injection

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Background and Goal of Study: Treatment and prevention of post herpetical neuropathy are not still defined such as many other aspects. Among the different possible therapeutic approaches, there is the technique of epidural injection of drugs, whose efficacy we intended to verify.
Materials and Methods: Our study has been performed in 6 months in 21 patients (14 M and 7 F), range 50- 76 years, affected by chronic neuropathic post herpetical pain. All these patients had previously undergone unsuccessful conservative therapy. Our therapeutic strategy combined invasive procedure with drugs already in therapy (NSAIDs 71.2%, strong opioids 14%, tramadol about 55,6%, tricycle antidepressants 34%, anticonvulsivants 66,6%).The patients received Bupivacaine (15 mg)and Methylprednisolone (60 mg) as a day procedure. Using a standard technique, with 18 G Tuohy needle the puncture was performed medially in the corresponding lumbar or thoracic interspace. Pain score (VQS) were used to assess patients before and after epidural injections.
Results and Discussion: There were no complications. In the whole group of patients we performed maximally 3 epidural injections. We had two no –responder patients. Just after 14 days, 77% patients were satisfied and their VQS were improved significantly in 68,5%. After 3 months only 25% of patients has still necessity to continue some conservative therapy.
Conclusion(s): Our therapy obtained very good pain relief. It seems to be good approach to post herpetical pain in outpatient's treatment. This is prototype of patient with chronic neuropathic pain who needs a multidisciplinary and multimodal approach.
References:

1 Dworkin RH,Backonja, M,Rowbotham MC, Alen RR, Bennet GI et al.Advances in neuropathic pain diagnosis, mechanisms, and treatment recommendations. Arch. Neurol 2003;60:1524-34.

14AP2-2

Lumbar epidural injection in the management of lumbar radicular pain. A prospective study of 90 patients followed up for a 6 months

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Background and Goal of Study: Low back pain is most frequent disease that leads patients to the centre for antalgic therapy. Lumbar epidural injection of steroids and local anaesthetics has been useful in the treatment of lumbar irradiating radicular and low limb pain, but is not enough widely practised in our country.
Materials and Methods: We have undertaken a prospective study of 90 patients (age range 29-86 years) with lumbar radicular pain, of more than 6 months duration, who failed conservative treatment. Neither patients with non-specific "low back pain" nor patients with spinal stenosis were included in this study. All patients received a lumbar epidural injection of Bupivacaine and Methylprednisolone as a day case procedure. Pain score (VQS), range of lumbar movements and Patient's active daily life (ADL) were used to assess patients before and after the epidural injection. Subjective satisfaction degree were also evaluated. Statistical analyses was done by Wilcoxon's t-test.
Results and Discussion: There were no complications. Eighty-four percent of the patients improved significantly at six weeks and sixty-five percent reported continued improvement at a six month follow-up. A promising initial response was a good predictor of the future epidural injections. Fifty-five percent of the patients still derived a significant benefit after 18 months with a important reduction in analgesic requirements.
Conclusion(s): Day case lumbar epidural injection of steroid and local anaesthetic in this series has been safe, correct and reproducible procedure.
References:

1 Abram SE. Treatment of lumbosacral radiculopathy with epidural steroids. 1999. Anesthesiology 91:1937-1941.

14AP2-3

Successful treatment of spontaneous intracranial hypotension (SIH) with a thoracic epidural blood patch

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Background and Goal of Study: Spontaneous intracranial hypotension (SIH) remains an underdiagnosed cause of headache. The clinical charateristics of SIH are the same as those occuring after dural puncture. Diagnosis is mainly clinical, but magnetic resonance imaging (MRI) shows specific features. If conservative therapy fails, treatment with an epidural blood patch (EBP) can be effective. We report a case with SIH and the successful treatment by a high thoracic EBP.
Materials and Methods: A 40-year-old healthy man presented to our hospital complaining of daily headaches for 2 months. The acute onset of headache occured initially after a mild head strike. The patient had bilateral frontal headache with postural features which was relieved by assuming a recumbent position. Diagnosis was set after an MRI and radionuclide cysternography (4-mCiTc-99m-DTPA). MRI showed meningeal enhancement and bulging sacs with cerebrospinal fluid (CSF) leakage at the T3 to T8 level, while radionuclide cysternography showed CSF leak and early appearance of radioisotope in the bladder. A lumbar puncture showed an opening pressure of 50 mmH^2O (normal 70 to 180mmH_20). Pain was severe and did not respond to usual therapeutics. After discussion with neurologists an EBP was performed by the anaesthetist in the operating room. The epidural space was identified with the patient seated, using the "hanging drop technique", and the insertion of the 18G Tuohy needle was performed at the T2-T3 level. Under aseptic precautions, 15 ml of autologous blood were injected. The patient remained recumbent for 2 hours.
Results and Discussion: Two hours after the EBP the patient was able to assume the semirecumbent position and at 24 hours he reported complete relief of headache at the upright position. Four days later MRI showed CSF leakage to be less, while the patient was free of headache. Low CSF pressure headache, also called Schaltenbrand syndrome or SIH, although rare, is an increasingly recognized cause of chronic headache but it takes time to be diagnosed. Most CSF leaks are found at the cervicothoracic junction or in the thoracic spine. Its estimated prevalence is only 1 in 50.000 individuals. In the literature there are numbered reports of SIH treatment with a lumbar EBP, while in one case of failure a second EBP at the T9-T10 level was successful.
Conclusion(s): In a case of SIH due to high thoracic T3-T8 CSF leakage, an effective EBP at the T2-T3 spinal level was successfully performed. To our knowledge this is the fist time that a high thoracic EBP was performed.

14AP2-4

Comparison of four pain scales after craniotomy: Preliminary results

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Background and Goal of Study: High incidence of inadequately treated pain after craniotomy may be related to difficulties in expressing pain. This prospective study was designed to characterize intensity of pain by comparing four pain measurement scales after intracranial surgery.
Materials and Methods: Twenty patients with supratentorial tumor and eight with nonruptured cerebral arterial aneurysm, median (range) 49.5 years (24-74), scheduled for elective craniotomy were studied. Anesthesia was induced with thiopental and fentanyl and maintained with inhaled anesthetics or propofol and remifentanil. Postoperative pain was treated with oxycodone as needed, and paracetamol. Intensity of pain was assessed at rest and during head movement with 10 cm red-and-white wedge scale (RWS, 0-10), eleven-point numeric rating scale (NRS, 0-10), five-point verbal rating scale (VRS, 0-4) and seven-point faces pain scale (FPS, 0-6) at predetermined intervals.
Results and Discussion: Twenty-three patients completed the study. Intensity of pain was low with all the scales. The results of RWS correlated well with NRS, (Spearman Rank Correlation coefficient 0.82, p<0.001,) VRS (0.76, p<0.001) and FPS (0.75, p<0.001) as well as results of NRS/VRS (0.82, p<0.001), NRS/FPS (0.81, p<0.001) and VRS/FPS (0.81, p<0.001) had good correlation. FPS had the best total success rate of all the measurements. Severe or unbearable pain at rest was observed in 17.7% of RWS, 19.2% NRS of, 5.7% of VRS and 9.4% of FPS measurements.

Median (25th/75th percentiles) pain scores at rest/ during head movement

Scale	Preop (n=28)	0.POD 4-6 hrs after extubation (n=26)	1.POD (n=27)	2.POD (n=26)	3.POD (n=23)	Failed measure-ments (%)
RWS	0(0/0)/0(0/0)	3(2/4)/3(2/4)	2 (1/4)/3(1/4)	1(0/3)/2(0/3)	0(0/2)/0(0/3)	3,1
NRS	0(0/0)/0(0/0)	3(2/4)/4(2/4)	2(1/3)/3(1/4)	2(0/3)/2(0/3)	1(0/2)/1(0/2	4,6
VRS	0(0/0)/0(0/0)	1(1/2)/1(1/2)	1(1/1)/1(1/2)	1(0/1)/1(0/2)	1(0/1)/1(0/1)	7,7*
FPS	0(0/0)/0(0/0)	1(1/2)/1(1/3)	1(1/1)/1(1/3)	1(0/2)/1(0/3)	1(0/1)/1(0/2)	1,5

* p<0.01 in comparison with FPS (McNemar's test), POD=postoperative day.

Conclusion(s): In contrast to previous studies, number of measurements indicating severe pain was low (<20%). Furthermore, all tested pain scales showed low intensity of postcraniotomy pain. VRS may not be the best method in assessment of acute pain after craniotomy.

14AP2-5

Acupuncture attenuates chronic pain independently from age groups in adults

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Background and Goal of Study: This study was to clarify the effectiveness and mechanisms of acupuncture for chronic pain between age groups using Pain Vision and VAS.
Materials and Methods: Twenty three of adult patients (32-84 yo.) suffering from chronic pain were candidates for this study. We divided two age groups (one group under 60 years old, the other group over 60 years old). All patients had acupuncture procedures for 40-60 minutes by needling acupuncture points with "mederidian" and the vital energy "Qi". We evaluated the effects of acupuncture on chronic pain at pre- and at post-acupuncture. Subjective evaluations of pain were visual analogue scale (VAS) of pain. Objective evaluations of pain were measured by a commercially available microprocessor-controlled electrical neurostimulator (Pain visionTM, Nipro Japan). It delivers a sinusoidal constant alternating current (50 Hz, pulse width 0.3 ms, intensities 0-250 micro A), and measure different types of the current perception (CPT) threshold. One CPT is the minimum perception threshold (MPT) which a patient perceives the current applied on a normal forearm. The other CPT (PET) is the current threshold which the patient perceives the equivalent strength as the chronic pain. Pain degree was calculated: (PET-MPT)/MPT.
Results and Discussion: There were significant changes of VAS (45.9+/-2.7 vs. 27.3+/-4.7 mm, mean+/-SD, p=0.0024), and pain degree (308.4+/-327.9 vs. 174.1+/-250.9, p=0.0047) between pre and post-acupuncture in the under 60 years group. There were significant changes of VAS (45.1+/-16.4 vs.25.8+/-17.4 mm, mean+/-SD, p=0.00001), and pain degree (201.7+/-245.2 vs. 73.6+/-93.9, p=0.0017) between pre and post-acupuncture in the over 60 years group. There were no significant changes between the two age groups. These results demonstrated that acupuncture attenuated chronic pain independently from age groups in adults. Pain is a subjective sensation that is difficult to measure and/or assess. VAS is subjective and depends on an individual's experience for pain. Pain vision is quantitative analysis of perception of painless stimulating current flow as intensity of pain. Our study could not reveal the difference between analgesic action and psychological action of acupuncture(1).
Conclusion(s): These results suggest that acupuncture attenuates chronic pain independently from age groups in adults.
References:

1 Madsen MV, et al: Acupuncture treatment for pain: systematic review of randomised clinical trials with acupuncture, placebo acupuncture, and no acupuncture groups. BMJ 2009;338:a3115.

14AP3-1

Antinociceptive effect of intrathecal ginsenosides through alpha-2 adrenoceptors in the formalin test of rat of rat

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Background and Goal of Study: Experimental evidence indicates that ginseng and clonidine (alpha-2 agonist) are active against various nociceptive states. Moreover, alpha-2 adrenoceptors are divided into three subtypes; alpha-2A, B and C. The purposes of this study were to define the nature of pharmacological interaction after coadministration of ginsenosides with clonidine in the formalin-induced nociceptive state and to further clarify the role of the subtypes of alpha-2 adrenoceptor on the effect of ginsenosides.
Materials and Methods: Intrathecal catheter was placed in male SD rats. For induction of pain, 50 µl of 5% formalin solution was applied to the hindpaw. Isobolographic analysis was used for the evaluation of drug interaction between ginsenosides and clonidine. Furthermore, alpha-2A adrenoceptor antagonist (BRL 44408), alpha-2B adrenoceptor antagonist (ARC 239) and alpha-2C adrenoceptor antagonist (JP 1302) were intrathecally given to verify the involvement of the alpha-2 adrenoceptor subtypes in the antinociception of ginsenosides. The expression of alpha-2 receptors was measured in naïve and inflammatory rats with RT-PCR.
Results and Discussion: Both ginsenosides and clonidine produced an antinociceptive effect during phase 1 and phase 2 in the formalin test. Isobolographic analysis revealed an additive interaction after intrathecal delivery ginsenosides-clonidine mixture in both phases. Intrathecal BRL 44408, ARC 239 and JP 1302 reversed the antinociception of ginsenosides in both phases. Alpha-2A, B and C adrenoceptors mRNA detected in spinal cord of naïve rats and the injection of carrageenan had no effect on the expression of alpha-2 adrenoceptors.
Conclusion(s): These results suggest that ginsenosides, clonidine and the mixture of the two drugs are effective against acute pain and facilitated pain state evoked by formalin injection at the spinal level. Thus, the spinal combination of ginsenosides with clonidine may be useful in the management of the same state. Furthermore, alpha-2A, B and C adrenoceptors exist in the spinal cord and contribute to the antinocieption of intrathecal ginsenosides.

14AP3-4

Reproducibility of electronic Von Frey and Von Frey monofilaments testing

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Background and Goal of Study: Von Frey monofilaments(VFM) and Electronic Von Frey(EVF) have been used as quantitative sensory testing(QST) to explore mechanical hyperalgesia. However, intrinsic reliability of the methods is often neglected. The aim of the study was to determine VFM and EVF´s reproducibility in undamaged areas.
Materials and Methods: Prospective study performed in 2 groups of individuals without nervous disorders; G1:30 volunteers(30.8±4.3yrs), and G2:28 patients submitted to knee arthroplasty(70.78±8.8yrs) receiving local anesthetics for postoperative analgesia. Testing were performed by two trained investigators (A and B) in forearm and abdomen and repeated 24 hours later. Four VMF of 1, 4, 100 and 300g were applied consecutively. Pain threshold was determined as the VMF which at least 2 out of 3 applications were referred painful. EVF, which measures the pressure applied, was tested afterwards. Time employed in each test was recorded. Kappa and Lin coefficients were used to analyze reproducibility. SPSS16 was used and P≤ 0.05 taken for statistical significance.
Results and Discussion: Data analysis of reproducibility is shown in the table: Whereas intra and interobserver reproducibility of VFM was only fair/moderate, EVF showed a good intraobserver reproducibility in G1 and almost perfect in the rest of the cases. No differences were found between the two areas. Time employed was 2.5 and 6 min for EVF and VFM respectively.

		VFM(KC)		EVF(LC)	
		G1	G2	G1	G2
Intra	A(1-2day)arm	0.40	0.40	0.78(0.60-0.89)	0.88(0.78-0.94)
	A(1-2day)abd	0.54	0.34	0.77(0.57-0.88)	0.86(0.73-0.93)
	B(1-2day)arm	0.39	0.39	0.78(0.59-0.89)	0.88(0.76-0.94)
	B(1-2day)abd	0.39	0.31	0.76(0.57-0.88)	0.88(0.76-0.94)
Inter	1day(A-B)arm	0.31	0.24	0.84(0.69-0.92)	0.85(0.70-0.93)
	1day(A-B)abd	0.56	0.52	0.90(0.81-0.95)	0.85(0.71-0.92)
	2day(A-B)arm	0.52	0.42	0.81(0.66-0.89)	0.81(0.66-0.89)
	2day(A-B)abd	0.64	0.43	0.80(0.64-0.89)	0.93(0.86-0.97)

Grade of correlation:Kappa and Lin coefficient(<0.21poor;0.21-0.40fair;0.41-0.60moderate;0.61-0.80substantial;>0.80almost perfect)

Conclusion(s): EVF was a reliable and rapid test to explore pain threshold in undamaged areas in volunteers and in-hospital patients. Reproducibility of VFM was lower.

14AP3-5

Comparison of antinociceptive effects of tramadol, lornoxicam and paracetamol in a chemical model of visceral pain in mice

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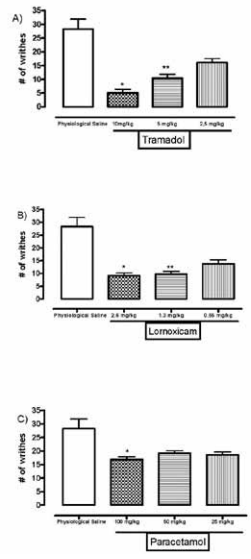
Background and Goal of Study: There are several experimental methods to propose the efficacy of pharmacological agents to test nociception and analgesia. Acetic acid induced writhing test is an established method for studying visceral pain.The aim of this study is to compare efficacy and potency orders of tramadol, lornoxicam and paracetamol in a mice model and supply evidence for clinicians dealing with pre-emptive analgesia.

Materials and Methods: Swiss albino mice were treated either with intraperitoneal physiological saline, tramadol (10.0 mg/kg, 5.0 mg/kg and 2.5 mg/kg), lornoxicam (0.65 mg/kg, 1.30 mg/kg and 2.60 mg/kg) or paracetamol (100 mg/kg, 50 mg/kg and 25 mg/kg) 5 min before inducing the writhing test. The mice received intraperitoneal 0.2 ml 3% acetic acid solution injections and the writhes were observed and recorded for 10 min.Percent maximum possible effects and median effective doses (ED_{50})were calculated and the efficacy order for the three agents were compared. The number of writhes in different groups was compared by using *Kruskal Wallis* statistics followed by *Dunns post-hoc* test. All statistics were performed by using GraphPad Prism (USA). Statistical significance was accepted where p<0.05.

Results and Discussion: In Figure1 the effect of 3 different doses of intraperitoneal tramadol (A; 2.5, 5 and 10 mg/kg), lornoxicam (B) and paracetamol (C) on the number of writhes induced by intraperitoneal 3% acetic acid is shown.(*, p < 0,001 and **, p < 0,01 compared to physiological saline).The efficacy order for the three agents was found as: Tramadol ≥ Lornoxicam > Paracetamol. Median effective doses (ED_{50}) for the drugs were also calculated as 1.54 mg/kg, 5.20 mg/kg and 97.32 mg/kg for lornoxicam, tramadol and paracetamol respectively. The potency order was observed as: Lornoxicam > Tramadol > Paracetamol.

Fig. 1



Conclusion(s): These results state that tramadol and lornoxicam have similar efficacy where pre-emptive role of paracetamol should be further questioned in a clinical setting.

14AP3-6

Peripheral K_{ATP}-channels and COX-1 (but not COX-2) are involved in peripheral sensitization and mechanical hyperalgesia after incision in rats

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Background and Goal of Study: The sensitization of nociceptive fibers (A-delta/C-fibers) contributes to hyperalgesia after incision in rats. However, it is basically unclear which relevant mechanisms are involved. In the present study, we assessed mechanisms involved in sensitization of nociceptors after incision contributing to incision-induced mechanical hyperalgesia.

Materials and Methods: Rats (n=86) underwent plantar incision. Mechanical withdrawal thresholds (WT, calibrated von Frey filaments) was assessed before and two days after incision and local wound injection of various drugs was performed in individual animals: diclofenac (100µg,200µg,600µg and vehicle; n=6/group), SC560 (selective COX1-inhibitor 600µg,1000µg and vehicle; n=6/group), NS398 (selective COX-2-inhibitor 100µg,200µg,400µg and vehicle; n=4/group), pinacidil (selective K_{ATP}-channel-agonist 60µg and vehicle; n=6/group) and glibenclamid (selective K_{ATP}-channel-antagonist 50µg and vehicle; n=5/group). WT was measured for 4hrs after drug administration. The highest dose (200µg, 600µg) was administrated in the contralateral paw of separate rats to detect a systemic effect. In separate experiments animals pretreated with the glibenclamid (n=6) received the selective K_{ATP}-channel agonist pinacidil.

Results and Discussion: Diclofenac increased dose dependently the decreased median WT after incision from 65mN to 148mN (100µg), 236mN (200µg) and 160mN (600µg) 60min after injection (p<0.05 vs. vehicle). Contralateral administration of 600µg but not 200µg diclofenac increased the WT 2 days after incision. The COX1-inhibitor SC560 (1mg) increased the decreased WT after ipsilateral (but not contralateral) injection (p<0.05 vs. vehicle). In contrast NS398 had no effect on WT after incision. Pinacidil increased the decreased WT from 35mN to 106mN after incision (p<0.05). Pinacidil induced antinociception was blocked with pretreatment of glibenclamid (p<0.05). Currently we are recording from skine-nerve preparation to determine the role of COX-1 and K_{ATP}-channel in sensitizing specific nociceptors.

Conclusion(s): Peripheral COX-1 but not COX-2 inhibition decreased mechanical hyperalgesia after incision in rats. Similar, activation of ATP-dependent K-channel reduced mechanical hyperalgesia. Our results indicate that inhibition of K_{ATP}-channel activation contributes to sensitization of nociceptors and mechanical hyperalgesia after incision. In addition peripheral activation of COX-1 is involved in peripheral sensitization and mechanical hyperalgesia after incision.

14AP3-7

Sensory loss in patients with Crohn´s disease

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Background and Goal of Study: Crohn´s disease (CD) is a painful inflammatory bowel disease with a heterogeneous clinical appearance. CD patients undergoing major abdominal surgery require notably higher postoperative opioid amount compared to non CD patients.[1] Quantitative sensory testing (QST) evaluates large and small fibre sensory functions and permits the discrimination of distinct patient groups according to sensory profiles. The aim of the study was to investigate differences in QST profiles between CD patients and patients without CD.

Materials and Methods: After approval of the local ethics committee and written informed consent we enrolled 103 CD patients and 80 control subjects. Analgesic medication and surgery within the last three month was an exclusion criterion. QST was applied according to a standardized protocol including cold (CDT) and warm (WDT) detection threshold, cold (CPT) and heat (HPT) pain threshold, mechanical detection (MDT) and pain (MPT) threshold, vibration detection threshold (VDT), pin-prick pain (MPS) and pressure pain threshold (PPT).[2] QST results between CD and non CD patients were compared using a t-test. Correlations between different QST parameters were assessed by Pearson´s r. A cluster analysis on all QST parameters was performed to identify subpopulations with different sensory profiles.

Results and Discussion: Patients with CD showed significant higher thresholds in CDT (-1.63 vs. 1.13°C), WDT (2.6 vs. 2.0 °C), VDT (7.6 vs. 7.81) and MPT (236 vs. 172 mN). No significant differences were found in any other

parameter. There was a significant correlation with abs(r)>0.5 between CPT and HPT, between CPT and PPT, and between HPT and PPT in both groups, whereas a correlation between CDT and WDT was only seen in CD patients. Cluster analysis detected two subgroups (hypaesthetics and hyperaesthetics) in both CD and non CD patients. In CD and non CD patients hypasthetics contained a larger proportion of males (CD: 59% vs. 32%, p=0.006; non CD group: 58% vs. 36%, p=0.06). Furthermore in the CD group the hypasthetics had a tendency to a longer duration of the disease (16 vs.12 years, p=0.057).

Conclusion(s): QST shows a loss of small fiber function in CD patients compared to healthy controls. This loss of function is increasing with disease duration. The observed higher opioid consumption of CD patients in acute postoperative situations can not be explained by a general higher sensitivity of sensory functions.

References:
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14AP3-8

tDCS for postoperative multimodal analgesia: Preliminary results

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Background and Goal of Study: Multimodal analgesia combines drugs and techniques to improve postoperative analgesia and reduce opioid-related adverse events. Previous studies showed that transcranial magnetic stimulation decreases both pain and morphine consumption during the postoperative period (1). Transcranial direct current stimulation (tDCS), a non-invasive method, polarizes the brain and modulates its excitability. This study investigated the potential of tDCS to improve analgesia and reduce morphine consumption during the post-operative period in patients undergoing lumbar spine surgery.

Materials and Methods: After Ethical Committee approval and informed consent, 18 ASA 1-2 patients were included. Anaesthesia was induced with propofol and sufentanyl 0.2µg.kg-1, maintained with sevoflurane in O2/air mixture. Ketorolac 0.3mg.kg-1, ketamine 0.5mg.kg-1, magnesium sulfate 2g, tramadol 100mg and paracetamol 1g completed peroperative analgesia. In recovery room, IV morphine was titrated to obtain VAS<40. Then, patients were randomized in a double-blind fashion to receive 20 minutes of a sham or active 1mA tDCS. The active tDCS electrode targeted the left dorsolateral prefrontal cortex, and the reference electrode was positioned on the scalp over the right ear (2). Afterwards, IV morphine PCA was given to the patient. We compared the first and second postoperative day (D1, D2) morphine consumption and resting/dynamic VAS (r VAS / d VAS) using the Wilcoxon rank sum test. p<0.05 significant.

Results and Discussion: Results are expressed as mean ± SD. No side effect occurred during tDCS. Despite a classical wide inter-individual variability of the VAS scores, tDCS reduced significantly the D2 r VAS, and reached borderline significance for D2 d VAS. No statistically significant difference was found concerning morphine consumption and D1 pain scores. But more patients are needed to improve the power of the study.

	D1 morphine	D1 r VAS	D1 d VAS	D1+D2 morphine	D2 r VAS	D2 d VAS
Sham	26.1 ± 31.1	22 ± 19	45 ± 26	43.6 ± 44.2	19 ± 12	45 ± 15
tDCS	20.6 ± 20.9	19 ± 18	45 ± 29	31.5 ± 35.1	5 ± 10	20 ± 25
p	NS	NS	NS	NS	0.027	0.056

Conclusion(s): Our results shows that tDCS tended to improve the second postoperative day pain scores. The technique will be tested more extensively to precise its ability to boost multimodal analgesia in clinical practice.

References:
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14AP3-9

Repeated painful stimulation of the oesophagus causes a decrease of visceral pain evoked potential amplitudes

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Background and Goal of Study: Habituation caused by repeated pain stimuli may influence experimental pain measurements, e.g. during investigation of drug effects. For evoked potentials (EP) habituation results in decreasing amplitudes [1]. The present investigation evaluates whether peak-to-peak-amplitudes of visceral pain evoked potentials (VPEP) are changed by repeated stimuli of the oesophagus.

Materials and Methods: The study protocol was approved by the university's ethics committee. 30 healthy male volunteers participated in this study. Standard monitoring parameters and 32 channel electroencephalogram (EEG) according to the 10-20-system were recorded with a sampling rate of 5 kHz. For VPEP, electric stimuli (stimulus frequency of 0.125 Hz) were applied in the distal oesophagus via a specially designed bipolar electrode which was passed transnasally [2]. 4 consecutive iterations (I-IV) of 50 stimuli [1] were given at the individual pain threshold (17.6 – 65.6 mA). For each iteration I-IV, VPEP were analyzed using stimulus-synchronised averaging of the EEG (Tp9, reference Fcz, band pass filter 0.5-12 Hz). After identification of VPEP minima and maxima, P1/N2 peak-to-peak-amplitudes were analyzed with respect to a decrease from iteration I to IV (Wilcoxon test, p<0.05, Bonferroni correction for multiple comparisons).

Results and Discussion: VPEP P1/N2 amplitudes decrease with repeated stimuli as shown in table 1. Multiple comparisons provide significant changes between I-II, I-III, I-IV and II-IV.

iteration (50 sweeps)	I	II	III	IV
VPEP P1/N2 amplitudes (µV)	9.26 ± 5.57	6.68 ± 4.09	5.61 ± 2.74	4.88 ± 2.39

P1/N2 amplitudes (mean values ± standard deviation) of VPEP for iteration I (sweeps 1-50), II (51-100), III (101-150) and IV (151-200).

Conclusion(s): For non-painful stimulation of the oesophagus, a decrease of EP amplitudes has been shown before [1]. Despite of adequate stimulation frequency, the current study reveals a decrease of VPEP amplitudes with increasing number of stimuli for painful stimulation of the oesophagus. As already shown for somatic pain [3], the present result could be caused by habituation on visceral pain. Habituation may influence evaluation of drug effects on pain intensity and should be considered for assessment.

References:
1 Gastroenterology 1989; 97: 475-8.
2 Scand J Gastroentero 1994; 29: 776-81.
3 Pain 2007; 132: 301-11.

14AP4-1

Does the method and timing of ketamine administration effect postoperative morphine requirement?

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Background and Goal of Study: At subanesthetic doses ketamine has marked analgesic activity. However contradictory reports exist regarding its efficacy on postoperative pain and side effect profile.The aim of this prospective, randomized, double-blind, and placebo controlled study was to evaluate the effects of ketamine administration method (single bolus, peroperative infusion, per and postoperative infusion) on postoperative morphine requirement and side effects.

Materials and Methods: After Faculty Ethic Committee approval and patients' written consent, 52 patients, aged 38-70 years, undergoing colectomy under general anesthesia were randomly allocated into four groups. Group 1 (control group, n=13) received iv serum physiologic bolus and group 2 (n=13) received 0.5mg/kg iv ketamine bolus at induction. Group 1 and 2 received serum physiologic infusion per and postoperatively. Group 3 (n=13) received 0.5mg/kg iv ketamine bolus at induction, 0.25 mg/kg/h ketamine infusion peroperatively and serum physiologic infusion postoperatively. Group 4 (n=13) received 0.5 mg/kg iv ketamine bolus at induction, 0.25 mg/kg/h ketamine infusion per and postoperatively. Postoperatively in the recovery room, pain was assessed using visual anologue scale (VAS) and morphine bolus was given in order to get VAS ≤ 3. Then intravenous patient controlled analgesia (1mg/ml morphine solution, 1.5 cc bolus dose, 10 min lockout time) was started. At postoperative 1, 2, 4, 8, 12, 24, 36 and 48 th hours VAS scores, side effects, morphine consumption were recorded. The data were analysed statistically with one-way ANOVA, Tukey-Kramer and Bartlett's test (p<0.05).

Results and Discussion: There was no statistically significant difference in demographic characteristics and VAS scores of patients between groups (p>0.05). Morphine bolus doses in the recovery room and 48 hours total morphine consumption were significantly lower in group 4 than the others. Two patients in group 1, 3 patients in group 2, 1 patient in group 3 and 6 patients in group 4 had nightmare or hallucination (p>0.05). One patient in group 1, 1 patient in group 2, 3 patients in group 3, 2 patients in group 4 had nausea-vomiting (p>0.05).

Conclusion(s): It is concluded that 0.5mg/kg iv ketamine bolus injection at induction and per and postoperative 0.25 mg/kg/h ketamine infusion in patients

undergoing colectomy under general anesthesia decreased postoperative morphine consumption; single ketamine bolus at induction or only peroperative infusion of ketamine were not different than placebo infusion.

14AP4-2

Comparison of the effects of dexmedetomidine, midazolam and ondansetron in patients receiving postoperative patient controlled morphine

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Background and Goal of Study: This prospective, randomized, double blinded, controlled study was designed to compare the effects of dexmedetomidine, midazolam and ondansetron, starting 10 minutes before anaesthesia induction and continuing for 24 hour as an infusion, on postoperative analgesia and antiemetic effect in patients receiving postoperative patient controlled morphine (PCM).
Materials and Methods: Following approval of drug research ethical committee and patient written consent, 120 patients undergoing elective laparotomy were recruited. Patients were randomly allocated into four groups. Ten minutes before the induction of anaesthesia the first group (Group D) received dexmedetomidine, a loading dose of 1 µg/kg and followed by a dose of 0.2 µg/kg/hr for the first 24 hours. The second group (Group M) received midazolam, a loading dose of 0.05 mg/kg and followed by a dose of 0.002 mg/kg/hr. The third group (Group O) received ondansetron, a loading dose of 4 mg and followed by a dose of 0.5 mg/hr. The fourth group (Group S) the control group and received 0.9 % saline, a loading dose of 100 cc and followed by a volume of 5 cc/hr of saline. At the closure of peritoneum, all patients were given a loading dose of morphine (0.1 mg/kg) for the management of postoperative analgesia. Patients were allowed to use a PCM device giving a bolus dose of morphine 0.02 mg/kg. Discomfort, sedation, pain scores, cumulative morphine consumption, recovery times and side effects were recorded at the first minute and at 1,2, 6, 12 and 24 hours after start of PCM.
Results and Discussion: Recovery times were found significantly longer in D group compared to O ($p < 0.005$) and S groups ($p < 0.004$). Pain and patient comfort were found similar between groups. Sedation scores were significantly higher in D group compared to O and S groups ($p < 0.001$). Morphine consumption was significantly lower at 6, 12 and 24 hours in group O and lower only at 12 hour in group D, postoperatively. At the first 24 hour, the incidence of nausea and vomiting was significantly lower in D, M and O groups than in S group ($p<0.001$).
Conclusion(s): In patients receiving PCM, dexmedetomidine, midazolam and ondansetron, starting before the induction of anaesthesia, provided lower incidence of postoperative nausea and vomiting at the first two hour compared to saline group. Although VRS scores were similar between groups, morphine consumption after 24 hour was significantly lower in D and O groups than in S and M groups.

14AP4-3

The influence of a single preoperative dose of pregabalin on patient-controlled analgesia following surgery for inflammatory bowel diseases

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Background and Goal of Study: Inflammatory bowel diseases (IBD) require surgery in approximately 70% of cases (1) and management of chronic and acute pain can be a challenge for anaesthesiologists. Multi-modal analgesia with antineuropathic pain drug like pregabalin (2), may be important for optimal postoperative pain treatment.
Materials and Methods: Fifty adults (18-60 years), ASA physical status II undergoing surgery for IBD were randomly assigned to orally receive either placebo capsules (Group P) or pregabalin (Group PG) (150 mg) two hours before surgery. All patients received general anaesthesia, PONV prophylaxis (dexamethasone 8 mg and ondansetron 4 mg every 12 hs) and postoperative patient-controlled analgesia (PCA) with a background infusion of morphine (bolus 1 mg, lockout interval 15 min), plus paracetamol 1gr/three times a day. During 24 postoperative hours, total morphine consumption was recorded. Moreover, the number of bolus doses and the amounts of postoperative analgesics were registered. Visual analogue pain scores (VAS) were assessed at 1,2,4,8,12,24 hours after surgery. The incidence of adverse reactions was also assessed. Even, each patient was asked to complete a questionnaire regarding satisfaction with the analgesic experience (VAS from 0 very satisfied to 10 very dissatisfied). Data were analysed using Student's t test ($p<0.05$).
Results and Discussion: There were not differences regarding age, sex, types of surgical procedure between two groups. Over a 24 hours period, total morphine consumption in Group PG were lower than in Group P (25±5 vs 35±3, $p<0.05$) as well as the amounts of rescue analgesics. VAS scores were significantly lower in the Group PG during the early postoperative period (at 1,2,4 hours). Incidence of adverse effects (PONV, excessive sedation) was equal between groups. Patient's satisfaction was comparable within groups.
Conclusion(s): A single preoperative oral dose of pregabalin seems to be useful and safe for reducing analgesic consumption after surgery for IBD.
References:
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14AP4-4

Epidural injection of triamcinolone reduces postoperative pain and consumption of patient-controlled epidural analgesia

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Background and Goal of Study: Epidural analgesia provides optimal analgesia, decreasing postoperative morbidity and mortality.Epidural administration of triamcinolone acetonide, one of long-acting synthetic glucocorticoid, has been safely used for the treatment of chronic pain. However there are few studies over the analgesic effect of epidural corticosteroid on postoperative pain.1. In this study we investigated whether preoperative, single, epidural administration of triamcinolone could reduce postoperative pain and patient-controlled analgesia (PCEA) consumption in patients undergoing gastrectomy.
Materials and Methods: 60 adult patients undergoing gastrectomy for gastric cancer, were included in this prospective, randomized, double-blinded study.The patients in triamcinolone group received triamcinolone acetonide 1mg/kg which was mixed with 0.9% normal saline to 10ml and the patients in control group received 0.9% normal saline 10ml before surgery. After operation PCEA containing 250 ml of 0.1% ropivacaine and fentanyl 5µg/ml was set to delivery basal infusion 2 ml/hr and an 2ml bolus dose on demand with lockout interval of 10 minPain scores were assed using visual analogue score (linear 10mm, starting from 0 = no pain to 10 = worst pain imaginable) at rest and with effort (coughing and at 30° sitting) at 1hr, 6hr, 12hr, 24hr and 48 hr postoperatively. After each VAS scoring interval, the investigators checked infused volume of analgesics of PCEA, level of sedation, nausea and pruritus.In addtion, C-reactive protein (CRP) levels were measured at 48hr postoperatively.
Results and Discussion: PCEA consumption was significantly lower in the triamcinolone group during 6-12h, 12-24h, 24-48h and total consumption of PCEA during 48h than saline group ($P< 0.05$). VAS pain score at rest was significantly lower in the triamcinolone group than in the control group at 48h postoperatively ($P<0.05$). In addtion 48 hr after operation CRP levels was significantly lower in group triamcinolone than group control ($P<0.05$).
Conclusion(s): Preoperative administration of epidural triamcinolone for postoperative epidural analgesia provided a significant reduction in PCEA ropivacaine and fentanyl mixture consumption and VAS pain at rest at 48hr postoperatively without any significant side-effects.
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14AP4-5

The influence of preoperative pregabalin administration on postoperative opioid consumption – A pilot study

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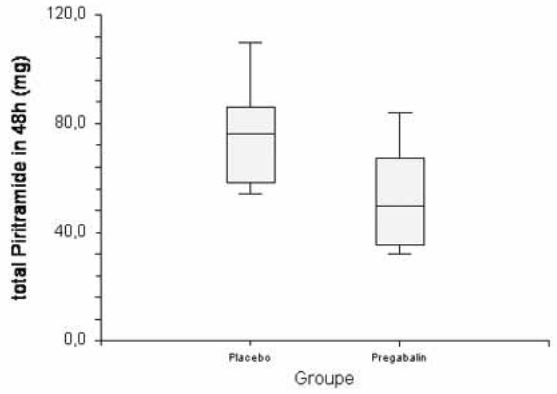
Background and Goal of Study: Theoretical considerations give support to the concept of a preemptive effect of prebabalin. However, in current literature the influence of pregabalin on posteroperative morphine consumption is reported inconclusively. The goal of our study was to evaluate the effect of preoperative pregabalin administration on the postoperative opioid consumption in patients with elective nephrectomy.
Materials and Methods: As no data were present as basis for an *a-priori* sample size calculation, we planned a pilot study with a sample size of convenience of 20 patients. According to a computer generated random table, subjects received either 300mg pregablin or placebo orally 1 hour before anaesthesia. Primary target was the postoperative piritramide consumption in the first 48 hours documented by a patient-controlled analgesia device.
Results and Discussion: Analyzing the results of 20 patients (10 verum vs. 10 placebo), we could demonstrate a significant effect on the posteropative piritramide consumption (Fig. 1, $p=0.009552$, $Beta=0.217$). Based on this results, our follow up study has to include n=24 patients for a power of 0.9. Postoperative nausea and vomiting was documented in 2 cases in the pregaba-

lin group vs. 1 in the control group. Sedation scores showed no differences between the groups.

Fig. 1



Conclusion(s): Based on this pilot study we speculate that the preoperative administration of 300mg pregablin preoperatively has a significant effect on the postoperative opioid consumption. This pilot study is limited by its low power.

14AP4-6

Effects of intravenous infusion of lidocaine on perioperative opioids consumption and postoperative hyperalgesia after lumbar arthrodesis

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Background and Goal of Study: Intravenous infusion (iv) of lidocaine decreases per and postoperative opioïds consumption during major abdominal surgery (1). These results are not confirmed for hip arthroplasty (2). We tested the hypothesis that peroperative iv administration of lidocaine during lumbar arthrodesis decreases perioperative opioïds consumption and postoperative hyperalgesia.
Materials and Methods: During this double-blinded, randomized and placebo-controlled clinical trial, 18 patients scheduled for lumbar arthrodesis were assigned to receive either an iv bolus injection of 1.5 mg/kg lidocaine at induction of anesthesia, followed by an intraoperative continuous infusion of 2 mg/kg/h (GP1) or an equal volume of saline (GP2). Anesthesia was conducted under a continuous infusion of propofol and boluses of sufentanil. Consumption of propofol (mg), sufentanil (µg) and entropy scores were recorded. Pain scores (scale of 0-10; 0=none; 10= worst pain imaginable), morphine consumption (mg) and area of hyperalgesia (cm2), evaluated with Von Frey hairs, were recorded postoperatively. Statistical comparisons (mean ± s.e.m.) were performed using unpaired Student t-test (P<0.05 significant).
Results and Discussion: Groups are similar in terms of age, weight, height, sex, duration of anesthesia and surgery (P> 0.05). Consumption of propofol (1912±170 vs 2430±427; P=0.27) and entropy scores (49.25±6.61 vs 42.44±2.61; P=0.33) are similar in both groups. Peroperative requirement of sufentanil is less important in GP1 compared to GP2 (32.83±3.80 vs 43.83±3.28; p=0.04). Morphine consumption is superior (3±0.81vs 1±0.47; p=0.04) during the first postoperative hour whereas pain is superior during the second postoperative hour (5.88±0.93vs 2±0.92; p=0.009) in GP1 compared to GP2. The area of hyperalgesia is smaller at 24 (15.48 ± 7.17 vs 42.95 ± 6.51; P= 0.02) and 48 hours (4.75 ± 4.75 vs 31.56 ± 5.42; P=0.008) in GP1 compared to GP2.
Conclusion(s): Our results suggest that intravenous infusion of lidocaine has a sparing effect on the peroperative consumption of sufentanil. Postoperative area of punctuate hyperalgesia around the wound is dramatically decreased for the patients who benefit from the lidocaine iv infusion and is not related to the early post operative pain.

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14AP4-7

Efficacy and safety of pregabalin in the treatment of postoperative pain following inguinal herniorrhaphy

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Background and Goal of Study: Pregabalin, an $\alpha_2\delta$ ligand, is indicated for the treatment of fibromyalgia and pain from diabetic peripheral neuropathy and post-herpetic neuralgia. The objective of this study was to assess the efficacy and safety of pregabalin following elective inguinal herniorrhaphy.
Materials and Methods: This was a multicenter randomized, double-blind, placebo-controlled study of men 18 to 75 years of age undergoing elective, unilateral, open mesh, Lichtenstein inguinal herniorrhaphy. The study design consisted of 2 pre-surgery doses (12 hours and 2 hours, pregabalin 25 mg, pregabalin 75 mg, pregabalin 150, or placebo), a 7-day postoperative dosing period [pregabalin 50 mg/day (n=108), 150 mg/day (n=106), 300 mg/day (n=103) or placebo (n=108), each administered by twice daily dosing], 7-day taper phase, and follow-up at months 1, 3, and 6. An analysis of variance model was used to analyze efficacy endpoints. Descriptive statistics summarized the safety analysis.
Results and Discussion: Worst pain scores (primary end point) with pregabalin were numerically superior to placebo, although statistical significance was not demonstrated (pregabalin 300 mg/d unadjusted p-value= 0.0334; adjusted p-value 0.0668). Pain interference index scores and opioid consumption at 24 hours post-surgery were lower in each pregabalin group versus placebo (p<0.05). Furthermore, pregabalin 300 mg/day was associated with a significant reduction in pain caused by sitting, walking, and coughing 1 hour post-surgery; lower current resting pain scores at 1 hour post-surgery (p=0.0003); and lower sleep interference scores at day 2 post-surgery (p=0.0031) and at day 9 (p=0.0058); and lower total cumulative doses of opioids during the first 7 days. At day 4 post-surgery, patients in the pregabalin 150 mg/day group reported lower Visual Analog Scale anxiety scores (p=0.0221). The incidence of some spontaneous adverse events typically associated with opioids (i.e. nausea and vomiting) was generally low in the pregabalin 300 mg treatment group.
Conclusion(s): Although the administration of pregabalin did not reduce worst pain scores at 24 hours, it did reduce pain interference and overall opioid consumption at 24 hours. Therefore, additional studies are required to establish to potential benefit of pregabalin in the acute surgical setting.

14AP4-8

Norketamine versus ketamine – Analgesic potential and side effects

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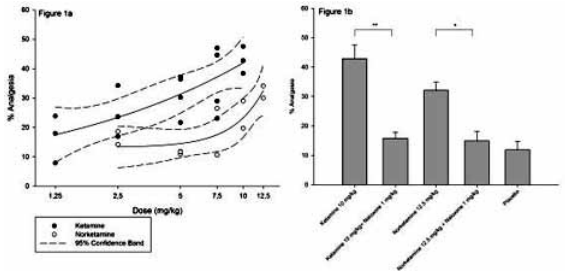
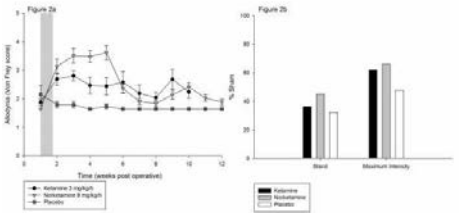
Background and Goal of Study: Painful nerve stimulation leads to activation of N-methyl-D-aspartate receptors (NMDAR) in the spinal cord. NMDAR antagonists have shown efficacy in preclinical models and patients with neuropathic pain but large-scale clinical use of NMDAR antagonists (ketamine K) is limited by severe side effects. Norketamine (Nk), the primary active metabolite of K, may be more useful.
Materials and Methods: We quantified the pharmacological profile of Nk and K in an *in vitro* model of xenopus laevis frog recombinantly expressing human NMDAR. *In vivo* protocols (Sprague-Dawley rats) were defined for managing acute (heat) and chronic pain (spared nerve injury). To differentiate between Nk/K effects on opioid (OR) and NMDAR during acute pain, we also administered Nk/K on OR antagonist background.



Results and Discussion: *In vitro model:* 10^{-7}M of K significantly reduced NMDA signaling to 60.1±17.9%. Responses to agonists were reduced to 63.9±19% in the presence of $\geq 10^{-5.5}$M Nk. E_{max}, was 10^{-3}M for K and 10^{-4}M for Nk. IC_{50} was reduced by 50%. *Acute Antinociception:*K and Nk showed effects *in vivo* in a dose-dependent manner. E_{max} was 42.8±4%analgesia at 10 mg/kg K; for Nk, E_{max} was 32±2.8% at 12.5 mg/kg (Fig 1a). Effects were reversed when administered on a Nlx background (Fig 1b). *Chronic pain:*Both drugs alleviated tactile allodynia; K for 39±18 POD (n=5), Nk for 50±18 POD (n=5, Fig 2a). Functional assessment performed with a gait analysis system showed improvement of function. Animals receiving K or Nk stand longer on the injured paw while walking (stand) and distribute their weight more evenly (maximum intensity, Fig 2b).



Conclusion(s): Nk is acting on NMDAR and OR, showing analgesic potency. We measured dose-dependent acute antinociception effects for both drugs, with two-time lower potency for Nk vs K. In a chronic pain model, Nk was more efficient in alleviating allodynia and improving locomotor function.

14AP4-9

Morphine/ketamine PCA prevents neuropathic pain after pelvic trauma surgery

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Background and Goal of Study: Pelvic trauma followed by reconstructive surgery is associated with a high incidence of nerve damage and pain. The NMDA antagonist ketamine is not only effective in managing the symptoms of neuropathic pain [1] but is also morphine sparing in the first 24 hours after surgery [2]. We report on the use of patient controlled analgesia (PCA) morphine combined with ketamine for this patient group.
Materials and Methods: We followed 132 in-patients who underwent reconstructive surgery for pelvic fractures; 59 received PCA morphine-plus-ketamine, both drugs 1mg/ml (1ml bolus; 5 minute lockout) for postoperative pain relief (Treatment group; TG), 73 historically matched patients received PCA morphine alone, same prescription (Control group; CG). Record was kept of patients' demographic details, length of time and total morphine dose using PCA, effectiveness of pain control, side effects and number of Acute Pain Team contacts. The incidence, character and treatment of persistent post-PCA pain as well as overall patient experience was also recorded.
Results and Discussion: Demographic details were similar in both groups. No statistically significant differences were observed between TG and CG with respect to duration and total morphine dose using PCA, effectiveness of pain control and patient experience, even when age or sex were investigated as confounders. Pruritus was commoner in CG 8% (6/73) compared with TG 3% (2/59) but the difference was not significant. Persistent post-PCA pain whilst in hospital was reported by 19% (14/73) patients in CG and was classified as neuropathic in 64% (9/14) of these patients, whilst 7% (4/59) patients in TG reported persistent post-PCA pain, none of whom were classified as having neuropathic pain. These differences did not achieve statistical significance.
Conclusion(s): PCA morphine-plus-ketamine provided comparable analgesia to PCA morphine alone following reconstructive surgery for pelvic trauma without any increase in side effects. There was a trend towards a reduced in-hospital incidence of persistent postoperative neuropathic pain following PCA morphine-plus-ketamine but longer term follow up is needed.

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1 Schmid R. Use and efficacy of low-dose ketamine in the management of acute postoperative pain: a review of current techniques and outcomes Pain 1999; 82: 111-125.
2 Bell RF, Dahl JB, Moore RA, Kalso E. Peri-operative ketamine for acute post-operative pain: a quantitative and qualitative systematic review (Cochrane review). Acta Anaesthesiologica Scandinavica 2005; 49: 1405-1428.

14AP4-10

Effects of intravenous clonidine on postoperative analgesia, sedation, and haemodynamic in morbidly obese patients undergoing laparoscopic gastric by-pass

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Background and Goal of Study: Intravenous clonidine (CLO) reduces postoperative opiate consumption in nonobese patients.1 It also results in postoperative sedation and hypotension. Whereas sparing opiate is welcome in morbidly obese patients, sedation is best avoided to reduce the risk of hypopnae or apnae.2 We therefore investigated the effects of the intraoperative administration of iv CLO on postoperative analgesia, sedation, and haemodynamic in morbidly obese patients undergoiong laparoscopic gastric by-pass.
Materials and Methods: After IRB approval and informed consent 34 morbidly obese patients scheduled for laparoscopic gastric by-pass were included in this study. Anaesthesia (propofol and remifentanil TCI) was standardized in all patients. At the induction of anaesthesia patients were randomly allocated in two groups: CLO 6 µg/kg IBW over one h or Saline. Postoperative analgesia consisted of parecoxib 40 mg and paracetamol 2 g one h before the end of surgery. After surgery patients were given iv paracetamol 1g/6H and piritramid (a synthetic opiate) PCA. Postoperative pain scores (100 mm VAS) at rest, during mobilisation and coughing were recorded 0, 1, 2, 3, 4, 6h after surgery, and on day 1 at 8:00, 13:00, and 18:00. Parietal, visceral, and shoulder pain scores were assessed at the same time points. Piritramid consumption was recorded. Sedation scores (modified Aldrete and Ramsay scales) and blood pressure were also measured. Data were analyzed using ANOVA; P≤0.05 = statistically significant.
Results and Discussion: Pain scores at rest, during mobilisation and coughing were significantly smaller in the CLO group during the first two postoperative h (P<0.01). Parietal and visceral pain scores, as well as piritramid consumption were also less in the CLO group during the same period (P<0.01), but shoulder pain was not affected by CLO. Ramsay scores were greater in the CLO group at the arrival in the recovery room; sedation was thereafter similar in the two groups. Finally postoperative haemodynamic was not significantly different between the two groups.
Conclusion(s): Intraoperative iv CLO (6µg/kg IBW) significantly improves early postoperative analgesia without affecting postoperative sedation and haemodynamic. The reported intraoperative benefits3 and these postoperative effects make CLO an attractive adjunct of anaesthesia in morbidly obese patients.

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3 Wallace A Curr Opinion Anaesthesiol 2006,19:411-17.

14AP5-1

Pregabalin versus ketorolac in two postoperative multimodal analgetic regimen for carpal tunnel syndrome surgery. Which is the best?

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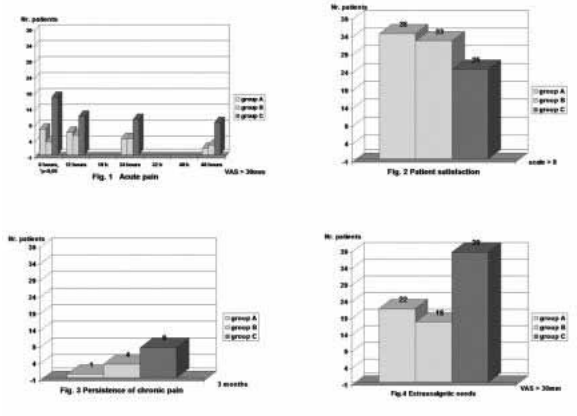
Background and Goal of Study: Primary aim: to assess the efficacy of 2 drugs – pregabalin and ketoprofen – in a similar multimodal analgetic regimen, against a placebo-control group. Secondary objectives: extraanalgetic needs, persistence of chronic pain 3 months after surgery, and patient satisfaction.
Materials and Methods: 117 ASA I or II patients, scheduled for carpal tunnel syndrome surgery were enroled in this prospective, randomized, placebo-controlled study. All patients received i.v. plus local anesthesia intraoperatively and were divided into three groups: Group A: 150mg pregabalin per os before surgery and 150 mg twice a day starting two hours after surgery, for 48 hours. Group B: 10mg ketorolac before surgery and 10 mg each 8 hours postoperatively for 48 hours. Group C: placebo pill before surgery and a pill each 8 hours postoperatively. All 3 groups received in addition the same paracetamol regimen: 2g i.v. 30 minutes before surgery and 1g each 8 hours postoperatively for 48 hours. Pain score was recorded for up to 48 hours: VAS > 30 mm = moderate/severe pain indicator and patients received 100mg i.v. tramadol as rescue therapy. We recorded patients' satisfaction (0 to 10 scale) and the persistence of chronic pain 3 months after surgery. A Mann-Whitney U-test was performed for signifficant differences (p<0,05).



Results and Discussion: a. Pain score: Significant difference between groups A and B only in the first 6 hours postoperatively (*p<0,05) Significant difference between the two groups vs placebo concerning pain score (p<0,05). b. Patient satisfaction (scale 0 to 10) c. Persistence of chronic pain 3 months after surgery d. Extraanalgetic needs.

Table 1.Analgetic requirements for the first 48h

Drug intervals	Group A	Group B	Group C
1 - 6 h	8	4	18
7 - 12 h	7	6	12
13 - 24h	5	5	11
25 - 48h	2	3	10
Total patients	22	18	51

Conclusion(s): In addition to improving analgesia and patient comfort multimodal regimen may prevent the development of chronic pain after carpal tunnel syndrome surgery by stopping central hemoplastic changes determined by injury. Pregabalin remains an interesting, still to explore drug in pain therapy.

14AP5-2

Preemptive analgesia with pregabalin to postoperative pain management after spine surgery for decompression and stabilization

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Background and Goal of Study: Despite the enormous success of pain control after spine surgery for decompression and stabilization, an intense pain can develop postoperatively and is both distressing and difficult to treat once established (1). The use of parenteral opioids has been the mainstay of analgesia for patients undergoing spinal surgery; nevertheless their use is associated with side-effects. Pregabalin seems to be effective on postoperative pain (2). We hypothezed that perioperative treatment with pregabalin could reduce the incidence of postoperative pain after spinal surgery.

Materials and Methods: A randomized, double-blind, parallel-group, placebo-controlled trial was performed in 30 patients (45-85 yr), ASA I-II, undergoing elective decompressive spine surgery. Patients received either oral pregabalin (150 mg) or placebo, 1 hour before surgery. Anesthesia was inducted with propofol and cisatracurium and was maintained with remifentanyl and sevoflurane. During the postoperative period a continuous infusion of 2 ml/h with morphine 0.4 mg/ml and ketorolac tromethamine 1.2 mg/ml, was administered and intravenous morphine (2 mg) was used as rescue therapy. PONV prophylaxis was made using dexamethasone 8 mg and ondansetron 4 mg every 12 h. Patients were questioned for the first 1 h in the PACU and were later evaluated in the ward at 2,4,6,12, and 24 h. Pain (using a visual analogue scale, VAS) oxygen saturation, nausea, vomiting, sedation, gastrointestinal ileus, morphine use were recorded. Data were analysed using Student's t test.

Results and Discussion: During the first twelve hours control, VAS scores were significantly lower in the pregabalin group when compared with the placebo group. The morphine consumption in the pregabalin group was 1±1.5 mg, whereas in the placebo group, it was 7±2.6 mg (p<0.01). Postoperative nausea and vomiting, respiratory depression were similar between groups while the incidence of gastrointestinal ileus was higher in the placebo group. No significant differences between two groups were observed with regard to sedation.

Conclusion(s): Perioperative pregabalin administration seems to reduce the incidence of acute postoperative pain after spine surgery for decompression and stabilization with less opioids consumption while decreasing some morphine-associated side-effects.

References:

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14AP5-4

Epidural ketamine has significant sparing effect on post operative opioid consumption – A randomised controlled study

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Background and Goal of Study: This study compared the effects of morphine versus combination of morphine and ketamine through epidural route. It also aimed to find out the optimum dose of epidural ketamine to achieve maximum morphine sparing effect post operatively.

Materials and Methods: It is a prospective double blinded controlled study from a teaching hospital. After ethical approval, we randomised 60 patients who underwent abdominal surgery into 4 groups of 15 patients each. 30minutes prior to the incision, each patients received either morphine alone (Group1) or with varying doses of preservative free ketamine (Group 2 -0.25mg/kg, Group 3- 0.5mg/kg, Group 4- 0.75mg/kg body weight.) through a lumbar epidural catheter. Patients also received intravenous morphine (0.1mg/kg body weight) during induction. Intraoperative haemodynamic parameters, post operative PCA (Brawn) morphine consumption, alertness and patient comfort were recorded at fixed intervals. Pain was scored using Visual Analog Scale (VAS). Potential side effects such as nausea and vomiting, sedation, hallucination or respiratory depression were documented. Statistical analysis (ANOVA) was performed using SPSS (version 10).

Results and Discussion: The demographic data were comparable. No significant difference was observed between groups with respect to intraoperative haemodynamics. The duration of intraoperative analgesia following epidural and intravenous morphine was significantly more in group 4 compared to group 1(120+ 58.65 Vs 186+ 97.16*). Total morphine requirement during initial 24 hours was lower in group 3 and 4 compared to group1 [34.60+9.840 Vs 23.40+8.927*, 20.25+9.010**]. VAS scores with cough and movement were significantly lower at 24 hours with group 3*. Sedation was more prominent in group 4 compared to others. 42.9% of patients in group 4 had mild sedation at 24 hours. A previous study used epidural Bupivacaine, morphine and ketamine for upper abdominal surgery and found that it provided pre- emptive analgesia [1]. Ketamine in a dose of 0.5mg.kgwt provided optimal analgesia as well as lower morphine consumption. A clinically significant opioid sparing effect has noted with ketamine in doses of 0.5mg. kgwt and 0.75mg.kgwt.post operatively. (* = p<0.05, **= p <0.001)

Conclusion(s): Combination of epidural morphine and ketamine can provide adequate analgesia for patients under going upper abdominal procedures. There is significant morphine sparing effect with doses ranging 0.5mg/kgwt and 0.75mg.kgwt.of ketamine.

14AP5-5

Addition of ketamine to morphine PCA in patients suffering severe postoperative pain: Effect of a preoperative intake of opioids

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Background and Goal of Study: Efficient postoperative pain management can be difficult, specifically for patients taking preoperative opioids (1). Ketamine (K) helps to control severe pain and displays opioids sparing effect (2). The study evaluated the benefit of adding K to morphine PCA in patients suffering severe postoperative pain, taking into account a preoperative intake of strong opioids (OP) or not.

Materials and Methods: Patients with severe postoperative pain (VAS score > 6/10 at rest and/or with movement) not relieved by PCA morphine and common analgesics (NSAIDs and paracetamol) during the first 24h after surgery were included. K was added to morphine (ratio morphine : K = 1 :2.5) in PCA device, keeping same setting (bolus 1mg morphine, interval 5 min, maximal dose allowed for morphine = 30 mg/4h). Pain scores at rest and with movement, morphine consumption (mg/kg) were recorded at 4h, 24h and 48h after K addition. For data analysis, patients were separated in two groups: preoperative intake of strong opioids (group OP) or not (Controls, group C). Statistical analysis used Mann-Whitney and one way repeated measure ANOVA with posthoc test, P value < 0.05 was significant (*).

Results and Discussion: Age and sex ratio were similar. In group C (n=42) and group OP (n=28), 55% and100% of patients presented with preoperative pain, VAS score 4.5±1.7 and 6.1±1.0 (*) respectively. K addition allowed to control postoperative pain in both groups, with higher pain relief in C group. Opioid sparing effect did not differ between both groups. Incidence of adverse effects (mostly sedation) did not differ : 30% and 17% in C and OP groups.

% reduction in pain scores and morphine use (median, IQR)

		4h postK	24h postK	48h postK
% reduction pain at rest	C group	31 (17-46)	50 (28-70)	57 (33-70)
	OP group	25 (16-38)	33 (23-50)	38 (28-48)
% reduction pain at movement	C group	20 (11-30)	31 (16-44)	38 (25-54)
	OP group	20 (4-29)	20 (13-32)	20 (11-36)*
% morphine sparing effect	C group	---	39 (6-57)	64 (30-78)
	OP group	---	31 (20-56)	59 (34-72)

* P<0.05 between C and OP groups

Conclusion(s): The data show that at the doses used, K addition to morphine PCA (ratio 2.5:1) improved postoperative pain management in patients with

severe pain (3) and induced similar opioid sparing effect in opioid dependent and opioid naïve patients.

References:
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3 Cepeda et al. Pain 2003; 105: 151-7.

14AP5-6

Epidural vs. subcutaneous application of s-ketamine for postoperative pain management after total knee replacement

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Background and Goal of Study: Several studies showed an improvement of postoperative analgesia with epidural s-ketamine compared to i.v. s-ketamine [1,2]. The aim of this prospective randomized, double blinded and placebo-controlled study was to investigate the mechanism of action of epidurally administered s-ketamine.

Materials and Methods: After approval by the local ethics committee and informed written consent, 75 patients (ASA I-III) undergoing total knee replacement were enrolled in the study and randomized to one of three groups (epidural group E, subcutaneous group S, placebo group P). After application of an epidural catheter general anaesthesia (fentanyl 2 µg/kg, propofol 2 mg/kg, atracurium 0,5 mg/kg) was induced. Anaesthesia was maintained with remifentanil (0,25-0,5µg/kg/min) and desflurane (0,5 MAC). 20 min before the end of surgery, patients of the E-group received 0,5 mg/kg s-ketamine epidurally and 5 ml NaCl 0,9% s.c. The S-group received 0,5 mg/kg s-ketamine s.c. and 5 ml NaCl 0,9% epidurally. Patients of the P-group received 5 ml NaCl 0,9% s.c and epidurally. All patients were treated with an i.v.- piritramide patient controlled analgesia. Hemodynamics, blood gas analyses and piritramide consumption were recorded over 24 hours postoperatively. Side effects of used medication were documented. VAS-score was recorded every 4 hours at rest and under movement. S-ketamine plasma-concentrations were measured at 30 min 1 h, 6 h, 12 h und 24 h after injection. Data are presented as mean ± SEM.

Results and Discussion: Demographic data were comparable between the groups. There were no differences in hemodynamic parameters, bloodgas analyses and side effects. VAS scores for pain at rest and with movement were comparable in all groups. Cumulative piritramide consumption was significantly lower in the E-and S-groups compared with the P-group 24 hours postoperatively. There was no difference between the E-and the S-group (E:0,50 ± 0,04 mg/kg, S:0,51 ± 0,05 mg/kg, P: 0,66 ± 0,04 mg/kg, p<0,05). Plasma concentrations for s-ketamine were comparable in the E-and S-groups.

Conclusion(s): Our data show a comparable analgesic effect of s-ketamine independent of the route of application in patients undergoing knee-arthroplasty. The analysis of plasma concentrations of s-ketamine suggests a systemic mechanism of action for both, epidural and subcutaneous application. Therefore, a regional effect of s-ketamine on the spinal cord seems to be unlikely.

References:
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2 Martinsdale SJ, et al. Br J Anaesth 2004; 92:344-7.

14AP5-7

The efficacy of epidural versus spinal postoperative analgesia after remifentanil-based anesthesia for colorectal surgery

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Background and Goal of Study: The transition from remifentanil intraoperative anesthesia to postoperative analgesia must be planned carefully due to the short duration of action (3-10 min) of remifentanil hydrochloride, a potent, esterase-metabolized mu-opioid agonist. 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 anesthesia.

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 anesthesia. General anesthesia used remifentanil as the perioperative opioid (1 microg/kg as a bolus then, 0.5 microg/kg as a continuous infusion). In the post anesthesia care unit, pain scores for patients were evaluated by using behavioral pain scores of 1-3, verbal pain scores of 0-3, and visual analog 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.

Results and Discussion: 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 behavioral pain score, the verbal pain score and visual analog scale pain score were lower 30 min, 3, 12 and 24 hours after the operation. Extubation time was similar in both groups. 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): Perioperative administration of morphine applied intrathecally does not provide entirely adequate immediate postoperative pain control after remifentanil-based anesthesia in major surgery. 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 anesthesia than with the spinal and general anesthesia.

14AP5-8

Preoperative oral pregabain vs placebo in laparoscopic cholecystectomy

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Background and Goal of Study: Pregabalin, was shown to be effective in neuropathic pain and postoperative pain although.[1] We aimed to investigate effects of pregabalin in a dose dependent manner and placebo controlled in acute postoperative pain therapy and side effects.

Materials and Methods: With institutional approval and written, informed consent, 90 ASA physical status I-II patients (age 21 between 80 yr) scheduled for elective laparoscopic cholecystectomy were enrolled and randomly divided into three groups. Patients were excluded if they had cooperation inability, psychiatric disorders, severe systemic disorders. Patients were randomly allocated to receive one of the three study drug; placebo (Group I), 150 mg pregabalin (Group II) or 300 mg pregabalin (Group III) orally, 1 hour before surgery. VAS, Aldrete, Ramsay scores and total fentanyl consumption, nausea and vomiting incidences were recorded just arrival at the PACU, and 15,30, 60, 120th mins, 3, 4 and 6th hours of PACU stay by a blinded anesthesiologist. Whenever the patients experienced severe pain (VAS> 60mm) they received 50 mcg i.v. fentanyl as rescue therapy and recorded.

Table

Measuremen Time	Group I	Group II	Group III
PACU arrival	3,9±1,7	2,3±1,5a	1,9±1,4b
15th min	2,9±1,3	2,0±1,0	1,3±0,9b
30th min	2,5±1,3	1,7±1,1	0,9±0,9b,c
60th min	1,8±1,0	1,2±1,1	0,5±0,6b,c
120th min	1,0±0,8	0,7±0,8	0,3±0,7b
3th h	0,5±0,6	0,3±0,4	0,1±0,3
4th h	0,1±0,3	0,0±0,0	0,0±0,2
6th h	0,0±0,2	0,0±0,0	0,0±0,0

a statistically significant difference between Group I and II (p<0.001) b statistically significant difference between Group I and III (p<0.001) c statistically significant difference between Group II and III (p<0.001)

Results and Discussion: Pain scores, rescue opioid consumption, nausea and vomiting incidances were significantly lower in pregabalin 300 mg group. Pain scores were shown in table.[

Conclusion(s): Preoperative oral pregabalin improved pain therapy in the early postoperative period and decreased fentanyl consumption, nausea and vomiting incidences in laparoscopic cholecystectomy patients.

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14AP5-9

Efficacy and safety of pregabalin in the treatment of postoperative pain following total knee arthroplasty

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Background and Goal of Study: Pharmacologic control of voltage-gated calcium channels by the $\alpha_2\delta$ subunit may have benefit in the management of postoperative pain. This study was designed to evaluate the efficacy and safety of pregabalin, a new $\alpha_2\delta\delta$ ligand, in the treatment of postoperative pain in patients undergoing primary total knee arthroplasty.

Materials and Methods: This was a randomized, double-blind, placebo-controlled study of men and women 18 to 80 years of age with osteoarthritis

undergoing primary total knee arthroplasty. The design consisted of a screening/baseline phase (1-2 weeks prior to surgery), 2 pre-surgery doses (12 hours and 2 hours, pregabalin 75 mg, pregabalin 150 mg or placebo), 2 to 6 week postoperative dosing period [pregabalin 150 mg/day (n=98); 300 mg/day (n= 96); or placebo (n= 98), each administered by twice daily dosing], taper phase, and follow-up at months 3 and 6. The primary endpoint was mean worst pain score on the Modified Brief Pain Inventory-Short Form 48 hours post-surgery. Cumulative total amount of opioids, pain interference with functional activities, long-term neuropathic pain symptoms, and adverse events were assessed. An analysis of variance model and Cochran-Mantel-Haenszel test were used to analyze efficacy endpoints. Descriptive statistics summarized the safety analysis.

Results and Discussion: Although the worst pain scores for both pregabalin treatment arms did not differ significantly from placebo at 48 hours, pregabalin 150 mg/day was associated with lower cumulative dose of opioids at 48 hours post-surgery (p=0.0224) and lower pain interference scores with general activity at discharge. Passive range of movement was significantly better with pregabalin 300 mg at 24, 96, and 120 hours (p values: 0.0154, 0.0080 and 0.0038, respectively). The incidence of persistent pain at month 3 and 6 was not significantly different with pregabalin or placebo treatment. The most common adverse events in both pregabalin treatment arms were nausea, somnolence, constipation, and dizziness. Nausea and vomiting were more common in the placebo group (nausea: 150 mg, 29.59%; 300 mg, 32.29%; placebo, 52.4%; vomiting: 150 mg, 14.3%; 300 mg, 15.62%; placebo, 25.51%).

Conclusion(s): Although the administration of pregabalin did not reduce worst pain scores at 48 hours, pregabalin reduced overall opioid consumption at 48 hours and nausea and vomiting, and seems to have a role in functional activities. Therefore, additional studies are required to establish the potential perioperative benefit of pregabalin in orthopedics.

14AP6-1

Effects of intrathecal bolus administration of morphine on postoperative hyperalgesia in rats

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Background and Goal of Study: Intrathecal morphine is well known to have antinociceptive effects on thermal and inflammatory nociception. However, its effects on postoperative hyperalgesia are not so much studied. This study was performed to know the effects of intrathecal bolus morphine on postoperative hyperalgesia in rats.

Materials and Methods: After the approval of the institutional review board, male Sprague-Dawley rats were implanted with lumbar intrathecal catheters. One week later, rats were anesthetized with halothane. A 1 cm longitudinal incision was made through skin and fascia of the plantar aspect of the foot, starting 0.5 cm from the proximal edge of the heel. The plantaris muscle was elevated. The skin was apposed with 2 mattress sutures of 5-0 nylon. After suture, saline (control), morphine 1, 3, or 10 µg in 10 µl saline was administered intrathecally. Before surgery and 2, 24, 48, 72, 96, 120, 144, and 168 hours after surgery, withdrawal response to von Frey filament application, and thermal withdrawal response to light beam were tested on both paws.

Results and Discussion: Von Frey filament withdrawal weighting and thermal paw withdrawal latency decreased in the operated paw, but did not change in the non-operated paw. Intrathecal morphine increased Von Frey filament withdrawal weighting in both operated and non-operated paw, but not statistically significant. Thermal withdrawal latency was significantly longer with morphine 10 µg than with saline at 2 hours in the non-operated paw, and at 120 and 144 hours in the operated paw.

Conclusion(s): In a post-surgical pain model of rat, intrathecal bolus morphine significantly decreased long-term thermal hyperalgesia, but did not have significant effects on mechanical hyperalgesia.

14AP6-3

A small-dose naloxone infusion reduces nausea and sedation without affecting analgesia by intravenous tramadol

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Background and Goal of Study: An early study showed that a naloxone infusion decreased the incidence of morphine-related side effects from intravenous patient-controlled analgesia. The authors aimed to determine whether naloxone preserved analgesia while minimizing side effects caused by intravenous tramadol.

Materials and Methods: Eighty patients undergoing general anesthesia for cervical vertebrae operation were randomly assigned to four groups. All received 1mg/kg tramadol bolus before the end of surgery, followed by a continuous infusion containing 800 mg tramadol with either no naloxone (Group 1, n=20), or 0.05 ug/(kg.h) naloxone (Group 2, n=20), 0.1ug/(kg.h) naloxone (Group 3, n=20) and 0.2 ug/(kg.h) naloxone (Group 4, n=20). A 0- to 10-mm Visual analog scales (VAS) for pain during rest and coughing, nausea five-point scale(NFPS)for nause and vomiting,and RSS(ramsay sedation score)for sedatin were measured. Scores were assessed at 2, 6, 12, 24 and 48 h postoperatively. Analgesia and side effects were evaluated by blinded observers.

Results and Discussion: Seventy-eight patients completed the study.The intravenous tramadol provided good analgesia. There was less nausea in the high-dose naloxone group ($P < 0.05$).Either resting or coughing VAS were no different in any dose of the naloxone groups compared with that of the control group. Sedation was less in both of the higher dose naloxone groups ($P < 0.05$ at 6, 12, and 24 hours). Tried groups reported less nausea at 6,12,24 and 48 hours than did control group ($P < 0.05$ or $P < 0.01$).The incidence of vomiting in the control group was 35% vs 10% for high dose naloxone group ($P < 0.05$).

Conclusion(s): Adding naloxone to tramadol can significantly reduce side effects without affecting tramadol-induced analgesia, give good patient comfort for postoperative pain management after cervical vertebrae surgery. So based on our results, we believe that when initiating tramadol intravenous administration for moderate to severe postoperative pain, clinicians should strongly think adding a small-dose naloxone infusion.

14AP6-5

Intrathecal diamorphine as an addition to routine multi-modal analgesic management of thoracic surgical patients: An audit using matched historical controls

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Background and Goal of Study: Intrathecal (IT) morphine with non-neuroaxial block appears to be at least as effective as thoracic epidural analgesia and avoids potential complications [1]. We introduced IT diamorphine, theoretically superior to morphine, [2] and audited its efficacy as an addition to our standard multimodal regimen (morphine patient controlled analgesia (PCA), local anaesthetic blocks, and oral analgesics).

Materials and Methods: 167 thoracic surgical patients who had lumbar IT diamorphine (300mcg via 25g needle) as part of analgesic management were matched with 167 patients 'controls' according to age, sex and type of operation. All were visited daily by our Acute Pain Team who noted demographic data, pain score (0, no pain, 4, pain at rest), total PCA dose, duration of PCA and adverse events. After matching, the patient groups were subdivided into those who underwent open thoracotomy and those who received video-assisted thoracoscopic (VATS) procedures. Fisher exact and Mann-Whitney were the statistical tests.

Results and Discussion: IT diamorphine improved efficacy of analgesia in terms of mean [SD] time (hrs) needing PCA (33.8 [19.6] vs 39.4 [20.2], p=0.005) and the proportion of patients needing PCA for > 24 hrs (22.8% vs 35.9%, p=0.011). Patients who had VATS procedures and received IT diamorphine needed a lesser mean cumulative dose of PCA morphine (48.7 [58.1] vs 64.6 [77.9] p=0.029), a shorter mean total time (hrs) needing PCA (30.2 [18.7] vs 38.2 [21.8], p=0.008) and fewer required PCA for > 24 hrs (27.2% vs 41.8%, p=0.040). There was no respiratory depression. Individual adverse events (pruritis, hallucinations, nightmares, headache, hypotension, urinary retention) were not significantly more common in either group, but when combined achieved significance (p = 0.037) in those who had IT diamorphine.

Conclusion(s): The addition of IT diamorphine to a multimodal analgesic regimen for thoracic surgical patients is effective and associated with a low rate of minor analgesic-related complications.

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14AP6-6

Intrathecal morphine analgesia after cervical and thoracic spinal cord tumor surgery – An observational pilot study

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Background and Goal of Study: Surgical resection of intramedullary spinal cord tumors often requires multilevel laminectomy. Postoperative intravenous

opioid analgesia, even patient controlled analgesia may achieve insufficient pain control. Intrathecally administered morphine provides effective pain control. Frequently it is injected at lumbar levels. To our knowledge it has not been used at thoracic or cervical injection sites. After intradural surgery, morphine could be injected locally at the end of dural closure. We postulated that this route of morphine administration would improve pain control. Since all patients remain in the intensive care unit postoperatively this new pain treatment would be safe and it's effects well documented. The aim of the study was: -to improve pain after cervical and thoracic spinal cord surgery -to demonstrate the safety of thoracic and cervical intradural application of morphine.

Materials and Methods: Nine consecutive patients undergoing resection of intramedullary spinal cord tumors were studied. Informed consent was obtained and the study was approved by the institutional review board. Patients underwent surgery in total intravenous anesthesia with propofol, remifentanil and ketamine. Immediately before finishing the dural closure 7µg/kg BW morphine was given via a microsurgically prepositioned intrathecal catheter which was withdrawn for the final dural suture. All patients were extubated in the operating room and transferred to the ICU. Basic analgesia with acetaminophen and metamizol was given. Intravenous morphine was added as needed. Tropisetron was given for PONV prophylaxis.Visual analog scale (VAS), blood pressure, respiratory rate(RR), oxygen saturation(SaO2), amount of additional iv morphine given, side effects were noted at 1,2,4,6,8,10,12,16,20,24,48,72h postsurgery.

Results and Discussion: Six patients (7-75 years, mean 41y) received cervical injection (C3-C7), 3 at thoracic levels (Th2-Th12). Mean VAS was highest upon arrival at the ICU (2 of 10), mean value was 1. Mean dose of iv morphine was 0.29 mg. Mean RR was 16. RR. 8/min without changes in SaO2 was recorded in 1 patient for 8h. Four other patients had their RR drop below 10 at least once. After 12h all patients had RR>10/min. Nausea /vomiting was observed in one patient, pruritus in one patient on day 1.

Conclusion(s): Morphine can be given intrathecally at cervical and thoracic levels after intramedullary surgery. It provides excellent analgesia with few side effects. Administration is save if patients are observed at an intensive care unit.

14AP6-7

A randomized phase I trial evaluating the anti-hyperalgesic and analgesic effects of 50%-50% N_2O-O_2

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Background and Goal of Study: Perioperative pain is a major issue in clinical practice. Opioids remain unsurpassed analgesics to relieve pain. However, it has been shown that opioids increase postoperative pain and hypersensitivity by an activation of the NMDA-receptors [1]. Animal studies reported that N2O is able to prevent hypersensitivity developed by perioperative doses of opioids [2]. This trial was designed to evaluate the effect of N2O on hypersensitivity induced by both, nociceptive inputs and remifentanil, in healthy volunteers.

Materials and Methods: After IRB approval, 21 healthy volunteers were randomized in this blind, placebo-controlled, cross-over study. Transcutaneous electrical stimulation [3] at high current intensities (63.5 ± 20.8 mA) were applied to induce spontaneous acute pain intensity around 60 mm (on 100 mm VAS). The current intensity was kept constant for 160 minutes. Pain intensities as well as the extent of the hyperalgesic and allodynic area were assessed during the application of the different medications. Inhaled gas mixtures (placebo or tested drug) started at T20 and lasted for 60 minutes, Intravenous administration of remifentanil or placebo started at T50 and lasted for 30 minutes. Each volunteer underwent the following four sessions at random: Placebo group: 50%-50% N2-O2 and i.v. isotonic saline; Remifentanil group: 50%-50% N2-O2 and i.v. remifentanil at 0.1 µg/kg/min; Nitrous Oxide group 50%-50% N2O-O2 and i.v. isotonic saline solution; Nitrous Oxide + Remifentanil group: 50%-50% N2O-O2 and i.v. remifentanil at 0.1 µg/kg/min.

Results and Discussion: The hyperalgesia in Remifentanil group was observed from T110. There were significant time and treatment effects observed on the four groups regarding areas of hyperalgesia and allodynia ($p<0.02$) during the post-treatment period. Mean area of hyperalgesia was significantly reduced in the N2O + Remifentanil group versus the Remifentanil group (35.88 ± 22.37 vs. 43.55 ± 18.48 cm2, $p=0.004$). Mean of pain intensity was significantly reduced in the N2O + Remifentanil group versus the Remifentanil group (37.96 ± 12.78 vs. 42.15 ± 13.34 mm, $p<0.0001$).

Conclusion(s): N2O significantly reduced the hyperalgesia, the allodynia and the pain intensity developed after Remifentanil administration. N2O could have the ability to reduce the postoperative pain hypersensitivity and therefore be a key anesthetic drug.

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14AP6-8

Genotypes of *ABCB1* transporter can predict morphine induced respiratory depression in children undergoing tonsillectomy

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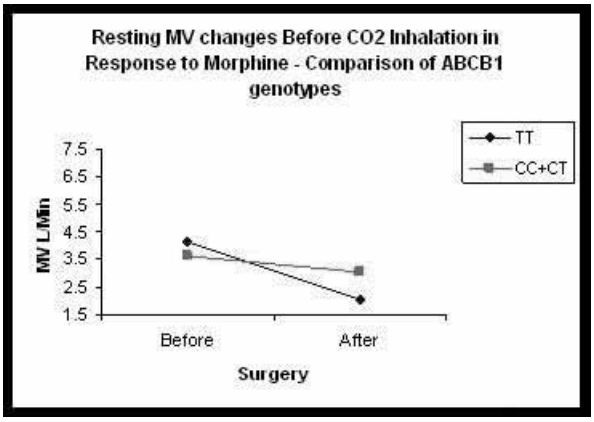
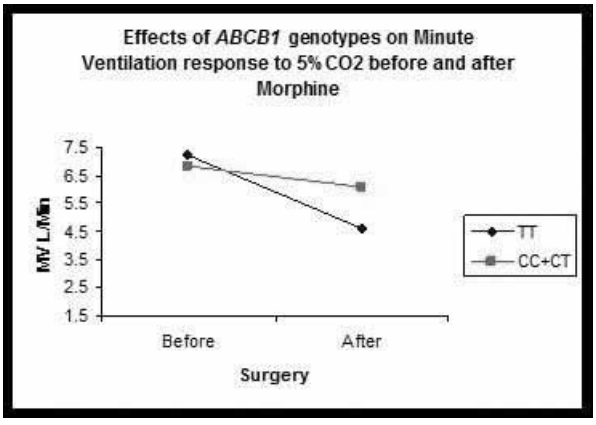
Background and Goal of Study: Morphine, the most commonly used perioperative opioid in children, has a narrow therapeutic index and high interindividual variability in analgesic and adverse effects, of which respiratory depression is a life threatening one. This study aims to evaluate the effects of genotypes of *ABCB1 blood-brain barrier transporter* on morphine induced respiratory depression.

Materials and Methods: After institutional IRB approval and informed consent, we enrolled 108 children aged 6-15 years, ASA 1-2, undergoing tonsillectomies. Clinical respiratory depression was defined as respiratory rate < 10/minute and/or oxygen saturation <92% on room air. In addition, respiratory response (changes in minute ventilation, etc) to inspired 5% Carbon-Dioxide (CO_2) was obtained at baseline and after morphine/tonsillectomy. Investigators were blinded to the different genotypes of *ABCB1* SNP, rs1045642 when CO_2-respiratory response and respiratory depression data were obtained. Statistical analyses were done using SAS, version 9.1 (SAS Institute Inc., Cary, NC) and $p < 0.05$ was considered significant.

Results and Discussion: The incidence of clinical respiratory depression in children with *ABCB1* TT genotype was more (21%) than those with CC and CT genotypes (12%). Resting minute ventilation (MV) obtained before 5% CO2 challenge decreased significantly after morphine in TT genotype compared to CC and CT genotypes. There was a significant decline in minute ventilation response to 5% CO2 after morphine in TT genotype compared to CC and CT genotypes (p=0.0316).





Conclusion(s): *ABCB1* TT genotype significantly increases the risk of morphine induced respiratory depression in children compared to other genotypes. This strong genotype-outcome association is an important step in personalizing the use of morphine to maximize pain relief while minimizing the likelihood of serious adverse effects in children.

14AP6-9

Analgesic andantihyperalgesic properties of single doses of oral morphine in a human pain model

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Background and Goal of Study: Current discussions on opioids focus on dose adjustment as well as on a reasonable choice of analgesics meeting the therapeutic requirements of different pain states. The distinct property of reducing symptoms of sensitisation contributes to the choice of pharmacological treatment. This study examined the analgesic and antihyperalgesic properties of three different doses of oral morphine with major attention to the antihyperalgesic potency of morphine in general and the efficiency of dose escalation.
Materials and Methods: After approval of the local ethics committee, 20 healthy male volunteers (age: 38.6 ± 1.6 ys) undergoing 4 sessions in a randomized cross-over design were enrolled in this double-blind and placebo-controlled study. Transcutaneous electrical stimulation induced spontaneous acute pain (NRS = 6 of 10) and stable areas of hyperalgesia for painful mechanical stimuli (pinprick-hyperalgesia). Pain intensities as well as the areas of hyperalgesia were determined over 180 min at regular intervals before and after a single oral dose of either morphine (15 mg, 30 mg or 60 mg) or placebo. The effect was assessed as percentage reduction compared to baseline. Statistical analysis (RM-ANOVA, Tukey test) was performed on the maximum and on the integral (AUC) of the effect.
Results and Discussion: For pain rating, the maximum effects as well as the AUCs were significantly larger for each morphine dose as compared to placebo, whereas there were no significant differences between the three morphine doses (table 1). For the hyperalgesic areas, there was no significant impact of any oral dose of morphine compared to placebo, neither for the maximum effect nor for the AUC of the effect (table 1).

	placebo	morphine 15 mg	morphine 30 mg	morphine 60 mg
Pain max. reduction (%)	-45.4±4.3	-58.8±4.5 *	-62.1±4.5 *	-65.0±4.5 *
Pain AUC (% min)	-5253±555	-6798±609*	-7159±692*	-7506±710 *
Hyperalgesia max. reduction (%)	-21.7±5.6	-22.0±4.7	-27.8±3.4	-26.7±4.9
Hyperalgesia AUC (% min)	725±825	45±744	-506±586	336±754

Table 1: Results (mean±SE) for placebo versus 15 mg, 30 mg or 60 mg of oral morphine. *significant differences versus placebo group ($p < 0.01$)

Conclusion(s): Our results provide data of possibly limited applicability of oral morphine in pain states associated with symptoms of sensitisation. Morphine showed significant reduction of pain compared to placebo without a clear dose dependency. On the contrary, antihyperalgesic properties of morphine were not different from placebo.

14AP6-10

Age-related dosage regime for intrathecal morphine as an analgetic adjunct in primary hip and knee arthroplasty

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Background and Goal of Study: Intrathecal diamorphine was frequently used in our institution as part of a multimodal approach to providing post-operative analgesia. Due to a shortage of the drug in the UK, intrathecal morphine was introduced. However, the lesser lipid solubility makes late respiratory depression particularly hazardous, but there are other well recognized side-effects associated with the use of opioids [1]. This prospective audit in patients scheduled to undergo resurfacing hip (RsHR), total hip (THR), and total knee replacement (TKR) was conducted in order to monitor side-effects and increase patient safety.
Materials and Methods: Inclusion criteria, peri-operative care as well as data collection followed established protocols. Preservative-free morphine was added to 0.5% heavy bupivacain applying the suggested age-related dosage regime. This was based on available evidence [2] and a pilot study: Age: <70y = 250 mcg; 70–74y = 200 mcg; 75–79y = 150 mcg; 80y = 100 mcg. Femoral nerve blockade with 20 ml of 0.25% L-bupivacaine was carried out in TKR-patients. Statistical analysis was performed with Minitab Version 15 for Windows.
Results and Discussion: 108 ASA 1-3 patients were included (RsHR=18, THR=23 and TKR=67) with age<70=70; 70-74=12; 75-79=14; 80=12. The mean PCA-morphine consumption (mg) in the first 24 hours post-spinal anaesthesia were (SD, minimum, median, maximum) for RsHR=14.67 (12.49, 0.00, 14.50, 36.00); for THR=11.48 (13.73, 0.00, 7.00, 52.00); and for TKR=6.37 (9.12, 0.00, 2.00, 40.00). This proved to be significantly different between the three procedures (P=0.008) and significantly higher only in the RsHR-group as compared to the TKR-group (P=0.014). However, there was no difference in the mean amount of morphine used in each age group (P=0.059). There were no serious side-effects documented.
Conclusion(s): Intrathecal morphine can be recommended as part of a multimodal analgesia approach in the first 24 hours following hip and knee arthroplasty. Applying the suggested age-related dosage regime, high patient satisfaction was achieved with little complementary use of PCA-morphine.
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Acknowledgements: I am very grateful indeed to K. Yathish for his help, the APS- and ward 5 orthopaedic nurses for their support, and staff statistician D. Young for his analysis.

14AP6-11

Intraoperative magnesium sulphate does not suppress remifentanyl-induced acute opioids tolerance and hyperalgesia in surgical patients

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Background and Goal of Study: It is known that intraoperative remifentanil (RF), 0.4mcg/kg/min produces acute tolerance and/or hyperalgesia (1). Although the mechanisms involved are controversial, the activation of N-metyl-D-asparate (NMDA) receptor might play a role. We investigated whether intraoperative administration of NMDA antagonist, magnesium sulphate ($MgSO_4$), could suppress the development of tolerance and/or hyperalgesia in surgical patients.
Materials and Methods: After approval of institutional Ethical Committee, informed consent was obtained from each patient. Thirty-nine adult patients undergoing an elective wrist arthrodesis surgery were randomly assigned to one of three groups. Group A (n=13) received high-dose RF, 0.8mcg/kg/min, and normal saline. Group B (n=13) received low-dose RF, 0.1mcg/kg/min, and $MgSO_4$. Group C (n=13) received high-dose RF, 0.8mcg/kg/min, and $MgSO_4$. $MgSO_4$, 50 mg/kg, was given intravenous bolus injection before starting surgery followed by infusion at 20mg/kg/min until the end of surgery. Anesthesia was maintained with TIVA (using propofol TCI). Propofol concentration was titrated to maintain Bispectral index score at approximately 50. All patients received fentanyl, 4 mcg/kg, at the end of surgery. Postoperative analgesia was provided with intravenous fentanyl PCA and intrarectal diclofenac sodium (DF), 50mg. The pain was evaluated by a numerical rating scale (NRS) at 0, 1, 2, 4, 6, 12, 18, and 24 hrs after surgery. Statistical significance ($P<0.05$) was determined using Kruskal Wallis test and Fisher's exact test.
Results and Discussion: In groups A and C, NRS was significantly higher than that in group B at 0hr (4.7±3.9 in group A and 4.1±3.0 in group C vs. 1.1±2.2 in group B $p<0.05$) and 1hr (7.0±3.1 in group A and 6.9±3.6 in group C vs. 4.0±2.9 in group B, $p<0.05$). There were no significant differences in postoperative fentanyl consumption among three groups, while the using number of times of DF per patient in groups A and C significantly more than that in group B (0.8±1.0 in group A and 0.6±0.6 in group C vs. 0.1±0.3 in group B).
Conclusion(s): The results suggest that acute tolerance and hyperalgesia might be produced by high dose RF, and that intraoperative $MgSO_4$ does not show the suppressive effect on RF-induced acute tolerance and/or hyperalgesia in patients undergoing wrist arthrodesis surgery.
References:
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14AP7-2

The analgesic efficacy of tramadol is reduced by co-administration of ondansetron for antiemetic propose

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Background and Goal of Study: Tramadol is a central acting analgesic that blocks the reuptake and enhances the release of serotonin at spinal antinociceptive pathways. Ondansetron, an antagonist at serotonin 5-HT_3 receptors that mediates vomiting, is often co-used for the management of postoperative pain to decrease postoperative nausea and vomiting. We hypothetise that this drug combination raises tramadol requirement by patient-controlled analgesia (PCA).
Materials and Methods: With ethics committee approval, written informed consent, 40 patients, undergoing hernioplasty or thyroidectomy under general anesthesia, were enrolled in a double-blinded, controlled, prospective study. The patients were randomly allocated to receive ondansetron 4 mg i.v (group O) or saline (group C) at the beginning of wound closure. At 0, 1, 2, 4 and 24

hours of PCA, tramadol consumption, pain, nausea, vomiting, sedation and shivering were evaluated. Overall satisfaction with analgesia was rated at 24 hours. Statistical analysis was performed using the Mann-Whitney U-test, the significance level set at P <0.05 and data presented as mean±SEM.

Results and Discussion: Groups presented similar characteristics: At 2 hours of PCA, tramadol demand ($mg.kg^{-1}.h^{-1}$) was 41% greater in group O than in group C (0.24±0.02 vs 0.17±0.04, P=0.01). Additionally, cumulative tramadol consumption was larger in group O than in group C ($mg.kg^{-1}$; 0.6±0.07 vs 0.37±0.05, P=0.019) at this time-point. There were not differences in tramadol consumption in other observation periods, which is not surprising due to ondansetron terminal half-life of about 3 hours. Pain scores were never > 6 (0-10 numerical rating scale). The low incidence of nausea and vomiting, 10% in each group, as well as other end-points evaluated were not significantly different. The ondansetron-weakening of tramadol analgesic efficacy could be due to a competitive antagonism at spinal $5\text{-}HT_3$ receptors.

Table 1. Demographic and anesthetic-surgical data

	Ondansetron (n=20)	Control (n=20)
Sex (M/F)	8/12	10/10
Age (yr)	53±4	59±2
Weight (Kg)	70±4	73±3
ASA physical status (I/II/III)	6/12/2	2/16/2
Surgery duration (min)	68±8	80±9
Hernioplasty	10	11
Thyroidectomy	10	9

Data are presented as mean±SEM or number of patients.

Conclusion(s): Our study strongly suggests that ondansetron's administration for antiemetic prophylaxis raises tramadol's consumption by PCA, thus decreasing its analgesic power, beyond being clinically unnecessary. This is also an economical disadvantage in our clinical practice.

14AP7-3

Low-dose intrathecal morphine for postoperative analgesia after adolescent idiopathic scoliosis surgery

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Background and Goal of Study: Adolescent idiopathic scoliosis surgery is associated with high postoperative pain scores. This study was designed to assess the efficacy and safety profile of low-dose intrathecal morphine supplemented by continuous infusion of fentanyl for postoperative pain management after adolescent idiopathic scoliosis surgery.

Materials and Methods: This was a randomized, placebo-controlled, double-blind study. Thirty patients, 11–22 yr of age, scheduled for adolescent idiopathic scoliosis surgery, were randomly allocated into three groups to receive a single dose of 0 (saline injection, group A), 2ug/kg(group B), or 5ug/kg (group C) intrathecal morphine after general anesthesia induction. After surgery, additional pain relief was provided with continuous intravenous infusion of fentanyl (fentanyl, 0.4ug/kg/h)using the single-use continuous infusion device. All patients were assessed with respect to pain scores (visual analog scale of 0–10), and side effects included of nausea, vomiting, pruritus, respiratory depression and Ramasay scores.

Results and Discussion: Demographic data, duration of surgery, and total of fentanyl used were comparable between groups. Pain scores on postoperative of 0h,6h,12h,24h,48h were assessed as follows(group A: 2.1±2.2,2.5±1.6,2.9±1.1,2.7±1.1,2.8±1.1; group B: 2.1±1.4,3.0±0.9,2.8±0.9,3.0±1.5,2.4±1.3; group C:0.9±1.4,0.9±1.1,1.3±1.2,1.6±1.2,1.5±1.2). Pain scores were significantly lower over the whole study period after 5ug/kg intrathecal morphine than after saline and 2ug/kg, but there was no difference between 2ug/kg intrathecal morphine and saline. The incidence of side effects was comparable between groups except pruritus occurred in two patients of group C.

Conclusion(s): These data demonstrate that low-dose intrathecal morphine supplemented by continuous intravenous infusion of fentanyl seems to be safe and effective postoperative analgesia for adolescent idiopathic scoliosis surgery. The dose of 5ug/kg provides better analgesia than 2ug/kg intrathecal morphine and saline.

14AP7-4

Effect of endoplasmic reticulum chaperones on the development of morphine tolerance

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Background and Goal of Study: Opioids are potent analgesics that are widely used to control acute and chronic pain. Although repeated administration of opioids, particularly morphine, induces tolerance that reduces the effectiveness of the analgesic, the precise molecular mechanism for the development of tolerance remains uncertain. Opioids bind to the mu opioid receptor (MOR) to activate various signaling molecules, leading to a decrease in neuronal excitability. Chronic morphine tolerance may be derived from adaptations in the intracellular signal transduction of post-MOR activation. Proteins destined for secretory pathways are inserted into the endoplasmic reticulum (ER), where their folding or degradation intermediaries interact with molecular chaperones like binding immunoglobulin protein (BiP). Many physiological and pathological conditions, such as secretory demands, ischemia, and hypoxia can cause aberrant protein folding and the accumulation of misfolded proteins in the ER. These insults lead to ER stress and initiate the unfolded protein response to accommodate the protein overload. Recent studies have suggested that chronic ER stress might modulate intracellular signaling pathways, resulting in several chronic disorders such as type II diabetes. In this study, we examined whether ER chaperones may attenuate the MOR signaling pathway, which might cause the development of morphine tolerance.

Materials and Methods: BiP is central to ER function. We have previously produced knock-in mice expressing a mutant BiP with the retrieval sequence deleted in order to elucidate the physiological processes that are sensitive to BiP function in adulthood (1). We tested the thermal antinociceptive effect of morphine in heterozygous mutant BiP mice in a hot plate test. Then, we examined the effect of a chemical chaperone, which improves ER protein folding capacity, on morphine tolerance in wild-type mice.

Results and Discussion: Paw withdrawal latencies before and after a single administration of morphine were not significantly different between the wild-type and mutant BiP mice. Repeated morphine administration for 5 days caused the development of morphine tolerance in the wild-type mice. On the other hand, the mutant BiP mice showed less morphine tolerance. Furthermore, we found that a chemical chaperone also attenuated the development of morphine tolerance in wild-type mice.

Conclusion(s): These observations indicate that ER chaperones like BiP may play an important role in the development of morphine tolerance.

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14AP7-5

Magnesium sulphate alleviate remifentanil-induced postoperative hyperalgesia in scoliosis surgery

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Background and Goal of Study: To evaluate the effect of magnesium sulphate (a NMDA-recepter antagonist) on remifentanil-induced postoperative hyperalgesia in patients undergoing scoliosis surgery.

Materials and Methods: Seventy-five patients undergoing Scoliosis Surgery (ASA I ~ II, aged 10-25 years) were randomly assigned to three groups (n = 25) : Group S (intraoperative remifentanil at 0.05 $\mu g{\cdot}kg^{-1}{\cdot}min^{-1}$); Group R (intraoperative remifentanil at 0.4 $\mu g{\cdot}kg^{-1}{\cdot}min^{-1}$); Group M (intraoperative remifentanil at 0.4 $\mu g{\cdot}kg^{-1}{\cdot}min^{-1}$, accompany with induction dose of 40 $mg{\cdot}kg^{-1}$ magnesium sulphate, followed by an intraoperative infusion of 20 $mg{\cdot}kg^{-1}{\cdot}h^{-1}$ till the end of surgery). Patient controlled intravenous analgesia (PCA) was performed with fentanyl after operation. Cumulative injected volume of the PCA, pain scores, extubation time and side effects were recorded during 48 postoperative hours.

Results and Discussion: During 36h and 48h postoperative fentanyl consumption was less in Group S than that of Group R ($P < 0.05$). During 24h, 36h and 48h postoperative fentanyl consumption was less in Group M than that of Group R ($P < 0.01$). Extubation time was longer in Group S than that of Group R and Group M ($P < 0.05$). There were no significant differences in pain scores and side effects in the three groups.

Conclusion(s): Intraoperative infusion of remifentanil at 0.4 $\mu g{\cdot}kg^{-1}{\cdot}min^{-1}$ triggers postoperative secondary hyperalgesia. Perioperative magnesium sulphate supplementation could alleviate the hyperalgesia induced by remifentanil.

14AP7-6

Pretreatment of lithium chloride (Licl) alleviate remifentanil-induced hyperalgesia in rats model of incisional pain

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Background and Goal of Study: To bserve the effects of pretreatment administration of lithium chloride (Licl) on incisional pain and remifentanil-induced hyperalgesia in rats model.

Materials and Methods: Fourty-two male Sprague Dawley (SD) rats were randomly divided into seven groups (n=6): C group (control), I group (incisional pain), R group (remifentanil+ incisional pain), IL group (incisional pain+Licl), RL1 group (remifentanil+ incisional pain+low-dose Licl), RL 2 group (remifentanil+ incisional pain+medium-dose Licl), RL3 group (remifentanil+ incisional pain+high-dose Licl). IL group, RL1-3 groups were administered intraperitoneally Licl 0.4ml at ten minutes before anesthesia with sevoflurane, the concentration of Licl in IL group and RL1-3 groups were 36 mg/kg, 9 mg/kg, 18 mg/kg, 36 mg/kg respectively, while C group, I group and R group were administered intraperitoneally saline accordingly. R group and RL1-3 groups were pumped subcutaneously with remifentanil (40μg/kg) at the speed of 0.8ml/h at fifteen minutes after anesthesia with sevoflurane, while C group, I group and IL group were pumped subcutaneously with saline accordingly. All groups except C group needed to be made the model of incisional pain. At T_0 (24 hours before operation) and T_1 (6 hours after operation), T_2 (24 hours after operation), T_3 (48h after operation) respectively, Paw Withdrawal Thermal latency (PWTL) and Paw Mechanical Withdrawal Threshold (PMW) were detected on the rats' right hindpaw in all groups.
Results and Discussion: At T_1, T_2, T_3 compared with I group (7.70±0.67, 10.79±1.83, 10.97±1.87) the PMW of R group(3.72±0.71, 6.54±1.27, 7.27±1.53)were significantly lower (P<0.05); compared with I group (20.74±2.72, 16.56±1.38, 22.55±2.01), the PWTL of R group (11.81±2. 52,11.27±2.30, 12.30±2.21) were significantly shorter (P<0.05). Compared with I group, the PMW of IL group at T1,T2,T3 (12.08±3.20,14.31±1.70,14. 95±0.13) were higher (P<0.05);compared with I group, the PWTL of IL group at T2 (23.17±2.43)were also significantly longer (P<0.05). Comparing IL group with RL3 group, the values of PMW and PWTL were all no significant differences at each time (P>0.05). Compared among the RL groups, both the PMW and PWTL were no significant differences at each time (P>0.05).
Conclusion(s): In rats model of incisional pain, remifentanil could induce hyperalgesia on the area of adjacent to the incision; lithium chloride could decrease the pain threshold of incision and prevent the remifentanil-induced hyperalgesia

14AP7-7

Preanesthetic administration of dexmedetomidine alleviate remifentanil-induced hyperalgesia in rats model of incision pain

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Background and Goal of Study: Background [/bold]Although remifentanil is a superior analgesic, numerous experimental and clinical studies suggest that remifentanil activates N-methyl-D-aspartate (NMDA) pronociceptive systems inducing hyperalgesia on withdrawal. Because some studies found dexmedetomidine(DEX)could selectively depress the NMDA receptor-mediated excitatory postsynaptic potential, the authors used a incisional pain model in rats to determine the hyperalgesic effects of the remifentanil alone or in combination with dexmedetomidine.
Materials and Methods: During sevoflurane anesthesia, a hind paw plantar incision was performed in rats receiving remifentanil subcutaneous injections (40μg/kg,30min). In some groups, subcutaneous dexmedetomidine injections (12.5μg/kg, 25μg/kg or 50μg/kg) were performed in saline- or remifentanil -treated rats at 10 min before anesthesia. Paw withdrawal Thermal latency (PWTL) and Paw Mechanical Withdrawal Threshold (PMW) were assessed using the Thermal plantar test and the von Frey application test at T0 (24 hours before surgery), T1 (6 hours after surgery), T2 (24 hours after surgery) and T3 (48 hours after surgery) respectively.
Results and Discussion: Remifentanil produced exaggerated postoperative pain as indicated by the enhancement of thermal hyperalgesia and mechanical hyperalgesia after hind paw plantar incision in 48 hours after surgery. With 25μg/kg or 50μg/kg dexmedetomidine doses pretreatment prevented remifentanil-induced enhancement of thermal pain in 24 hours after surgery and mechanical pain in 48 hours after surgery. However, with 12.5μg/kg dexmedetomidine doses pretreatment only prevented remifentanil-induced enhancement of mechanical pain in 48 hours after surgery.
Conclusion(s): In rats model of incisional pain, Remifentanil could induce hyperalgesia on the area of adjacent to the incision; Dexmedetomidine could prevent the remifentanil-induced hyperalgesia in a dose- and time-dependent manner.

14AP7-8

A double blind randomised study of intranasal fentanyl versus placebo in patients undergoing removal of drains after mamma surgery

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Background and Goal of Study: Usually, acetaminophen or NSAID's are prescribed to reduce pain after mamma surgery. Pain during removal of drains is however not treated. Intranasally administered fentanyl is suitable in short painful procedures and may be an effective pain control during removal of drains. The aim of this study was to evaluate the analgesic effect and pharmacokinetic profile of intranasally administered fentanyl after removing drains in comparison with intranasally administered placebo, and to develop a better dosage regimen if necessary.
Materials and Methods: Thirty-six patients were randomized in two groups. The first group received one nose spray of 0.05 mg/0.1 ml fentanyl, whereas the second group received one nose spray of 0.1 ml placebo, 10 minutes before removing drains. Pain intensity was measured by a visual analogue scale (VAS 0-100), before administration of the study drugs, at the moment of removing the drains, and 5, 10, 15, 30, and 60 minutes after removing the drains. Venous blood samples were drawn at baseline, and 5, 10, 15, 30, 60 and 120 minutes after administration of the study medication for pharmacokinetic analysis. A population pharmacokinetic model was developed to predict which dosage of intranasal fenatnyl should be administered to reach a therapeutic blood level.
Results and Discussion: Mean VAS scores at baseline were 6.0 for the placebo group and 14.8 for the fentanyl group. At the moment of removing drains, VAS scores were 33.8 and 31.0 respectively. Random effect model analysis showed a significant difference between both groups (p=0.006), when also including baseline VAS-scores and time as covariates to the model. Pharmacokinetic data showed that the maximal mean fitted concentration of 0.184 ng/ml was reached at 13.76 minutes after administration of intranasal fentanyl with $t_{1/2}$ of 66 minutes. According to the population pharmacokinetic model, 0.1 mg fentanyl should be administered to reach a therapeutic plasma level.
Conclusion(s): IN fentanyl is found suitable for using in short painful procedures, although estimated plasma levels were rather low. In future, a higher dosage of IN fentanyl should be administered to reach a more effective result.

14AP7-9

Comparative randomized study on the analgesic efficacy and side effects of iv PCA morphine versus a continuous infusion of a multimodal combination for cardiac surgery

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Background and Goal of Study: Morphine after cardiac surgery lacks of efficacy for pain at movement and has side effects. Goal: to compare efficacy, side effects and postoperative persistent pain of iv PCA morphine and iv continuous infusion of low doses of a multimodal combination.
Materials and Methods: Randomized double blinded study on patients submitted to cardiac surgery. Analgesic doses were calculated according to weight and age. All patients received 5-10 mg iv morphine 30 minutes before the end of surgery, wounds infiltration with bupivacaine and paracetamol iv 1g/8h. Group Morphine: iv PCA (low doses infusion+bolus) and Group Multimodal: continuous infusion of ketamine 2mg, tramadol 4.8mg, dexketoprofen 4.8mg, methadone 0.4mg as average hourly doses with mock bolus. Variables were recorded at 24 and 48 postoperative hours. Between 3 and 6 months after surgery a telephone interview recorded persistent pain. Student T, x^2 and Wilcoxon test were applied.

RESULTS

VARIABLE	Group Morphine N=43	Group Mulltimodal N=42	P
VAS 24h at rest	2.3± 2.8	1.4± 1.7	0.28
VAS 24h at mov.	5.3± 2.8	3.3 ± 2.2	0.01*
VAS 48h at rest	1.4±1.9	1.1±1.6	0.67
VAS 48h at mov.	4.7± 2.6	3.7± 2.5	0.07
Bolus demanded 24h	14.7± 27.1	5.6±4.8	0.15
Bolus adminis.24h	5.3±4.3	3.6± 3	0.05
Bolus demanded 48h	13.1± 18.5	8± 10.3	0.05
Bolus adminis.48h	6.5± 5.6	5.4± 6.6	0.14
Severe pain episodes 24h	23 (53.5%)	11 (26.2 %)	0.002*
Severe pain episodes 48h	21 (48%)	14 (33.3%)	0.18
Ramsay 24h	2.2 ±0.4	2.2 ±0.5	0.53
Ramsay 48h	2.2 ±0.5	2.3 ±0.6	0.57
PNV 24h	16 (37%	21 (50%)	0.28
PNV 48h	8 (18%)	11 (26%)	0.44
Intest.activity 24h	16 (37%)	14 (33%)	0.75
Intest.activity 48h	36 (83%)	37 (88%)	0.82
Analgesia quality Good-very good	33 (76.7%	40 (95.2%)	0.026*
Postop VAS	3.7 ± 1.2	4.1± 1.7	0.26
Postop NPS	14.3± 8.8	18 ± 9.9	0.18

Nr patients (%); x±SD;* statistical differences;VAS= Visual Analogic Scale 1-10; NPS=Neuropathic Pain Signs score

Results and Discussion: 136 patients were included but only 85 completed the study. Results are in the Table 1. Group Multimodal showed significantly lower VAS at movement, less severe pain episodes and better opinion by the patients; demanded bolus trended to be lower. Persistent pain of low intensity was present in almost 30% of patients.
Conclusion(s): Efficacy of the Multimodal regimen was slightly superior to morphine with similar side effects.
Acknowledgements: Drs. Fita, Roux, Basora.

14AP7-10

Influence of opioid selection and dosage on postoperative pain and morphine consumption after cardiac surgery

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Background and Goal of Study: In animal models, the selection of remifentanil for analgesia may contribute to postoperative pain [1]. In patients increased postoperative pain may increase the incidence of chronic postoperative pain [2]. The relevance of opioid selection and opioid dosing as well as opioid-induced hyperalgesia for surgical patients is less well understood [3]. Therefore we studied patients after sternotomy for coronary artery bypass graft (CABG) surgery to evaluate the effect of two different intraoperative concentrations of remifentanil and sufentanil on postoperative pain and postoperative opioid consumption.
Materials and Methods: 56 male patients (age: 59±8 yrs) without renal insufficiency, neurologic disease or diabetes undergoing first time CABG surgery were randomized to receive a total intravenous anesthesia with propofol and a target-controlled infusion with either remifentanil 4 ng ml^{-1} (group RL) or 8 ng ml^{-1}(group RH) plasma concentration, or with sufentanil 0.4 ng ml^{-1} (group SL) or 0.8 ng ml^{-1} (group SH) plasma concentration. Targets were kept constant from skin incision to skin suture. Postoperative morphine requirement in the first 48 h was assessed using PCA. Pain rating (NRS: 0-10) at rest and under movement, and area of hyperalgesia around the sternotomy wound were monitored. The effect of treatment was analyzed by ANOVA.
Results and Discussion: The analgesic treatment significantly influenced postoperative pain at day 1, and also the postoperative morphine consumption (table 1). Morphine requirement was lowest in group SL (p=0.006 compared to RL, p=0.06 compared to SH, Tukey test). Areas of hyperalgesia were not different between groups.

Table 1: Morphine requirement (mean±SD) and pain rating (median and range)

	RL (n=16)	RH (n=14)	SL (n=14)	SH (n=12)	p
Morphine (µg $kg^{-1}min^{-1}$)	0.47±0.16	0.38±0.12	0.30±0.09	0.43±0.13	0.008
NRS rest, day 1	3 (0 - 6)	2 (0 - 6)	0 (0 - 3)	2 (0 - 4)	0.032
NRS movement, day 1	4 (0 - 6)	4 (0 - 8)	2 (0 - 8)	4 (0 - 8)	0.037

Conclusion(s): Intraoperative opioid selection and dosing significantly influenced postoperative morphine consumption and pain. Based on our results during cardiac surgery a low sufentanil concentration of 0.40 ng ml-1 (0.5 – 0.7 µg kg^{-1} h^{-1}) may be preferred.

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14AP8-1

Prevalence of pain in an Italian university hospital

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Background and Goal of Study: To estimate the prevalence of pain in patients admitted to the University Hospital of Ferrara, to quantify the burden of suffering, the intensity for area type, gender and the analgesic therapy received. To compare the prevalence of pain between the years 2002-2004-2007.
Materials and Methods: In the spring of 2002, 2004 and 2007 trained workers documented the presence and degree of pain for all patients admitted to hospital for at least 24 hours. The degree and intensity of pain was assessed using a numerical rating scale and administered analgesic therapy was recorded.
Results and Discussion: The prevalence of the pain, over 24 hours, in the 2007 and 2004 was 42% versus 36% on 2002. The prevalence of severe pain was independent of gender and area type in the 2002 and 2004 (16% in females versus 12% in males: Odds Ratios = 1.3, 95% Confidence Interval: 0.5-2.9; Surgery 11.4%, General medicine 16.8%, Odds Ratios = 1.6, 95% Confidence Interval: 0.6-3.6). In the 2007 we noted a greater prevalence of severe pain in Oncology (26%, Odds Ratios = 0.3, 95% Confidence Interval: 0.1-0.9) and it becomes indipendent of age. Pain affects quality life and is associated with longer stay and increased use of hospital resource. Nevertheless it doesn't receive enough attention from the sanitary personnel. This determines high level of prevalence as shown by national and international studies. The international project toward a pain free hospital, introducing laws and Guidelines, have been adopted from the Hospital of Ferrara where investigations of pain prevalence has started. Therapy has been administered in 70 % of the patients, versus 28.5% of the Italian investigation. The more used analgesics were the non-steroidal anti-inflammatory drugs; the use of the opioids was higher from 2004 to 2007. In the 2004, the greatest part of the patients have been treated as needed. In the 2007, the professional education produced a greater administration at fixed schedule and in continuos.
Conclusion(s): An important quality indicator in health care is pain prevalence. Its measurement was useful for the University Hospital of Ferrara to plan, a quality system in the management of the symptom pain, that aims to satisfy the patient, as well as the monitoring and control of sanitary expenses, through professional education in pain measurement, the elaboration of analgesic therapeutic protocols, shared by different departments, and through auditing, results.

14AP8-2

The effect of mechanical ventilation tidal volume during pneumoperitoneum on shoulder pain after a laparoscopic appendectomy

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Background and Goal of Study: Pneumoperitoneum-induced diaphragmatic overstreching with phrenic nerve neuropraxia is known to cause postlaparoscopic shouler pain (PLSP) after laparoscopic surgery. Therefore, we speculated that during inspiration, the lung could squeeze out the phrenic nerve with CO_2 gas against the constantly pressurized abdominal cavity with increasing tidal volume (V_T). Thus, we examined whether mechanical ventilation with a low V_T (LTV, V_T 7 mL/kg) during a pneumoperitoneum might reduce PLSP in patients undergoing laparoscopic appendectomy when compared to ventilation with the traditional V_T (TTV, V_T 10 mL/kg).
Materials and Methods: In a prospective trial, 64 adult patients undergoing laparoscopic appendectomy were randomly assigned to two groups of 32 each (LTV and TTV groups). Intravenous ketorolac was used as a postoperative rescue analgesic. The 2, 4, 24, and 48- hour postoperative incidence and severity of PLSP, severity of surgical pain, and need for rescue analgesia were assessed.
Results and Discussion: The overall incidence of PLSP was similar in both groups (57.1% in the LTV group vs. 65.5% in the TTV group). Compared to the TTV group, the PLSP incidences and verbal rating scale (VRS), and cumulative ketorolac consumptions did not decrease in the LTV group throughout the study period.

Table 1. Shoulder pain reported in the postoperative period

Time after operation (h)	TTV group (n = 29)	LTV group (n = 28)	P-value
2	12 (41.4%)	6 (21.4%)	0.182
4	14 (48.3%)	11 (39.3%)	0.677
24	12 (41.4%)	13 (46.4%)	0.907
48	4 (13.8%)	9 (32.1%)	0.091
Overall incidence	19 (65.5%)	16 (57.1%)	0.706

Values are number (proportion). There were no significant differences between groups.
Table 2. Verbal rating scale (VRS) of postoperative shoulder pain and cumulative ketorolac consumptions in the TTV and LTV groups

VRS / Cumulative ketorolac consumption (mg)	TTV group (n = 29)	LTV group (n = 28)
2 h	3.2 ± 3.5 / 5.2 ± 11.5	2.2 ± 3.2 / 9.6 ± 18.3
4 h	2.9 ± 2.5 / 11.4 ± 18.7	3.4 ± 3.0 / 15.0 ± 19.1
24 h	2.1 ± 2.1 / 19.7 ± 28.1	3.6 ± 2.9 / 20.3 ± 20.1
48 h	0.3 ± 1.0 / 21.7 ± 33.0	0.9 ± 1.6 / 25.7 ± 24.1

Values are expressed as mean ± standard deviation; There were no significant differences between groups

Conclusion(s): Mechanical ventilation with a reduced 7 mL/kg V_T during a pneumoperitoneum does not reduce the frequency and severity of PLSP after laparoscopic appendectomy, when compared to ventilation with the traditional V_T (10 mL/kg).

14AP8-3

Prospective safety surveillance study of fentanyl HCl iontophoretic transdermal system (fentanyl ITS)

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Background and Goal of Study: The efficacy and safety of fentanyl HCl iontophoretic transdermal system (fentanyl ITS) was previously evaluated in seven controlled clinical studies. To obtain a more comprehensive understanding of its safety, this study examined fentanyl ITS use under conditions of routine postoperative care.
Materials and Methods: Patients with planned surgery who were candidates for treatment with fentanyl ITS or opioid IV PCA were recruited into this phase IV, multicenter, prospective safety surveillance study. The study was initiated March 2008 and terminated as of September 2008, when the product was recalled from the market.
Results and Discussion: Completed data were obtained for 197 patients in the fentanyl ITS group and 16 patients in the IV PCA group from 16 centers in Europe (Netherlands, Austria, Germany, and Finland). Mean age was 55 years (range: 19-85) and 59% were women. The majority of patients had orthopaedic procedures (53%); the remainder had lower abdominal and other nonorthopaedic procedures. The majority of patients (79%) in the fentanyl ITS group used 1 system (mean=1.3 system (SD:0.57). The most common opioid used in the IV PCA was piritramide (75%), followed by morphine (25%). The most common (³3%) reported adverse events, which all were mild and temporary, were application-site erythema (8%), application site vesicles (7%), nausea (9%), and vomiting (5%) in the fentanyl ITS group; and nausea (6%), vomiting (6%), and dizziness (6%) in the IV PCA group. No serious adverse events occurred.
Conclusion(s): Fentanyl ITS used in a routine postoperative setting was generally well tolerated with a favorable safety profile.
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14AP8-4

Analgesic technique for primary colon cancer surgery doesn't affect cancer recurrence

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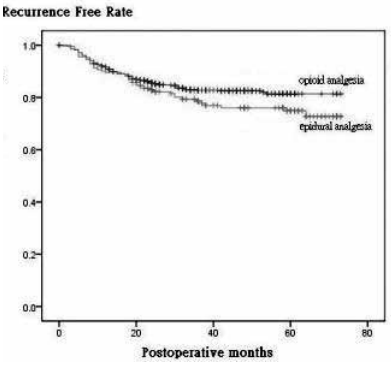
Background and Goal of Study: It is reported that regional anesthesia and analgesia attenuate or prevent perioperative factors that favor minimal residual disease after removal of the primary carcinoma. Retrospective studies in humans suggest that regional anesthesia and analgesia may reduce recurrence risk after surgery for breast and prostate cancer. Therefore, the authors evaluated colon cancer recurrence in patients who received general anesthesia with either postoperative opioid analgesia or epidural analgesia.
Materials and Methods: In a retrospective review of medical records, patients with invasive colon cancer who underwent primary colon surgery between May 2001 and December 2006 were evaluated through January 2009. The main outcome measure was the incidence of metastatic spread or cancer recurrence.
Results and Discussion: All 1113 patients received general anesthesia with inhalation anesthetic agent. 931 patients received postoperative opioid analgesia, and 182 patients received epidural analgesia. There were no significant differences in patients or surgical details, tumor presentation, or prognostic factors. Metastatic spread or cancer recurrence was observed in 155/931 opioid analgesia patients and 42/182 epidural analgesia patients. Mean recurrence- and metastasis-free survival for the study as a whole was 61.926 months (95% confidence interval, 60.501–63.352 months). The hazard ratio for metastatic spread or cancer recurrence in the epidural analgesia group compared with the opioid analgesia group was 1.326 (95% confidence intervals 0.940–1.871; P = 0.107 by log-rank test).



Kaplan - Meier survival curves for postoperative opioid analgesia and epidural analgesia groups

Conclusion(s): No difference was observed between the postoperative opioid analgesia and epidural analgesia groups in recurrence- and metastasis-free survival. There is a need for large randomized controlled trials to determine the ability of postoperative analgesic method to alter disease recurrence rates following primary colon cancer surgery.

14AP8-5

Peritoneal ropivacaine nebulization for pain control after gynaecologic laparoscopic surgery

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Background and Goal of Study: A novel approach to intraperitoneal local anesthetic (LA) administration, intraperitoneal LA nebulization, was described. This randomized double blinded, placebo-controlled trial was designed to evaluate the effects of intraperitoneal nebulization of ropivacaine on pain control after gynecologic laparoscopy surgery.
Materials and Methods: After IRB approval and written informed consent, 120 women, ASA I-III scheduled for elective gynecologic laparoscopic surgery were enrolled. Patients were randomized to receive either intraperitoneal nebulization of ropivacaine 30 mg before surgery (NEBU PRE Group); intraperitoneal nebulization of ropivacaine 30 mg after surgery (NEBU POST Group); intraperitoneal instillation of ropivacaine 100 mg before surgery (INSTILLATION Group) or intraperitoneal nebulization of saline 3 ml before and after surgery (CONTROL Group). Solutions were nebulized using the Aeroneb Pro® system (Aerogen, Galway, Ireland) through the 12-mm umbilical port. Analgesia was provided with port sites infiltration, IV paracetamol 15 mg/kg every 6 h and IV morphine PCA. Pain scores after coughing (NRSD 0 to 10 points), morphine consumption time to ambulation and PONV were collected in PACU, at 6h, and 24h. Data were analyzed using ANOVA or Mann-Whitney/Wilcoxon, chi-squared or Fisher exact tests, as appropriate. A p 0,05 was considered statistically significant.

TABLE 1

	CONTROL (n 30)	INSTILLATION (n 29)	NEBU-POST (n 29)	NEBU-PRE (n 30)
NRSD 6 hours	4,3 ± 2,1	3,6 ± 1,8	2,6 ± 1,7	2,1 ± 1,3
NRSD 24 hours	3,6 ± 1,9	2,8 ± 1,7	2,7 ± 2,3	1,7 ± 1,3
Cumulative morphine consumption (mg)	18 ± 9	17 ± 11	14 ± 10	11 ± 6
Walking time (h)	19 ± 6	21 ± 15	16 ± 5	17 ± 7

Data are mean and SD (±).

Results and Discussion: Two patients were excluded and 118 completed the study. Patients on CONTROL group presented significant higher NRSD values compared with those on NEBU-PRE, NEBU-POST and INSTILLATION groups (p < 0,01). Patients receiving nebulization consumed significant less morphine than those receiving instillation or placebo (p < 0,01). Patients on NEBU-PRE and NEBU-POST groups walked earlier compared with those receiving ropivacaine instillation or placebo (p 0,04). There were no significant differences on the incidence of PONV (p 0,33) or on hospital stay (p 0,62).
Conclusion(s): Intraperitoneal nebulization of ropivacaine produced adequate pain control, significant reduction on morphine consumption and significant reduction of on the time to unassisted walking after gynecologic laparoscopic surgery.

14AP8-6

Comparison of two different postoperative intravenous analgesia regimes on CRP changes following uncomplicated lumbotomy

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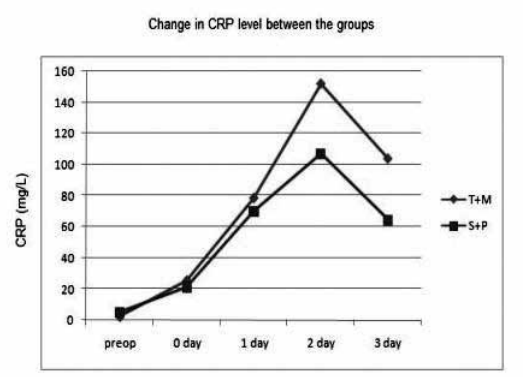
Background and Goal of Study: Lumbotomy with nephrectomy induces surgical stress which leads to systemic inflammatory response, with C-reactive protein (CRP) and fibrinogen as a non specific inflammatory marker changes. High doses of opiates alter the humoral and metabolic response to surgery and their combination with analgesic drugs with different pharmacological properties show better efficacy. We investigated the influence of two postoperative i.v. analgesia regimens on systemic inflammatory response in patients undergoing uncomplicated lumbotomy with nephrectomy.
Materials and Methods: We enrolled 32 patients, aged 42-70 yrs, ASA physical status I to II class, undergoing elective lumbectomy for nephrectomy. In all patients, general anesthesia was induced with intravenous midazolam, propofol, fentanil, vecuronium, and maintained with sevofluran, vecuronium, fentanil bolus in 35% O2-N2O. In postoperative period, patients were randomly divided into two groups to receive continuous intravenous analgesia. In group T+M (n=16) postoperative analgesia was achieved with mixture of tramadol and metamizol (600 mg tramadol + 5 gr metamizol in volume 50ml by continuous infusion in the range from 1-2 ml/h) and in group S+P (n = 16) with continuous i.v. infusion

of sufentanil (3ug/ml range from 3-5ml/h) with addition of i.v. paracetamol 1g q6h. Postoperative analgesia was provided until the end of postoperative day 3, and primary endpoint was VAS < 3. CRP, fibrinogen and leukocyte count were measured preoperatively and 8, 24, 48, 72 hours following the surgery. Dates were analyzed by Mann-Whitney's test, and are presented as mean ± SD.
Results and Discussion: CRP reached peak values in the second postoperative day following uncomplicated lumbotomy. There was a statistically significant difference in the value of CRP second (p=0.039) and third postoperative days (p=0.03) between the groups. There were no statistically significant differences in the values of fibrinogen and leukocytes among the groups in postoperative periods.



Conclusion(s): This pilot study shows that combination of sufentanil and paracetamol seems better to attenuate inflammatory response to lumbotomy by decreasing the CRP, as opposed to tramadol and metamizol.

14AP8-8

Postoperatory analgesia with subfascial catheter in patients undergoing abdominal hysterectomy

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Background and Goal of Study: To evaluate the analgesic efficacy and safety of continuous postoperative local anaesthetic wound instillation by subfascial catheter in patients undergoing total abdominal hysterectomy.
Materials and Methods: Prospective, observational, randomized, double-blind study of 28 patients undergoing abdominal hysterectomy under general anaesthesia. All patients gave written informed consent. Patients were randomized to three groups (A: bupivacaine 0.375% without adrenaline; B: physiological serum and C: levobupivacaine 0.375% without adrenaline. On completion of surgery, a subfascial bolus of 20ml of bupivacaine 0.375% was administered and a subfascial multiorifice catheter using an elastomeric pump (ONQ® PainBuster® I-Flow Corporation) at 5 ml/h for 48 hours. Intermittent intravenous metamizol 2gr/8h + paracetamol 1gr/8h was administered. Requirements for rescue analgesia (meperidine s.c. /6h), adverse effects, and the degree of patient satisfaction were recorded.
Results and Discussion: There were no significant differences in the three groups with respect to age, weight, height, length of surgery, length of surgical incision and intraoperative opioid dose. Consumption of meperidine on the ward was 20% in group A, 40% in group B and 40% in group C. Visual analogue pain scale (VAS) scores and the incidence of nausea were significantly lower in the groups receiving local anaesthetic wound instillation (A and C), compared with controls (group B). The patients evaluated the technique as good/very good, 7% as regular and 7% had a negative evaluation.
Conclusion(s): Ø This system of analgesia is efficacious, easy to administrate, and without complications or adverse events requiring the collaboration of the entire surgical team. Ø In the groups receiving anaesthetic wound instillation (A and C) there were lower VAS scores and a significant reduction in nausea in the first 48h postoperative hours. Ø Eighty per cent of patients receiving local anaesthetic instillation did not require opioids compared with 60% in the control group. Ø A total of 86% of patients evaluated the technique as good/very good. Ø There was no evidence of an increased risk of infection or local wound complications.
References**:**
1 The Analgesic Efficacy of Patient-Controlled Bupivacaine Wound Instillation after Total Abdominal Hysterectomy *Zohar et al. Anesth Analg 2001;93:482-7*
2 Evaluation of Continuous Infusion of 0,5% Bupivacaine by Elastomeric Pump for Postoperative Pain Management *LeBlanc et al. J Am Coll Surg. Vol.200, No. 2, Feb 2005*.

14AP8-9

Analgesics requirement and sub-Tenon injection for postoperativeacute pain controlling after posterior segment eye surgery

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Background and Goal of Study: Usually pain control after posterior segment eye surgery was by opioids and other analgesics. Sub-Tenon's infiltration is recognized as a safe regional anesthesia technique for anterior segment eye surgery and other ophthalmic procedures but as analgesic effect has not been assessed in post operative period. The aim of this study is to compare in a randomized double-blind study the analgesic requirement when bupivicaine was given by the sub-Tenon's route in posterior segment surgery.
Materials and Methods: The patients are shared in two groups (30 patients each). They were undergoing posterior segment surgery operated during the period 2007-2009 in the ophthalmologic clinic. General anesthesia was inducted with propofol (1-2 mg kg$^{[oline]1}$), sufentanyl and traceum and was maintained with sufentanyl and sevoflurane. One group received sub-Tenon's infiltration with bupivicaine 0.5% 3 ml by the surgeon before the end of surgery. In the controlled group only analgesics drug were used. A visual analogue scale (10-100) was used to assess pain. We calculated the median values of the visual analogue scale for each group and used the Mann-Witney U-test to compare groups. We studied the patients request for analgesics drugs throughout the operative period. We use Fischer's exact test to compare groups.
Results and Discussion: The mean duration (SD) age of the patients was 47 (16.3) year (male 23, female 7) in sub-Tenon group and 44 (14.7) yr (male 21, female 9). The mean duration of surgery was 100 (30) min in sub-Tenon's group and 90 (34) min on the controlling group. No complications were seen. We did not observe any ischemic optic neuropathy. From the recovery room unit 3.5 h after operation the pain score was lower in the sub-Tenon group (P=0,000001). In the control group the patients request analgesic drugs and some request morphine as their pain score was 70. In the 3-6 h period the pain score was significantly lower in the sub-Tenon group. In the 6-24 h period the difference was not significant. Consumption of ketoprofene and morphine was lower in the group receiving sub-Tenons infiltration (P=0,0009).
Conclusion(s): Sub-Tenon infiltration with bupivicaine 0.5%-3ml after excellent post operative analgesia for up to 6 h is more effective than other drugs.
References**:**
1 Calenda E. Evaluation of local anesth. drugs in ophthalmic procedures. Reg Anesth Pain Med 2001; 26:491.
2 Tokuda Y. Analegis effects of sub-Tenons versus retrobulbar anesth. in plannet extracapsular cat. surgery. Graefes Arch Clin Exp Ophtalmol 2000; 238:228-31S.

14AP8-10

Efficacy of post incisional wound infiltration with epidural analgesia after total abdominal hysterectomy

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Background and Goal of Study: Local anesthetic wound infiltration combined with other postoperative pain relief strategies can be a useful method after major surgeries. We determined to investigate randomized, prospective, double blind study if postincisional wound infiltration with levobupivacaine after total abdominal hysterectomy improved analgesia and reduced epidural analgesic requirements during the 24 hours after the operation.
Materials and Methods: Forty patients with ASA I–II, aged 35 – 65, scheduled for elective total abdominal hysterectomy under general anesthesia combined with epidural analgesia were prospectively studied. The patients were randomly assigned to two groups: Group EP (n:20) received only postoperative epidural analgesia with 1,25 mg/ml of 0.5%levobupivacaine and 2,5 µg/ml fentanyl; Group EPL (n:20) received 30 ml of 0.5%levobupivacaine wound infiltration on closure addicted to epidural analgesia. Postoperative analgesic requirements were measured using a patient controlled epidural analgesia device programmed at bolus 5 ml of 0.5%levobupivacaine plus 2.5 µg/ml of fentanyl per lock out 15 minutes and no background infusion. The primary end point of this study was to assess the analgesic efficacy of local anesthetic wound infiltration onto epidural analgesia, so total demand amounts and total epidural analgesic consumptions were recorded during 24 hours postoperatively, also postoperative pain was assessed 1., 4., 12., 24th hours using 10 cm visual analog pain scale (VAS) between two groups.
Results and Discussion: In Group EP, total demand amounts of epidural analgesics for 24 hours after surgery was significantly higher (p<0.001) than Group EPL (IQR EP:37 / IQR EPL:16.5). In Group EP total epidural analgesic consumption was significantly higher (p<0.0001) than Group EPL (IQR EP:81 / IQR

EPL:33). The visual analog pain scores at rest were significantly higher in Group EP than Group EPL (p<0.0001) for 1., 4., 12., 24.hours postoperatively.
Conclusion(s): In conclusion, infiltrating the incisional wound on closure with local anesthetic reduces both the epidural analgesic demand and consumption during 24 hours after surgery and provide additional analgesia.

14AP8-11

Procedure specific postoperative analgesia: Intravenous, epidural and femoral nerve analgesia after total hip arthroplasty – A comparison of three patient-controlled techniques in 447 patients

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Background and Goal of Study: Total hip artroplasty (THA) is associated with high-intensity pain in the immediate postoperative period and moderate- and low-intensity pain later in the postoperative period. The purpose of the study was to compare the effectiveness of three patient-controlled analgesia techniques in the postoperative period in patients undergoing primary total hip arthroplasty – patient-controlled intravenous, epidural and femoral nerve analgesia.
Materials and Methods: 447 patients undergoing primary total hip arthroplasty were prospectively followed by the Acute Pain Unit between May 2004 and July 2009. Pain scores at rest and on movement were recorded 24 and 48 hours postoperatively. Complications, side effects and patient satisfaction were also assessed.
Results and Discussion: 135 patients received in the postoperative period intravenous patient-controlled analgesia (PCA) with morfine, 217 epidural PCA and 95 femoral nerve PCA. Following pain scores (numeric rating scale) were observed: Following complications, adverse effects and patient satisfaction were observed:[table2]Patients with epidural and femoral nerve PCA had lower pain scores on movement 24 and 48 hours postoperatively and less nausea/vomiting and sedation than patients with intravenous PCA with morfine.

	Intravenous PCA	Epidural PCA	Femoral PCA
24 h at rest	0	0	0
24 h on movement	4	3* (p < 0,001)	3* (p < 0,03)
48 h at rest	0	0	0
48 h on movement	2.5	2* (p < 0,001)	2* (p < 0,03)

(the values represent median, * - statistically significant difference)

	Intravenous PCA	Epidural PCA	Femoral PCA
Insufficient analgesia	5,92 %	3,69 %	7,37 %
Nausea/vomiting	20,0 %	4,57 %*	9,47 %*
Sedation	6,67 %	0,91 %*	0,00 %*
Motor blockade	-	2,76 %	5,26 %
Confusion	0,74 %	0,46 %	1,05 %
Pruritus	1,72 %	3,69 %	1,05 %
Catheter problems	-	10,60 %	11,58 %
Satisfaction	87,93 %	91,28 %	90,24 %

(* - statistically significant difference, p < 0,02)

Conclusion(s): Both regional anaesthetic techniques provide comparable postoperative analgesia which is superior on movement and associated with less opioid-related adverse effects (nausea/vomiting, sedation) compared with intravenous PCA. Patient-controlled femoral nerve blockade provides effective analgesia after THA and is less likely to cause a severe neuraxial complication; therefore, the peripheral neural analgesia is the preferred technique.

14AP9-1

Review of post-operative analgesia in cardiac surgery patients in the intensive care unit

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Background and Goal of Study: For cardiothoracic patients recovering from surgery, optimal postoperative management should include adequate pain relief. It has been reported that these patients experience moderate to severe pain after surgery. The objective of our study was to investigate analgesic administration in post operative cardiac surgery patients in the coronary intensive care unit (CICU) and also to examine the pain scores reported by these patients and the documentation of these scores.
Materials and Methods: A sample of 50 patients admitted to the CICU following cardiac surgery during a three month period in 2009 were reviewed. Data were collected on demographic characteristics, opioids administered in the operating theatre, analgesics prescribed and administered in the CICU, pain assessment scores recorded, time to extubation and length of stay (LOS) in CICU.
Results and Discussion: All patients were prescribed and received a post-operative morphine infusion. The time of commencement varied. An infusion was commenced immediately on return from theatre for 24 (48%) patients. The mean start time was 2.12 hours after admission. Patients received an average of 1.75mg/hr of morphine in the first 24 hours after admission to the ICU. No relationship existed for time to first dose (r = 0.08) or amount of morphine administered on Day 1 (r =–0.05). Pain scores were recorded in the majority of patients (3 patients did not have any pain scores recorded) however the frequency of recording varied widely from hourly in a minority of patients to 2-3 times in 24hrs in others In general pain scores reported by the patients were low – usually 0-1, with a mean of 1.36 (SD1.3) and a range of 0-6. The most commonly recorded pain score was 1.
Conclusion(s): We found that data regarding use of morphine in the first 24 hours to agree with published data internationally. The recording of pain scores is performed however it is not noted to be at rest or with movement and it should be more complete as a number of patients had scores recorded only 3-4 times in a 24 hr period. Paracetamol is prescribed regularly and in the majority of patients administered regularly as per WHO guidelines.
References:

1 Meehan DA, McRae ME, Rourke DA, Eisenring C, Imperial FA. Analgesic administration, pain intensity, and patient satisfaction in cardiac surgical patients. Am J Crit Care 1995; 4: 435-42.
2 Review of analgesia use in the intensive care unit after heart surgery. Coventry LL, Siffleet JM, Williams AM. Crit Care Resusc. 2006 Jun;8(2):135-40.

14AP9-2

"A pain free hospital". Pain prevalence in an Italian teaching hospital

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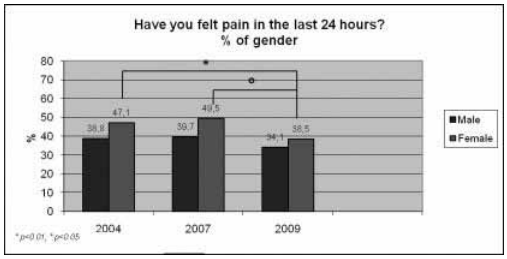
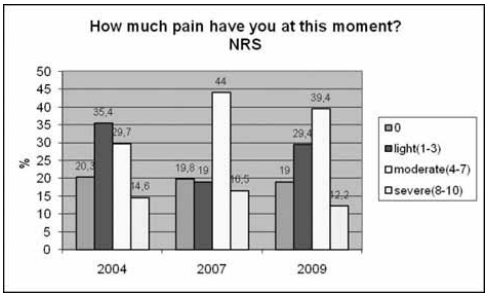
Background and Goal of Study: Prevalence of pain in the hospitals is relevant, despite the advance in available treatments. This study has evaluated its prevalence, intensity and gender distribution in a teaching hospital in 2009. These data have been compared with same collected in 2004 and 2007. Pain Free Hospital Committee (PFHC) sustained this study to improve the quality of pain evaluation and treatment.
Materials and Methods: On May 29, 2009 a one day prevalence survey about pain was made in hospitalized patients. A PHFC questionnaire was given to all subjects. The following data were recorded: demographic data, DH (Day Hospital) or not DH regimen of recovery, prevalence of pain and NRS value in the last 24 hours.
Results and Discussion: Data were collected from 808 patients: 91 DH, 657 non DH and 60 non responder. All were older than 6 years. 36.2% of patients had pain in the last 24 hours, significantly less than in 2007(p<0.01; χ:8.61) and 2004(p<0.05; χ:4.49). 38.5 % of women and 34.1 % of men complained of pain in the last 24 hours. The prevalence in women in 2009 has been lower than in 2007(p<0.01; χ:7.4) and 2004(p<0.05; χ: 4.07). The moderate(NRS4-7) and severe(8-10) pain has lowered, with an increase of light(1-3) pain.





Conclusion(s): We found a reduction of pain prevalence in hospitalized patients, at the day of survey. Although the female patients still complain of more pain than men, there is a significant decrement along the three surveys. The moderate-severe pain prevalence is also lowered. The improvement in staff education about pain screening and management might have been important for these results.

References:

1 Coucerio TC, Valenca MM, Lima LC, et al. Prevalence and influence of gender, age, and type of surgery on postoperative pain. Rev. Bras Anestesiol. 2009 May-Jun; 59(3):314-20.
2 Marri E., Petropulakos K, Forini E, et al. Indagine sulla percezione della sofferenza del dolore nella regione Emilia Romagna.

14AP9-3

A national survey of the post-operative management of patients following intrathecal opiate administration

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Background and Goal of Study: Intrathecal opiates (ITOs) are an effective analgesic modality[1]. Safety concerns, particularly the risk of delayed respiratory depression, limit current practice[2]. No national guidelines for post-operative care following intrathecal opiates exist within the United Kingdom. The aim of this study was to establish the standards of post-operative care of adult surgical patients following the administration of ITO in Scotland.

Materials and Methods: All Scottish acute hospitals with independent anaesthetic services were identified using the NHS Scotland website. Exclusively paediatric or obstetric hospitals were excluded. Each individual anaesthetic department was contacted by telephone to identify the consultant in charge of acute pain management. If no specific consultant was responsible for acute pain services, the lead clinician within the department was sought. The survey was completed by telephone.

Results and Discussion: Thirty-two hospitals were identified. The survey was conducted between Dec 2008 and April 2009 with 100% completion rate. The location of post-operative care following ITO bolus administration is shown. The duration of monitoring following intrathecal morphine and diamorphine was also recorded. Sedation score, respiratory rate, saturation, pain score, pulse and blood pressure were recorded almost universally, although 14 different regimens for the frequency of observations were described. Some hospitals (23%) attach patient-controlled analgesia (PCA) to ensure relevant observations are performed. Oxygen is routinely administerd in 63% of hospitals following intrathecal opiate administration. No reports of complications related to ITOs were described.

Post-op Destination

	Intensive Care	High dependency	Dedicated Ward	Normal Ward
Morphine	0	3	7	8
Diamorphine	0	5	7	11
Fentanyl	0	0	0	18

Each cell contains the number of hospitals

Duration of Monitoring

DURATION	MORPHINE	DIAMORPHINE
12-18HRS	0	4
24HRS	15	10
OVERNIGHT	1	4
Duration of PCA	2	3

Each cell contains the number of hospitals

Conclusion(s): There is noticeable heterogeneity in the care and monitoring of patients following ITO administration in different hospitals in Scotland. National guidelines for the administration of ITO would help to standardise post-operative care and this may improve the safety of this analgesic technique.

References:

1 Anaes Analg 1999; 88:599-604. #2. Anaes Analg 2005; 101:S30-S43.

14AP9-4

Intrathecal opiate administration for acute pain management – A survey of current practice in Scotland

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Background and Goal of Study: Intrathecal opiates (ITOs) can provide effective post-operative analgesia[1]. Safety concerns, particularly the risk of respiratory depression, may limit the widespread use of this analgesic modality[2]. No national guidelines for the administration of ITO exist within the United Kingdom. The aim of this survey was to establish the current practices of ITO administration for post-operative analgesia in adult patients in Scotland.

Materials and Methods: All Scottish acute hospitals with independent anaesthetic services were identified using the NHS Scotland website. Exclusively paediatric or obstetric hospitals were excluded. Anaesthetic departments were telephoned to identify the consultant in charge of acute pain management. If no specific consultant was responsible for acute pain services, the lead clinician within the department was sought. The survey was completed by telephone.

Results and Discussion: Thirty-two hospitals were identified. The survey was conducted between Dec 2008 and April 2009 with 100% completion rate. The opiates administered and the number of hospitals using each is shown. Of the two hospitals not administering ITOs, one considers the risks of ITOs to be unjustifiable and in the other the procedures performed are unsuitable for spinal anaesthesia. Some hospitals using ITOs avoid specific opiates. Eight do not use morphine and three avoid diamorphine because of concerns about respiratory depression, drug availability or itch. Five do not use fentanyl because the duration of analgesia was perceived as too short. Two hospitals regularly use ITO infusions (one diamorphine, one fentanyl) for the management of postoperative pain whereas all other hospitals only use a single bolus technique. The reported dose ranges are shown.

Intrathecal Opiate Use

	Number of Hospitals
Morphine	18 (56%)
Diamorphine	22 (69%)
Fentanyl	19 (59%)
None	2 (6%)

Maximum Morphine and Diamorphine Bolus Doses

Dose (mg)	Morphine	Diamorphine
≤0.1	5	0
≤0.3	8	3
≤0.5	0	9
≤1.0	0	1

Cells contain number of hospitals

Conclusion(s): ITOs are commonly administered for the management of post-operative pain in adults in Scotland. There is a wide range of different practices with regard to type and dosage of opiates used. National guidelines for the administration of ITO would help to standardise practice and may improve the safety of this analgesic technique.

References:

1 Anaes Analg 1999; 88:599-604.
2 Anaes Analg 2005; 101:S30-S43.

14AP9-5

Chronic pain after thyroidectomy: Incidence, typology, risk factors

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Background and Goal of Study: Chronic postsurgical pains (CPSP) are common. Their existence after thyroidectomy has been recently suspected. This study was assessed to evaluate the incidence of CPSP 3 and 6 months after thyroidectomy and their risk factors.

Materials and Methods: 304 consecutive patients undergoing total or partial thyroidectomy with or without lymphadenectomy were included over a period of 12 months. The anaesthetic protocol was standardized with general anaesthesia combined or not with a superficial cervical plexus block (SCPB). The day before operation, eligible patients were asked to evaluate their preoperative anxiety and need for information with the Amsterdam preoperative anxiety and information scale. They also completed several questionnaires of pain before, 3 and 6 months after surgery: the numeric scale (NRS), the neuropathic pain diagnostic questionnaire (DN4) and the Neuropathic pain symptom inventory. CPSP was defined as a DN4 > 3 on the surgical site 3 months after surgery. Results are presented as mean ± SD. Differences between CPSP or not were analyzed by Chi-square and Fisher tests for the qualitative variables and by Wilcoxon test for quantitative variables. $P<0.05$ considered as significant (*). A step-by-step logistic regression (Wald test) was performed to determine the predictive risk factors of CPSP.

Results and Discussion: 285 patients completed the questionnaire at 3 months and 183 patients at 6 months. SCPB was performed in 167 patients (58.2%). 42 patients (14.7%) reported neuropathic pain 3 months after surgery while there were 14 patients (7.6%) at 6 months. NRS was respectively 3 ± 2.6 at 3 months and 3.4 ± 2.3 at 6 months. The main symptoms described were paresthesia and itching. Three months after thyroidectomy, the risk of CPSP decreased in patients operated by an experienced surgeon (0.49 [0.24 to 1.03]) and patients operated for goiter (0.36 [0,17-0,77]). The risk increased in patients without SCPB (2.51 [1.19 to 5.28]), in anxious patients (1.14[1,05-1, 23]) and in patients describing cervical preoperative pain as electric shocks (3.01 [1.14 to 7.97]). At 6 months follow-up, risk factors for CPSP were preoperative cervical neuropathic pain (20.7 [1.7 to 25.1]), patients without SCPB (8.0 [1.6 to 39.2]) and significant need for information (1.4 [1.1-1.8]).
Conclusion(s): This study confirms the existence of chronic neuropathic pain until 6 months after thyroidectomy. Among risk factors observed, SCPB could play a preventive role in the occurrence of CPSP after thyroidectomy.

14AP9-6

Postoperative analgesic use increases by providing a preoperative prescription

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Background and Goal of Study: Previous studies have shown that pain after ambulatory surgery is still a major problem. Moderate to severe pain after discharge varies between 20-40%. This study was designed to assess the prevalence of postoperative pain after ambulatory surgery at the Maastricht University Medical Centre and to determine the use of postoperative analgesics after regularly providing a preoperative prescription.
Materials and Methods: To assess the postoperative use of analgesics, we investigated a cohort of 878 patients undergoing ambulatory surgery. Patients received a prescription for postoperative analgesics when presenting at the outpatient clinic for preoperative assessment. The prescription was written for acetaminophen in case of mild pain (i.e. NRS≤4), and Zaldiar® in case of moderate to severe pain (i.e. NRS>4). All patients were asked to fill out a questionnaire four days after the surgery to assess the use of postoperative analgesics, and to measure the severity of postoperative pain.
Results and Discussion: During the first four days after surgery 750 patients (85%) used analgesics. Of the 310 patients with moderate to severe pain (NRS>4; 36%), 302 patients (97%) used pain medication. On the fourth day after surgery, only 357 (38%) of the patients still used analgesics, while 168 (20%) experienced moderate to severe pain. Patients with NRS>4 used significantly more often analgesics on day four, and used relatively more often Zaldiar® than acetaminophen, compared to patients with NRS≤4 (x^2=117.32, p<0,001).
Conclusion(s): Our study showed that more patients used postoperative analgesics compared to findings in other studies. This might indicate that providing a preoperative prescription increases the postoperative analgesic use. However, analgesic use decreased disproportionally towards the fourth day compared to the decrease in pain, as 48 patients (29%) with moderate to severe pain on the fourth day used no analgesics at all. This demonstrates that there is still a lot to improve regarding the compliance of continuous postoperative pain treatment.

14AP9-7

Can we influence on the chronification of pain after inguinal hernia surgery during the perioperative period?

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Background and Goal of Study: The incidence of chronic postsurgical pain (CPSP) after hernia inguinal repair is from 10 to 30 %, being severe in 2-4% of cases (1). The physiopathology of CPSP is not totally identified. Peripheral and central neuroplastic changes in response to tissue and nerve injury could be related (2). The activation of spinal cord microglia contributes to neuropathic pain; bupivacaine inhibits microglial proliferation (3).The aim of this study is to review the incidence, perioperative risk factors, and the presence of CPSP after inguinal hernia repair.
Materials and Methods: Retrospective observational study, that included 261 patients with inguinal hernia repair during two years. Death patients or those with severe cognitive disease were excluded. Demographic, anaesthetic and surgical data, numeric visual scale for pain (NVS) after three month of the surgery were recorded. A telephone follow-up interview was filled out.Statistical analysis was performed with a Student's t-test and Chi-squared.P values< 0.05.
Results and Discussion: 89% were men and 11% women. Mean age was 58 ± 16 years. 85.4% of patients had preoperative pain and 12.3% recurrent hernia. Regional anaesthesia was used in 87.7% of patients and general anaesthesia in 12.3%. The incidence of postoperative pain, after three month of the surgery, was 16.2% (64.2% mild, 31% moderate and 4.8% marked pain). In 50% of patients with CPSP had neuropathic characteristics. The incidence of insomnia was 6% and in 87% of this was related to pain. The factors related to CPSP after hernia repair were: anaesthesia procedure (general anaesthesia 40.6% vs regional anaesthesia 12.8%, p < 0.00), recurrent hernia (28.2 % vs 1. 4.5%, p = 0.02), preoperative pain (18% vs 5.3%, p = 0.02). Tendency to chronification depending on the use of "mesh" (progrip 21.4% vs no progrip 14.3%, p = 0.08) and the gender (male 17% vs female 7%, p = 0.07).
Conclusion(s): The Regional anaesthesia could decrease the chronification of pain after hernia repair, maybe by the role of bupivacaine in the microglial proliferation. It's important to consider the presence of recurrent hernia and preoperative pain as a predictive factor of pain. The incidence of mild and moderate chronic pain is considerable as well the influence of this on their sleep. A focus on pharmacological, psychological and genetic study of chronification of pain would be recommended.
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14AP9-8

An audit of postoperative pain following laparoscopic weight reduction surgery

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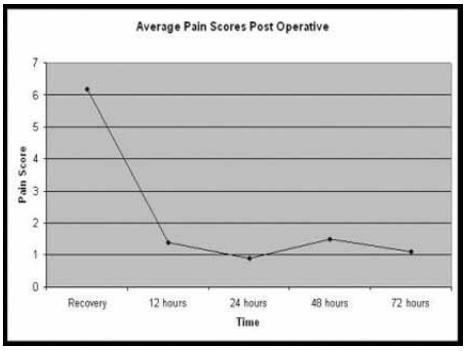
Background and Goal of Study: Patient controlled analgesia (PCA) for postoperative pain is well established in Weight Reduction Surgery (WRS). There is also evidence to suggest the use of intraoperative non-opioid analgesia has an opioid sparing effect post surgery [(1)]. In our unit patients receive remifentanil and propofol infusions intraoperatively, and Morphine PCA for 24 hours post operatively with other analgesics. Our goal was to see if this regimen provided adequate postoperative analgesia.
Materials and Methods: We performed a retrospective audit of 30 patients having had laparoscopic WRS. Data collected include: patient demographics, type of surgery and total morphine usage. Patient pain scores using a verbal rating scale during the first 72 hours after surgery were also noted.
Results and Discussion: The 30 patients audited (24 female, 6 male) had an average age of 37.9 years and weight of 139.7Kg. 28/30 underwent laparoscopic roux-en-y gastric bypass, 2 had laparoscopic gastric banding. 27/30 had 10mg Morphine and 17/30 had 1gram Paracetamol documented to be given intraoperatively. Morphine PCA was commenced immediately in recovery. The average pain score was 6.2 immediately post op, falling to 0.9 at 24 hours post op. The average amount of morphine used in 12 hours via PCA pump was 45mg. At 48 hours the average pain score rose to 1.5. Regular analgesia post op at 24 hours included Paracetamol for 29/30 and NSAIDs for 3/30. By 48 hours all were receiving regular paracetamol, 16/30 had regular NSAIDs, and 4/30 had regular codeine phosphate.



Conclusion(s): Our data suggest high pain scores immediately post op. This may reflect inadequate use of analgesia intraoperatively. We suggest the use of Morphine up to a dose of 0.2mg/kg and an increased dose of Paracetamol up to 2grams to be given intraoperatively. This may reduce early post op pain scores. Regular use of NSAIDs with Paracetamol post operatively may also reduce the second rise in pain scores at 48 hours. We plan to re-audit following implementation of these recommendations.

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14AP9-9

PROSPECT, before and after: Anaesthesia for total knee arthroplasty

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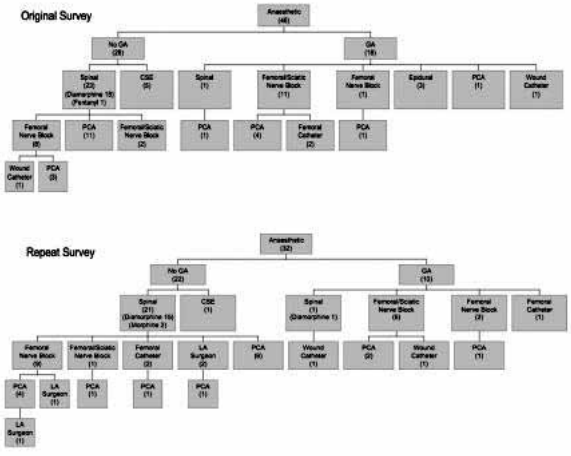
Background and Goal of Study: In October 2008 the PROSPECT working group, a collaboration of anaesthetists and surgeons, published consensus recommendations for postoperative analgesia following total knee arthroplasty (TKA) (1). In order to assess the impact of these recommendations, we conducted a survey of anaesthetic practise in the South West (SW) of England before and after publication.
Materials and Methods: In May 2007, Consultant or Non-Consultant Career Grade Anaesthetists with a subspecialty interest in TKA anaesthesia were identified in 13 hospitals throughout the SW of England. These anaesthetists were asked, by email questionnaire, to describe their primary anaesthetic techniques and post operative analgesia strategies. They were also asked to clarify any departmental consensus guidelines for TKA anaesthesia. In August 2009 the survey was repeated to the same hospitals but with additional questions clarifying awareness and the impact of the PROSPECT guidelines on practise.
Results and Discussion: The initial survey identified significant variation in practise throughout the region. 36 respondents revealed 46 different TKA anaesthetic techniques. None of the 13 departments had a departmental consensus guideline. In the repeat survey 29 respondents described 32 techniques. 6 (21%) reported a guideline within their department, 19 (66%) were aware of PROSPECT while 5 (26%) reported a change in practice as a result of this guidance. 4 respondents disagreed with the PROSPECT recommendations citing local audit to support their practise. The survey also revealed a significant drop in epidural use between the two surveys (1 vs. 8) with 66% vs. 48% now using some form of peripheral block.



Conclusion(s): There are a wide range of anaesthetic techniques used for TKA in the SW of England. The PROSPECT consensus recommendations were designed to support evidence based practise however they have not been universally recognised or implemented in the South West of England.

References:
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14AP9-11

Incidence of chronic post-surgical pain after midline laparotomy

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Background and Goal of Study: Chronic post-surgical pain (CPSP) is defined as the development and maintenance of pain for at least 2 months later than a surgery, once other causes have been excluded. Incidence has been studied in hernioplasties, mastectomies and toracothomies, with very different results (between 10 and 60%), but there is no any analysing midline laparotomies[1]. The goal of our study is to evaluate the incidence and characteristics of CPSP in patients who underwent abdominal surgery by midline laparotomy.
Materials and Methods: Retrospective data collection of all patients who underwent abdominal surgery by midline laparotomy from January 2008 to June 2009. A standarized and validated telephonic questionnaire was used. Questions were: presence of peri-incisional pain, intensity of it, characteristics and analgesic treatment required. Pain intensity was evaluated by the Verbal Numeric Scale (VNS: Scored from 0 to 10) and the Categorical Scale (CS: none, mild, moderate and severe).
Results and Discussion: From the 85 initial patients 68 answered the telephonic questionnaire (61,2% males), 11 were not localised and 6 were dead. 46% were ASA 2, 52% ASA 3 and 2% ASA 4. The mean time from surgery was 9±4 months. Incidence of CPSP was 25%, in 24% pain was continuous and in 76% intermittent, with seconds of duration in (38,5%), minutes (53,8%) and hours (7,7%). Mean VNS was 3,25±1,34 and by CS pain was considered mild in 50%, moderate in 43,7% and severe in 6,3%. 36,4% of patients were not treated, 12,5% treated with NSAID's and 50% with paracetamol, with a mild or regular response in 72,8% of patients. CPSP was presented as neuropathic in all patients contacted. The characteristics were burning in 53,3%, paresthesies in 13,3%, tingling in 33,3% and stabbing in 33,3%. 80% presented allodynia.
Conclusion(s): Is quite common the appearance of CPSP after midline laparotomy. It is presented as neuropathic pain, being allodynia the most frequent type. We find a disease probably under-diagnosed and not appropriately treated, with a duration of few seconds or minutes, mild-moderate intensity and a regular response to NSAID's and paracetamol. We consider we need more studies analysing predictive factors for developing CPSP to optimise perioperative treatments and minimise its incidence.

References:
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14AP10-2

The effects of gabapentin, tramadol and amitriptyline on pain behavior in a rat neuropathic pain model

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Background and Goal of Study: The purpose of this study was to investigate whether amitriptyline (A), gabapentin (G) and tramadol (T) have either additive or synergistic effects on behavioral signs of mechanical and thermal allodynia and hyperalgesia in a rat model of neuropathic pain.
Materials and Methods: 60 Sprague Dawley rats were randomly divided into eight groups and drugs (serum physiologic, 50 mg/kg gabapentin, 10 mg/kg tramadol and 10 mg/kg amitriptyline) were administered as Group I (C): Serum physiologic (control) (n=9), Group II (G): Gabapentin (n:10), Group III (A): Amitriptyline (n=7), Group IV (T): Tramadol (n=6), Group V (GT): Gabapentin+tramadol (n=6), Group VI (GA): Gabapentin+amitriptyline (n=5), Group VII (AT): Amitriptyline+tramadol (n=6), Group VIII (GAT): Gabapentin+amitriptyline+tramadol (n=8). Under general anaesthesia with ether, a peripheral mononeuropathy was produced in rats by placing loosely constrictive ligatures around the common sciatic nerve according to the chronic constriction injury (CCI) model. On postoperative 14th day, warm plate and cold plate test (for thermal allodynia), von Frey test (mechanical allodynia), hot plate test (thermal hyperalgesia) and tail immersion test (antinociceptive) were performed and data were recorded as baseline values. The following 5 days drugs were administered and measurements were repeated on 2nd and 5th days of treatment. All animals developed neuropathic pain behavior within 14 days after surgery.
Results and Discussion: In cold plate test, cumulative paw withdrawal time and number decreased in GAT group more than control group ($p<0.001$) and GT group ($p<0.05$), and decreased in AT group more than control group ($p<0.05$). In von Frey test cumulative paw withdrawal time and number decreased in GAT group more than control group ($p<0.001$).
Conclusion(s): We concluded that the combination of intraperitoneal 10mg/kg AMI, 10 mg/kg GBP, and 10mg/kg TRL is more effective than single use of them in cold and mechanical allodynia treatment in rats.

14AP10-3

Role of endothelin receptors and cytokines in rat models of complex regional pain syndrome

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Background and Goal of Study: Complex regional pain syndrome (CRPS) is a very complicated chronic pain disorder and classified into two types, I and II. Despite vigorous studies, the mechanisms of CRPS have not been well known. On the other hand, endothelin (ET) receptors and several cytokines have been shown to be involved in the various chronic pain conditions at the spinal level. Thus, the aim of this study was to evaluate the role of ET receptors and cytokines on CRPS in the spinal cord.
Materials and Methods: Male SD rats were used. Chronic post-ischemia pain (CPIP) was induced in anesthetized rats by placing a tourniquet (O-ring) at the ankle joint for 3 h, and removing it to allow reperfusion and this model was used as CRPS-I. Additionally, ligation of L5 and L6 spinal nerves was performed for induction of neuropathic pain and this model was used as CRPS-II. An intrathecal catheter for drug administration was placed in a subarachnoid space with sevoflurane anesthesia. For assessment of mechanical allodynia, mechanical stimuli using von Frey filament was applied to the paw and measured a withdrawal threshold. The effects of intrathecal ET-A, -B receptor antagonists, tumor necrosis factor a inhibitor, interleukin (IL)-1 antagonist and endothelin-1 were examined on a withdrawal threshold evoked by the O-ring or spinal nerve ligation.
Results and Discussion: After application O-ring and spinal nerve ligation, the paw withdrawal threshold was significantly decreased (mechanical allodynia) in injured sites. Intrathecal BQ 788 (selective ET-B receptor antagonist) dose-dependently increased the withdrawal threshold in both CRPS-I and -II. Intrathecal BQ 123 (selective ET-A receptor antagonist) did not affect the withdrawal threshold in both types. Intratehcal thalidomide (tumor necrosis factor (TNF)-α inhibitor) increased the withdrawal threshold in CRPS-I, but not CRPS-II. Intrathecal interleukin (IL)-1ra (IL 1 receptor antagonist) and ET-1 (endothelin-1) failed to alter the withdrawal threshold in both types of CRPS.
Conclusion(s): These results suggest that ET-B receptor, but not ET-A receptor, may be involved in the modulation of CRPS type-I and -II at the spinal level. Moreover, TNF-a may be associated with CRPS-I only. On the other hand, IL-1 and ET-1 may not play a role in the regulation of both types of CRPS. Thus, the ET-B receptor antagonist and tumor TNF-a inhibitor deserve as a potential novel therapy for CRPS at the spinal level.

14AP10-4

Effect of glial cell line-derived neurotrophic factor on the product of NO and activity of NOS and AchE in spinal cord and cerebral cortex in rats model of neuropathic pain

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Background and Goal of Study: To study the effect of glial cell line-derived neurotrophic factor(GDNF) on the product of NO and activity of NOS and AchE in spinal cord and cerebral cortex in rat model of neuropathic pain.
Materials and Methods: Adult Sprague-Dawley male rats were randomly divided into normal control group, sham operation group,spinal nerve ligation(SNL) group and SNL combined with treatment of GDNF group. Every group was divided into three sub-groups:SNL 3d,7d and 14d(n=10 in each group). the product of NO and activity of NOS and AchE in spinal cord and cerebral cortex were examined.
Results and Discussion: Compared with normal control and sham operation groups, the product of NO and activity of NOS and AchE in spinal cord and cerebral cortex of the rats in SNL group increased significantly. Compared with the rats in SNL group, there was an apparent decreased in GDNF treatment group three days later in spinal cord and cerebral cortex,but GDNF has no effect on activity of AchE in cerebral cortex.
Conclusion(s): The product of NO and activity of NOS and AchE in spinal cord and cerebral cortex were involved in the mechanism of neuropathic pain. Intrathecal administration of GDNF could inhibit the product of NO and activity of NOS in spinal cord and cerebral cortex.

14AP10-5

The neurological safety of epidural pamidronate in rats

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Background and Goal of Study: Pamidronate is a potent inhibitor of osteoclast-mediated bone resorption. Recently, the drug has been known to relieve bone pain. We believed it possible that direct epidural administration of pamidronate could have various advantages over oral administration with respect to dosage, side effects, and efficacy. Therefore, we evaluated neuronal safety of epidurally-administered pamidronate.
Materials and Methods: Twenty-seven rats weighing 250-300 g were equally divided into three groups. Each group received epidural administration with either 0.3 ml (0.375 mg) of pamidronate (group P), 0.3 ml of 40% alcohol (group A), or 0.3 ml of normal saline (group N). Pinch-toe test, motor function evaluation, and histopathologic examination of the spinal cord to detect conditions such as chromatolysis, meningeal inflammation, and neuritis, were performed on the 2nd, 7th, and 21st day following administration of each drug.
Results and Discussion: All rats in group A showed an abnormal response to the pinch-toe test and decreased motor function during the entire evaluation period. Abnormal histopathologic findings, including neuritis and meningeal inflammation were observed only in the group A rats. Rats in group P, with the exception of one, and group N showed no significant sensory/motor dysfunction over a 3-week observation period. No histopathologic changes were observed in groups P and N.
Conclusion(s): All rats in group A showed an abnormal response to the pinch-toe test and decreased motor function during the entire evaluation period. Abnormal histopathologic findings, including neuritis and meningeal inflammation were observed only in the group A rats. Rats in group P, with the exception of one, and group N showed no significant sensory/motor dysfunction over a 3-week observation period. No histopathologic changes were observed in groups P and N.
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2 Gangji V, Appelboom T. Analgesic effect of intravenous pamidronate on chronic back pain due to osteoporotic vertebral fractures. *Clin Rheumatol* 1999; 18: 266-7.
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14AP10-6

Intrathecal grafts of chromaffin cells bio-engineered with cationic polymer nanoparticles to improve met-enkephalin release also reduce neuropathic pain in rats

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Background and Goal of Study: Adrenal chromaffin cells produce analgesic substance such as met-enkephalin. In the present study, we evaluate the analgesic effects of transfected enkephalin gene into bovine chromaffin cells transfected with met enkephalin gene in a rat model of neuropathic pain induced by chronic constriction injury (CCI) of the sciatic nerve.
Materials and Methods: Non-viral vector, Cationic polymer synthesized with 1,4-butanediol diacrylate and 4,4´-trimethylenedipiperidine was used to form DNA/polymer complex. Cell toxicity of DNA/polymer complex were evaluated. After transfecting enkephalin gene into bovine chromaffin cells, enkephalin from cells was measured by radioimmunoassay (RIA) and then chromaffin cells were encapsulated with alginate and poly-L-lysine to protect the cells from the host immune system. One week after CCI, the microencapsulated cells were transplanted into rat spinal space. Mechanical allodynia was measured using von frey hair.
Results and Discussion: Cationic polymer nanoparticles have no cell toxicity. The cells with transfected gene significantly produced enkephalin after nicotin stimulation. Mechanical allodynia was significantly reduced in the transfected cell group, compared, compared to those without transfected gene.
Conclusion(s): The present data demonstrate enkephalin was more produced from chromaffin cell which enkephaline gene was transfected into via polymer vector and more effectively induced the analgesic effects when intrathecally implanted in the model of neuropathic pain. Thus, application of intrathecal implantation of bio-engineered chromaffin cells can be a novel method in humans for treating chronic neuropathic pain.

14AP10-7

Simultaneous fluorimetric and electrophysiologic recording in dorsal root ganglia: The effect of painful nerve injury

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Background and Goal of Study: Ca^{2+} serves as the most important second messenger in primary sensory neurons. Peripheral axotomy has been shown to disrupt Ca^{2+} signaling in DRG neurons dissociated from hyperalgesic rats after spinal nerve ligation (SNL). Here we present new observations obtained by an expanded recording method that simultaneously reveals cytoplasmic Ca^{2+} level ($[Ca^{2+}]_c$) and transmembrane potential without dissociation.
Materials and Methods: Male rats were subjected to spinal nerve ligation (SNL) or skin incision (control group), and hyperalgesia-type behavior was assessed by needle testing. Three weeks after surgery, L5 DRGs and the attached dorsal roots were surgically harvested from control animals and hyperalgesic SNL animals. The dorsal roots were stimulated with platinum electrodes, and conducted action potentials (APs) were recorded in the neuronal soma by glass microelectrodes (100MΩΩ). Entry of the ratiometric Ca^{2+} fluorophore Fura-2 (10mM in the microelectrode) permitted fluorimetric determination of $[Ca^{2+}]_c$.
Results and Discussion: Transient $[Ca^{2+}]_c$ elevations elicited by single conducted APs had greater amplitudes in slow-conducting C-type neurons

(226±49nM) than in Aδ neurons (173±61nM) and Aβ-type neurons (53±28nM; p<0.05). During trains of stimuli, unitary transients elicited by single APs stacked upon each other to produce a $[Ca^{2+}]_c$ elevation that was maximal at a distinct stimulation frequency for each neuron. This tuning frequency was higher in Aβ-type neurons (50Hz) than in C-type neurons (7Hz, *P*<0.05). In $[Ca^{2+}]_c$ transients elicited by single APs, painful nerve injury decreased transient amplitude (110±16nM) and decay constant (2.3±0.3s) compared to control (226±49nM, 3.1±0.3s, p<0.05) in C-type neurons, this was also true after trains of 20 APs at stimulation frequencies from 0.3 to 7Hz. In contrast, Aββ-type neurons showed a trend towards larger transient dimensions.

Conclusion(s): Natural activation by conducted APs reveals distinct features of Ca^{2+} signaling in different neuron types. Painful nerve injury disrupts Ca^{2+} signaling, particularly in C-type neurons. Since diminished Ca^{2+} entry produces hyperexcitability in sensory neurons, our findings may in part explain the generation of neuropathic pain after nerve injury.

14AP10-8

The relationship between neuronal nitric oxide synthase and NADPH-diaphorase in the dorsal root ganglia during neuropathic pain

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Background and Goal of Study: Changes in nitric oxide (NO) production in the dorsal root ganglia (DRG) may contribute to allodynia after nerve injury. It is known that the histochemistry of NADPH-diaphorase (NADPH-d) is known to be not always coincident with NOS. This study was conducted to investigate the relationship between nNOS and NADPH-d expression in the DRG in a spinal nerve injury model of neuropathic pain, and to elucidate role that NO plays in neuropathic pain.
Materials and Methods: nNOS immunohistochemistry and/or NADHP-d histochemistry were conducted in the DRG of a spinal nerve transection model of neuropathic pain, and the pain behavior was then measured by a von Frey filament test of the hindpaws of wild type and nNOS knock-out mice.
Results and Discussion: nNOS immunoreactive neurons and NADPH-d stained neurons were not always identical. Additionally NADPH-d increased, but nNOS did not increase significantly in the DRG after spinal nerve transection. Neuropathic pain behavior increased in the hindpaw of nNOS(–/—) mice after spinal nerve transection, but was lower than that of wild type mice after spinal nerve transection.
Conclusion(s): nNOS immunoreactive neurons and NADPH-d stained neurons were not always identical in the DRG, and a novel NADPH-d positive source may be involved in neuropathic pain after spinal nerve transection. Changes in nNOS expression in the DRG were not the primary cause of neuropathic pain behavior in a spinal nerve transection model of neuropathic pain.

14AP10-9

Effect of N-methyl-D-aspartate Receptor (NMDA-R) antagonists in a rat model of neuropathic pain

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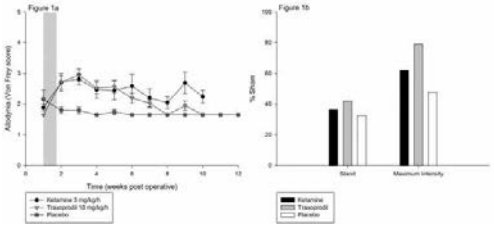
Background and Goal of Study: The role of NMDAR in chronic pain states has been well documented in the scientific literature. NMDAR antagonists have shown efficacy in preclinical models as well as in patients with neuropathic pain (NP). Large-scale clinical use of NMDAR antagonists is limited due to side effects of currently available compounds of this class (ketamine: K). A new compound Traxoprodil (Trx) has been described as a potent, selective NR2B subunit of NMDAR antagonist. This study aims to investigate the therapeutic value of Traxoprodil in a rat model of NP (Spared Nerve Injury – SNI model) as compared to Ketamine.
Materials and Methods: The SNI model in 9 wk female Sprague-Dawley rats gives a robust, prolonged neuropathic pain state (>90 days) with allodynia and hyperalgesia. Drugs were titrated to a dose that gave analgesia with tolerable side effects (K: i.v. 3 mg/kg/hour and Trx: 10 mg/kg/hour for 3 hours, 5 consecutive days). Response to tactile allodynia and mechanical hyperalgesia was assessed. Functional assessment was performed with a gait analysis system. Side effects were scored and registered.
Results and Discussion: Both NMDAR antagonists alleviated tactile allodynia in rats with neuropathic pain. Ketamine relieved tactile allodynia for 39±18 post operative days (POD), Traxoprodil for 40±5 POD (fig 1a). Gait analysis showed improvement of function after treatment with NMDAR antagonists. Amount of time spent on injured paw (stand) was improved (36±9% for K, 41±8% for Trx versus 32±10% for placebo). Weight distribution (maximum intensity) also improved (62±11% for K, 78±13% for Trx and 47±16% for placebo, Fig 1b). While K treatment was accompanied by important side effects (locomotor hyperactivity, overflow incontinence), there was no evidence of any side effects during Trx treatment.



Conclusion(s): NMDAR antagonists prove to be effective therapeutic drugs against mechanical allodynia, in this rat model of neuropathic pain. The central finding in our preliminary study demonstrates the potential of NMDAR antagonists to improve functional recovery, with more time spent on the injured paw and a more even distribution of the body weight. Trx exhibited a superior therapeutic index for efficacy versus side effects.

14AP10-10

Reactive oxygen species dependent increased spinal phosphorylations of ERK and JNK in hind paw ischemia/reperfusion injury-induced mechanical allodynia

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Background and Goal of Study: Reactive oxygen species (ROS) and inflammatory responses contribute to development of neuropathic pain.(1) Mitogen-activated protein kinases (MAPKs) are important for intracellular signal transduction and play critical roles in regulating neural plasticity and inflammatory responses. A neuropathic pain syndrome was produced in rats following prolonged hind paw ischemia/reperfusion (chronic post-ischemia pain: CPIP), creating an animal model of complex regional pain syndrome-Type I.(2) This study was designed to evaluate the effects of ROS on the activation of MAPKs in spinal cord. Herein we show superoxide and NO dependent phosphorylation of ERK and JNK in neuropathic pain model.
Materials and Methods: CPIP was produced by a Nitrile 70 Durometer O-ring for 3 hrs ischemia and subsequent reperfusion of left hind paw of SD rats. Changes of lipid peroxidation of spinal cord with allopurinol (40 mg/kg), an inhibitor of xanthine oxidase (XO), were measured to confirm increased XO–mediated ROS production in CPIP rat. To block the effects of ROS, allopurinol (LA: 4 mg/kg, HA: 40 mg/kg), superoxide dismutase (SOD, 4000 U/kg), *N*-nitro-L-arginine methyl ester (L-NAME, 10 mg/kg), or SOD + L-NAME was treated (i.p.) for 3 days after reperfusion. Mechanical allodynia (MA) was measured for 1 week. The activations of MAPKs (ERK, p38, and JNK) in lumbar spinal cord in accordance with the changes of MA at 3 days after reperfusion (the lowest withdrawal threshold on von Frey stimulation) were analyzed by the Western blot. Data were expressed as the mean ± SEM. Statistical analysis was performed using analysis of variance, followed by a post hoc Student-Newman-Keuls test ($p < 0.05$).
Results and Discussion: In all treated groups except vehicle group (CPIP), MA was attenuated at 3 days after reperfusion, which persisted for at least 1 week. Regardless of presence of L-NAME, SOD attenuated MA more significantly than L-NAME. The phophorylations of MAPKs are increased in vehicle group compared to other groups. The changes of ERK and JNK, not for p38, were correlated with ROS blockade and changes of MA.
Conclusion(s): This study suggests that ROS, especially superoxide or nitric oxide, are partly responsible for the development of MA via phosphorylations of ERK and JNK. The activation of p38 for MA is a non-ROS-dependent manner.
References:

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14AP11-1

Comparison of phrenic nerve infiltration and suprascapular nerve blockade for ipsilateral shoulder pain after thoracotomy in patients receiving thoracic epidural analgesia

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Background and Goal of Study: More than 70% of the patients complain of shoulder pain after thoracotomy. The aim of the study was to investigate the effect of phrenic nerve infiltration compared to suprascapular nerve blockade on ipsilateral post-thoracotomy shoulder pain.
Materials and Methods: Written informed consent was obtained from 90 adult patients scheduled to undergo a thoracotomy. Epidural catheter was

placed before the general anaesthesia. Patients were randomly assigned to: **Group Phrenic** received 2% lidocaine into the periphrenic fat by using a 20 G spinal needle just before chest closure; **Group Suprascapular** received 10 Ml of 0.5% plain bupivacaine into de suprascapular nerve once the surgery was finished. A blinded observer assessed the patients at 0.5, 1, 2, 3, 4, 5, 6,12, 48, 72 hours after surgery and at the discharge. The severity of the shoulder pain was assessed using a 10 VAS score and a five-point observer verbal rating score. All patients received 50 mg dexketoprofen/8h iv.

VAS Score

VAS	Phrenic blockade	Suprascapular blockade	p
0	0.11±0.39	0.16±0.60	0.064
1 hour	2.05±2.63	4.83±3.22	0.0001
3 hours	1.00±1.50	3.05±2.75	0.0001
5 hours	0.97±1.53	2.53±2.33	0.002
12 hours	0.78±1.58	1.48±1.66	0.075
24 hours	0.62±1.27	1.54±1.59	0.009
72 hours	0.24±0.60	0.92±1.62	0.025

Abbreviations:VAS visual analogue scale. Data in mean±SD

Results and Discussion: 74 patients were recorded (37 in each group).There was no significant difference in age, gender, weight, height, ASA status or type and duration of operation between the two groups. Pain scores at rest did not differ significantly between the two groups but total pain scores were significantly ($p<0.05$) lower in the phrenic group compared to the suprascapular blockade group over the whole time of the study except for the 12 hour. At discharge, all the patients in both groups had a VAS lower than 1.The marked reduction in the incidence of shoulder pain after lidocaine inflitration of the phrenic nerve strongly supports the hypothesis that irritation of the pericardium or mediastinal and diaphragmatic pleural surfaces results in pain that is referred to the shoulder via the phrenic nerve.

Conclusion(s): Blockade of phrenic nerve with 2% lidocaine provides more effective pain relief for ipsilateral post-thoracotomy shoulder pain than suprascapular blockade with plain 0,5% bupivacaine.

14AP11-3

The quality of postoperative epidural analgesia after upper and lower abdominal surgery: A survey of postoperative records

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Background and Goal of Study: Postoperative epidural analgesia is a standard of postoperative pain relief after major abdominal, thoracic, lower limbs' operations. However, postoperative epidural analgesia has got disadvantages, too: it is expensive, motor block and urinary retention can be caused by large doses of local anesthetics, there is lack of protocols for observation, risk of epidural haematoma and abscess, and need for rescue analgesia. The aim of the retrospective study was to compare the efficiency of postoperative epidural analgesia and its effect on postoperative course after upper and lower abdominal surgery.

Materials and Methods: Case histories including protocols of postoperative epidural analgesia of 152 patients were analyzed, 72 after upper (group U) and 80 after lower abdominal surgeries (group L). Patients had continuous epidural infusion: 1.5 mg/ml bupivacaine + 6 μg/ml fentanyl at a rate of 3-6 ml/hour. Groups were compared with respect to the intensity of pain (VAS), need of rescue analgesia, rate of side effects, postoperative complications, and length of hospital stay. Student's t, Mann-Whitney U, χ^2 tests were used, *p<0.05 was considered statistically significant.

Results and Discussion: Groups were comparable in sex, ASA, dose of fentanyl. Mean age was 64.4±14.1 vs 68.7±10.6* years, weight 71.6±14.1 vs 77.5±16.8* kg, duration of surgery 230.5±89.2 vs 164.3±59.3* min in group U vs L (*p<0.05). Median pain score on the operation day was 2 (0-5) vs 2 (0-6); day I – 2 (0-6) vs 1 (0-6)*; day II – 2 (0-5) vs 1 (0-5)*; day III – 1 (0-5) vs 0 (0-5); day IV – 2 (0-3) vs 0 (0-6); day V – 1.5 (0-3) vs 0 (0-2) in group U vs L (*p<0.05). Rescue analgesic at day of surgery was used in 37 (51.4%) vs 45 (56.25%) cases; at day 1 – in 40 (55.6%) vs 33 (41.25%) cases in group U vs L, p ns. Duration of epidural analgesia was 3.4±1.1* vs 2.9±1.0 days in group L vs U (*p<0.05). PONV was registered in 10 (13.9%) vs 17 (21.3%), pruritus – 3 (4.2%) vs 1 (1.3%), motor block – 7 (9.7%) vs 4 (5%), postoperative complications – 25 (34.7%) vs 23 (28.8%) cases in group U vs L. Median length of hospital stay was 15.5 (11-23) vs 13 (11-17.5) in group U vs L.

Conclusion(s): Postoperative epidural analgesia is equally effective after upper and lower abdominal surgery. However, pain intensity is statistically significantly higher after upper abdominal surgery at postoperative day 1 and 2. Requirement of rescue analgesia is comparable in groups with the highest level at day of surgery and postoperative day 1.

14AP11-4

Perioperative analgesia in laproscopic bariatric surgery

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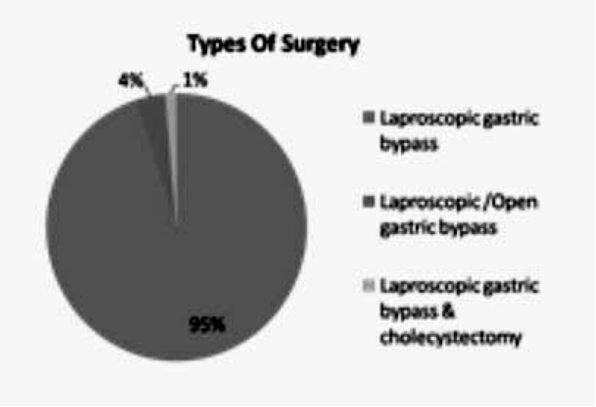
Background and Goal of Study: Laproscopic gastric bypass surgery is becoming increasingly common procedure in the United Kingdom.Adequate pain relief perioperatively enables reduction in cardiovascular, respiratory and gastrointestinal complications in bariatric patients and their early mobilisation postoperatively to reduce the incidence of thromboembolic complications.We therefore conducted a retrospective study of perioperative analgesia administered to patients undergoing laproscopic gastric bypass.

Materials and Methods: Retrospectively,twenty four hour analgesic consumption (intraoperatively and postoperatively in the Post Anaesthetic Care Unit and High Dependancy Unit) of 78 patients undergoing elective laproscopic gastric bypass was recorded from the anaesthetic and drug prescription charts.Mean total morphine consumption was recorded in the following three categories of Body Mass Index(BMI Kg/m^2) of the patients:40-44,45-49 and 50-60.



Results and Discussion: There was a large variation in the 24 hour morphine (range 4-165 mg) and fentanyl(range 200 -1300 mcg) consumption. Mean total 24 hour morphine consumption were as follows: BMI (40-44)-32.3 mg,BMI(45-49)-26.2 mg,BMI(50-60)-33.1 mg. 34.6 % received morphine I.V Patient Controlled Analgesia(PCA) while 6.4% received fentanyl I.V. PCA postoperatively in PACU and HDU.

Other Analgesia

Analgesia	Intraop(%)	Postop(%)
Paracetamol	100	100
Diclofenac	80.7	78.6
Clonidine	15.3	0
Fentanyl	92.3	1.1
Tramadol	3.8	2.2

Conclusion(s): Morphine consumption was unrelated to BMI.Multimodal analgesia was prescribed for all the patients. In our opinion,variation in opioid analgesic requirement can be overcome by judicious use of PCA[1].Use of non opiod analgesia should be encouraged as it causes less sedation during recovery from gastric bypass surgery[2].Also,use of mobile PCA could enable early mobilisation.

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14AP11-7

Postoperative analgesia after total hip arthroplasty: The role of periarticular infiltration

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Background and Goal of Study: Epidural analgesia gives excellent pain relief after total hip arthroplasty (THA) but is associated with side effects. Periarticular infiltration has also been found effective in pain relief after THA. We compared the efficacy of these methods after THA.

Materials and Methods: Sixty patients undergoing elective THA under spinal block were randomly assigned to receive (1) continuous epidural infusion with ropivacaine 0.2% 4 ml/h (group E), (2) infiltration around the hip joint before and after the final hip reduction with a mixture of 100 ml, consisting of: ropivacaine 0.75% (3 ml/kg), morphine (4-10 mg), 300 mcg epinephrine, 750 mg cefuroxime, 40 mg methylprednisolone, clonidine 1 mcg/kg (group I) or (3) patient controlled analgesia (PCA) with morphine (group C, control group). All patients also received paracetamol and lornoxicam postoperatively. PCA morphine provided rescue analgesia for groups E and I. We recorded VAS scores at rest and during movement and morphine consumption, at 1, 6, 12 and 24 hours postoperatively.
Results and Discussion: Statistical analysis was performed using the chi-square test and the Kruskall-Wallis and Mann-Whitney U tests. Patient demographics did not differ between groups. Mean values of VAS scores at rest and movement were <2 in groups I and E at all time points, while in group C were 3±2, 2±2, 1±1 at rest at 6, 12 and 24 h, respectively and 4±2, 3±2, 3±2 at movement at 6, 12 and 24 h, respectively (values are expressed as mean ± standard deviation). VAS scores at rest were significantly lower in groups E and I, compared to group C at 6, 12 and 24 h postoperatively ($p < 0.05$ at all time points). VAS scores at movement were also significantly lower in group E compared to group C at 6, 12, 24h postoperatively ($p<0.01$) and in group I compared to group C at 6 and 12h ($p<0.01$).Requested PCA doses and opioid consumption were significantly lower in groups E and I compared to group C (morphine consumption at 24h: group E: 7±4 mg; group I: 8±5 mg; group C: 18±8 mg) (group I vs. C, $p=0.002$; group E vs. C, $p<0.001$). No differences were observed between groups E and I in pain scores or opioid consumption.
Conclusion(s): Periarticular infiltration in THA seems to provide adequate pain relief and reduce opioid consumption the first day after THA. This method seems to be comparable to epidural analgesia and superior to intravenous PCA with morphine.

14AP11-9

Postoperative analgesia after thoracotomy without thoracic epidural analgesia: Interest of the paravertebral catheter associated to patient-controlled-analgesia with intravenous morphine

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Background and Goal of Study: Posterolateral thoracotomy is a severely painful surgical procedure. Analgesia using a thoracic epidural catheter is usually considered as the "gold standard" for postoperative thoracic analgesia. Unfortunately, it's not always executable because of its contraindications or in case of technical failure. Analgesia using a paravertebral block represents an alternative to the thoracic epidural catheter.
Materials and Methods: In a prospective monocentric comparative study, forty seven adult patients had a paravertebral catheter placed by the thoracic surgeon at the end of a posterolateral thoracotomy. They were randomly assigned to two equal groups to receive either : (1) 0,1 ml/kg bolus followed by a continuous infusion of 0.1 mL /kg/ h of 0.5% ropivacaine during 48 hours or (2) saline serum in the control group with the same rate. This technique was supplemented by patient-controlled intravenous infusion of morphine (bolus 1 mg, lock-out time 7 min) and paracetamol and nefopam. Visual analogue scale (VAS) at rest and when coughing, total morphine consumption and side effects were recorded during the first 48 hours after surgery. The two groups were compared with a Student Test and a variance analysis for the repeated measures. A p value < 0,05 was considered as significative.
Results and Discussion: Pain intensity, assessed using the VAS was similar in both groups. The average dose of morphine administered postoperatively in both groups was similar: 45,7 mg in the ropivacaine group versus 43,2 mg in the control group ($p=0,637$). Side effects of morphine consumption (nausea and vomiting, urinary retention, pruritus, respiratory rate and sedation) were similar in both groups.
Conclusion(s): Our results do not confirm the literature. If the paravertebral block obtained by percutaneous punction using the "loss of resistance" technique had demonstrates his efficacy, the placement by the thoracic surgeon was less studied. It's likely that this technique is less effective and a study comparing these two methods should be done.

14AP11-10

Gender difference in postoperative pain during the first 24 hours according to different analgesic techniques

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Background and Goal of Study: Today, 30% of patients experience severe postoperative pain during the first 24h postsurgery. Postoperative pain is influenced by multiple factors including gender difference, female patients experiencing more pain (1,2). The present study used retrospective database of our Postoperative Pain Service to compare postoperative pain and analgesics needs between male and female patients according to the type of postoperative analgesia.
Materials and Methods: Retrospective record of adult patients data were analysed (30 months period-multimodal analgesia used in all patients). Postoperative analgesic techniques involved intravenous morphine patient-controlled analgesia (PCIA), epidural analgesia (PCEA) and continuous peripheral nerve block (CPNB). Average pain scores (VAS 0-10) during the first night and at day 1, incidence of severe pain (VAS >7/10), analgesics consumption and side effects were recorded and compared between male (M) and female (F) patients. Statistical analysis used Mann-Withney rank sum test and $X2$. $P < 0.05$ was significant.
Results and Discussion: Demographic data included 4303 women and 3415 men. Small % of patients reported pain during the first night: 7.3 vs 5.6% with PCIA, 8.8 vs 8.3% with PCEA and 17.8 * vs 5.7% with CPNB, in F and M patients respectively.
Conclusion(s): Gender difference in postoperative pain at day 1 seems associated with use of opioid PCIA, women reporting higher pain scores but consumming less opioids and experiencing more opioid-related side effects like PONV (3). Incidence of severe pain does not differ between sexes regarding analgesic techniques.
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14AP12-2

Preperitoneal vs epidural analgesia in colorrectal surgery, a prospective comparative study

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Background and Goal of Study: Preperitoneal analgesia has shown to be an effective analgesic method versus placebo for postoperative pain control in colorrectal surgery. The aim of our study was to compare two methods of analgesia (peridural catheter vs preperitoneal catheter) in the postoperative period of non-iterative colorrectal surgery without colostomy.
Materials and Methods: In a prospective comparative study, 46 patients were randomized in two groups: group A: peridural catheter (bupivacaine 0.125% + fentanyl 3 ug/ml at 3 ml/h) and group B: preperitoneal catheter (bupivacaine 0.125% at 12 ml/h), during the first 48h after surgery Collected data were: demographics, diagnosis, comorbidity, length of surgery, pain intensity (VAS scale or categoric scale) at the end of surgery, 1h, 2h and 3h post-intervention, and once every 8h during the first 72h at the ward, analgesic consumption and postoperative evolution. Chi squared test to compare qualitative variables and ANOVA test to compare means between the two groups was used ($p<0.05$ as significant).
Results and Discussion: There were no statistically significant differences between groups on demographics, diagnostic (oncologic vs non-oncologic) or length of surgery. No statistically significant differences between preperitoneal vs peridural catheter patients on VAS scale puntuations or needs for analgesics in the postoperative period were observed. The postoperative evolution of the two groups of patients was also comparable: mean length of stay (group A: 13.2 days (± 9.4), group B: 13.3 days (± 8.7) and incidence of postoperative complications.

Pain scores and analgesics use in male and female patients regarding analgesic technique (median, IQR)

	PCIA morphine	PCEA	CPNB
F/M ratio (n)	2959/2174	826/996	518/245
First night pain scores [% severe pain]	F: 7 (5-8) [59%]; M: 7 (1-8) [55%]	F: 7 (6-8) [69%]; M: 7 (5-8) [56%]	F: 7 (6-8) [63%]; M: 6.5 (5-7) [50%]
Day 1 Pain at movement [% severe pain]	F: 6 (5-7)* [25%]; M: 6 (4-7) [35%]	F: 5 (3-7) [28%]; M: 5 (3-7) [27%]	F: 4 (2-6) [21%]; M: 4 (2-6) [24%]
Day 1 Pain at rest [% severe pain]	F: 3 (2-5)* [8%]; M: 3 (1-4) [6.5%]	F: 2 (0-4) [7%]; M: 2 (0-4) [6%]	F: 2 (0-4) [5.5%]; M: 2 (0.5-4) [6.5%]
24h analgesics use	F: 22mg (12-36)*; M: 28mg (16-46)	no difference	no difference
Day1 PONV (%)	F: 12.2%*; M: 5.6%	F: 3.6%; M: 1.1%	F: 1.7%; M: 0.4%

*P<0.05 between female (F) and male (M) patients

Mean values of Visual Analogic Scale measured during first 72h

VAS (0 to 10) (mean values)	0 h	1 h	2 h	Ward arrival	24 h	48 h	72 h
Peridural	3.2	2.8	2.6	2.4	1.3	1.9	1.6
Preperitoneal	3.1	4.1	3.9	3.8	2.9	2.7	1.8

Conclusion(s): In our study, the use of a preperitoneal continuous infusion of local anesthesic gave the patient a relief of postoperative pain after colorrectal surgery comparable to peridural analgesia. Preperitoneal analgesia is an effective and safe tool to control pain after colorrectal surgery, as an alternative to the widespread use of neuroaxial techniques.

14AP12-3

The hemodynamic and postoperative pain control effect of interscalene nerve block and general anesthesia for arthroscopic shoulder surgery

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Background and Goal of Study: Arthroscopic shoulder surgery are less invasive than open surgery, but we often experienced intraoperative hemodynamic instability and severe postoperative pain. Preoperative interscalene block and combinations of general anesthesia of volatile agents are shown to be provide hemodynamic stability and effective in alleviating pain after shoulder arthroscopy. We performed a prospective randomized clinical trial that influence of preoperative interscalene block on hemodynamic stability when received inhalation anesthesia with sevoflurane during arthroscopic shoulder surgery and postoperative pain scores.
Materials and Methods: Forty patients undergoing elective arthroscopic shoulder surgery for rotator cuff repair were randomly allocated to two groups. 5 minutes before the beginning of the operation, interscalene block with 10cc of 0.5% ropivacaine monitored by nerve stimulator. Anesthesia was induced with intravenous Propofol 2 mg/kg, rocuronium 0.6 mg/kg. The hemodynamics were recorded before incision and 1,3,5,10,20 minutes after insicion. And the visual analog scale pain scores were recorded 1,2,6,12,24 hours after operation.
Results and Discussion: The hemodynamics were significantly more stable in group 1 than 2 ($P < 0.05$). Compared with the control group, the interscalene block of ropivacaine resulted in significantly reduced additiolal analgesics. And the postoperative pain scores are lower than control group during 1 ~ 12 hours after surgery.
Conclusion(s): Interscleane nerve block was effective for controlling the hemodynamic changes during shoulder arthroscopic surgery and reduced the postoperative pain during 1 ~ 12 hours after operation.

14AP12-4

Preemptive intraperitoneal bupivacaine and intravenous paracetamol in postoperative pain after major abdominal surgery

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Background and Goal of Study: There is a constant need to improve the quality of postoperative pain management following major abdominal surgery. This study was designed to investigate whether preemptive intraperitoneal bupivacaine and intravenous paracetamol affect postoperative pain after major abdominal surgery.
Materials and Methods: 78 patients scheduled for major abdominal surgery were selected. They were randomly assigned, in a double-blind manner, to receive 30 minutes prior the end of surgery either intraperitoneal bupivacaine 0.25% (50 ml) plus intravenous paracetamol (1g=100 ml) (group S, n=39) or the corresponding volumes of normal saline in peritoneal cavity and intravenously, respectively (group C, n=39). Patients received a standard anesthetic protocol and continuous epidural analgesia with ropivacaine 0,25%, postoperatively (10-15 ml/h). Pain evaluation (VAS) was assessed every 4 h during first 24 h postoperatively. When patients referred VAS>3, i.v. morphine was added as rescue analgesia. Total morphine consumption, time to first supplementary analgesic demand and nausea occurence within 24h after surgery were recorded. Patient satisfaction, using a questionnaire to be completed the day after surgery, was controlled, too.
Results and Discussion: Groups were similar regarding demographics, complexity and duration of surgery. Statistically significant differences in the mean VAS level were noted at 4 ($p<0.001$), 8 ($p<0.002$) and 12h postoperatively ($p<0.001$) favourable to group S, whereas for the other examined time-points, the pain score registered comparable values in both groups ($p>0.35$). There was an explicit decrease in time to first additional analgesia request (4.8+/-3.6 vs 9.3+/-4.6, $p<0.05$), as well as in total morphine consumption (3.8+/-1.6 vs 9.2+/-1.9, $p<0.001$) in group S compared to group C. Rate of nausea was significantly lower in group S, too (5/39 vs 14/39, $p<0.05$). Patients belonging to group S rated the quality of pain management significantly more often as adequate, compared to those from group C ($p<0.05$).
Conclusion(s): Our results suggest that preemptive intraperitoneal bupivacaine associated to intravenous paracetamol appear to have significant analgesic properties, thus improving pain management, especially during early postoperative period after major abdominal surgery.

14AP12-5

Intraperitoneal administration of ropivacaine during laparoscopic cholecystectomy

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Background and Goal of Study: Intraperitoneal administration of local anesthetic has proven to be effective in the relief of postoperative pain, nausea and vomiting after laparoscopic operations. The aim of the present study is to evaluate the effectiveness of intraperitoneal ropivacaine administration on postoperative pain, nausea and vomiting (PONV) in non-complicated laparoscopic cholecystectomy.
Materials and Methods: In the present double-blind placebo controlled study we included 52 patients which were subjected to non-complicated laparoscopic cholecystectomy. The mean age was 51 years (range 35-66y). By using computerized table-randomization and applying the 3/2 rule we formed two groups. In group A (32 patients), ropivacaine was administered intraperitoneally to the subdiaphragmatic and subhepatic space. In group B (20 patients) saline solution was administered to the same spaces. All patients received a standardized anesthetic protocol. PCA was applied to all patients. We recorded the time of the first analgesic demand, the total amount of morphine received through PCA in the first 24 hours, VAS of pain on the 1st, 4th, 8th and 24th hour, hemodynamic parameters and PONV.
Results and Discussion: Both groups were comparable concerning epidemiologic and intra-operative characteristics. Two patients in groups A had pain VAS>3, while all patients of group B had pain VAS>3 on the first hour ($p>0.001$). All patients in group B had immediate start of PCA, while in group A the mean start of PCA was at 142minutes ($p>0.001$). Immediately postoperatively we had 12.5% of vomiting (4 patients) for group A and 25% (5 patients) for group B (p= ns). Four hours later vomiting was 3.1% and 5% for groups A and B respectively (p= ns), while there was no vomiting for both groups at 24 hours. The nausea scores one hour postoperatively, were statistically different between groups A and B ($p<0.001$) with means of 1.123 and 4.46 respectively. At four hours the means for groups A and B were 0.78 and 2.72 ($p<0.02$). No nausea was noted on 24 hours. All patients were hemodynamically stable and without drug related side-effects.
Conclusion(s): Intraperitoneal administration of ropivacaine intraperitoneally seems to significantly decrease the analgesic demand in the immediate postoperative period. Additionally, it seems to decrease postoperative nausea in the first postoperative hour.

14AP12-6

Trans-abdominal plane (TAP) block analgesia in day case laparoscopic cholecystectomy – A prospective study

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Background and Goal of Study: The Transverse Abdominal Plane (TAP) block is a regional anaesthetic technique which infiltrates local anaesthetic between the internal oblique and transverse abdominus muscles. We prospectively evaluated assess the efficacy of this technique in day-case laparoscopic cholecystectomy.
Materials and Methods: A consecutive cohort of 40 patients undergoing day-case laparoscopic cholecystectomy had a bilateral TAP block administered by a single Consultant Anaesthetist following induction of anaesthesia. Postoperative pain scores were prospectively quantified in the recovery bay by nursing staff using an analogue scoring system (range of 0-3). Patients were then phoned on Day 1 post-surgery and asked to quantify their pain using a Visual Analogue Score (0-10). These scores and clinical outcomes were then compared with a contemporaneous control cohort of 40 patients who underwent laparoscopic cholecystectomy without TAP block.
Results and Discussion: There were no adverse events associated with the insertion of TAP block. The mean anaesthetic time was not significantly increased in the TAP block group as compared with the control group (16 ± 0.5 mins vs. 18 ± 1mins; $p=0.11$). Patients who underwent TAP block had significantly lower pain score in recovery as compared with the control group (0.13 ± 0.09 vs. 0.90 ± 0.17; $p =0.003$). However by day 1 post surgery, the patients pain scores were not significantly different in either group (3.73 ± 0.41 vs 3.69 ± 0.35; $p =0.94$).
Conclusion(s): The TAP block is a safe and effective technique which provides superior short-term analgesia for patients undergoing day-case laparoscopic cholecystectomy.

14AP12-7

Continuous epidural analgesia or patient-controlled regional analgesia for radical retropubic prostatectomy. A randomized, double-blind study

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Background and Goal of Study: Postoperative pain after radical retropubic prostatectomy (RRP) is moderate to severe, but is often self-limiting and of short duration (< 48 h). The primary aim of the present study was to assess whether LA injected via retropubic, intra-abdominal catheter provides similar analgesia compared to EDA following radical retropubic prostatectomy.
Materials and Methods: 50 patients, ASA 1-2, were recruited for this prospective, double-blinded study. They were randomized into two groups: Group P, 25 patients (PCRA-Patient Controlled Regional Analgesia-Ropivacaine 2 mg/ml): patients could self-administer 10 ml of study drug via the intra-abdominal catheter as needed, maximum one dose per hour for 48 hours. These patients had a continuous infusion of 10 ml of 0.9% NaCl in the epidural catheter. Group E, 25 patients (Epidural Analgesia-Ropivacain 1mg/ml, fentanyl 2 µg/ml, adrenalin 2 µg /ml): 10 ml/h infusion via an epidural catheter for 48 hours and self-administer 10 ml of 0.9% NaCl intra-abdominally via the PCRA as needed. Primary end-point was pain at incision site 4 h postoperatively. Rescue medication in all patients was morphine IV as required. Secondary outcomes included: pain on coughing, morphine consumption, maximum expiratory pressures, length of hospital stay and adverse events.
Results and Discussion: Significant differences in pain intensity were found between the groups at rest and on coughing at 4 and 24 h after the operation ($p < 0.01$). Morphine consumption was significantly greater in the PCRA group compared to EDA group ($p < 0.01$). The maximum expiratory pressures were higher in the EDA group compared to PCRA group ($p < 0.01$).
Conclusion(s): EDA provides excellent postoperative analgesia with better preservation of expiratory muscle strength without any major adverse events compared to patient controlled regional analgesia and can be considered to be the gold standard in pain management following RRP.

14AP12-8

Lornoxicam versus paracetamol: Effects on endocrine stress response at the postoperative period

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Background and Goal of Study: The stress response to surgery and pain is characterized by hormonal changes. We aimed to investigate the effects of intravenous lornoxicam and paracetamol on the regulation of the endocrinological stress response and analgesia at the postoperative period in patients who underwent thyroidectomy under general anesthesia.
Materials and Methods: 60 ASA I-II women, aged between 18-65 years were assigned to lornoxicam (Group L; n=30) and paracetamol groups (Group P; n=30). The patients with a history of a pain therapy were excluded. The anesthesia was induced with propofol and fentanil and maintained with sevoflurane. The patients of group L were given 8 mg lornoxicam at the time of extubation and postoperative 12. hours (total 16 mg). The patients of group L were given 1 g paracetamol at the time of extubation and with 8 hours intervals in postoperative 24 hours (total 4 grams). Blood samples were taken one hour before the surgery, at the time of extubation and at postoperative 1. and 24. hours to measure and also compare the levels of adrenocorticotropic hormone (ACTH), cortisol, insulin and growth hormone (GH). Urine samples were collected 12 hours before and after the surgery to measure the urine catecholamine metabolites. Postoperative pain was evaluated with VAS. Comparative analyses were performed with Wilcoxon's test. The effects of anesthesia on stress hormones were compared with Friedman's test.
Results and Discussion: The levels of the hormones and hormone metabolites were in normal range before the surgery in both groups. ACTH, GH and cortisol levels were elevated at the extubation whereas insulin was reduced. ACTH, GH and cortisol levels were still high but tend to decrease at the first hour after the surgery. At the end of the study, ACTH, GH, insulin and cortisol levels returned to normal range. These changes were more significant in lornoxicam group compared to paracetamol group. Urine catecholamine levels were in normal range before the surgery and elevated at 12. hours after the surgery in both groups. The changes were similar between groups. VAS scores of group L was significantly lower than group P.
Conclusion(s): This study has shown that surgical stress has significant effects on stress hormone response and these effects may be restored with effective pain therapy. We think that lornoxicam is superior for postoperative pain relief compared to paracetamol and this is attributable to the anti-inflammatory properties of lornoxicam. In spite of this, both drugs are effective for postoperative analgesia.

14AP12-9

Comparison of analgesic efficacy of intravenous paracetamol and intravenous dexketoprofen trometamol after total abdominal hysterectomy

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Background and Goal of Study: We aimed to evaluate analgesic efficacy, opioid-sparing and opioid-related adverse effects of intravenous paracetamol and intravenous dexketoprofen trometamol in combination with iv morphine after total abdominal hysterectomy.
Materials and Methods: Sixty ASA I-II patients scheduled for total abdominal hysterectomy were enrolled to this study. Standard general anesthesia was performed to each patient. Patients were randomly divided into three groups. Paracetamol 1g in Group I (Paracetamol group n=20) and 0.9% NaCl 100 ml in Group III (placebo group n=20) was infused at the end of the operation and at 6 hours intervals over 24 hours. Dexketoprofen trometamol 50 mg in Group II (Dexketoprofen group n=20) was infused at the end of the operation and at 8 hours intervals over 24 hours. Intravenous patient-controlled analgesia (PCA) morphine programmed as 1 mg bolus 10 minutes locked-out interval was used as a rescue analgesic in all groups. Pain was evaluated at the end of anaesthesia and at 1st, 2nd, 4th, 8th,12th, 16th, 20th and 24th hours by using Visual Analog Scale (VAS). Hemodynamic parameters, morphine consumption, patient satisfaction and side effects were also evaluated.
Results and Discussion: No statistical significance was observed among the groups according to age, weight, height, BMI (body mass index), ASA, duration of anesthesia, duration of surgery, heart rate, mean arterial blood pressure and sedation scores ($p>0.05$). VAS scores were not statistically significantly different among the groups in all evaluation times ($p>0.006$) but decrease in VAS scores were statistically significant after the evaluation at 12th hour in all groups ($p<0.0006$). Total morphine consumption in group I and II were significantly lower than group III at 12th, 16th, 20th and 24th hours evaluations. Global satisfaction scores of the patients in group III was significantly lower than group I and group II after surgery ($p>0.006$) and the increase in global satisfaction score was significant only in group III ($p<0.0006$). There was no statistically significant difference among the groups according to nausea and vomiting ($p>0.006$).
Conclusion(s): Dexketoprofen trometamol and paracetamol didn't cause significant change on VAS scores but increased patients' comfort on clinical evaluation. Although dexketoprofen and paracetamol significantly decreased total morphine consumption but the incidence of nausea and vomiting were similar among groups which could be the result of gynecologic surgery.

14AP12-10

Effect of thoracic epidural blockade, remifentanil and clonidine on pain and perioperative immune response in patients undergoing lung resection

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Background and Goal of Study: Pain is the most relevant factor for prolonged hospital stay after thoracic surgery and is associated with stress known to alter the Th1/Th2 ratio (T = T helper cells) in the immediate postoperative time. Thoracic epidural block, central α-2-receptor stimulation via intravenous clonidine application and stimulation of opioid receptors can decrease either pain and/ or stress and might therefore influence this immune imbalance. The primary endpoint of the current study was the perioperative Th1/Th2 balance after lung surgery. The secondary endpoints aimed to the incidence of pain and pneumonia.
Materials and Methods: After approval by the ethics committee and informed consent a total of 60 patients were randomized to receive in a double-blinded manner either 1) remifentanil intravenously, or 2) remifentanil and clonidine intravenously, or 3) ropivacaine epidurally. Pain intensity was assessed by the numeric rating scale (NRS). Th1/Th2 ratio was measured using a cytometric bead array. Pneumonia was diagnosed according to the hospital acquired pneumonia criteria of the American Thoracic Society.
Results and Discussion: The Th1/Th2 ratio adjusted for baseline differed between groups over time ($p = 0.012$). On time point end of surgery we assessed no significant difference between the remifentanil and the clonidine group ($p = 0.679$) but a significantly lower ratio in the ropivacaine group compared to the remifentanil ($p = 0.004$) and the clonidine group ($p = 0.019$). NRS scores immediately after surgery were lower in ropivacaine compared with remifentanil and clonidine but achieved only borderline statistical significance. None of the patients developed pneumonia.
Conclusion(s): Intraoperative thoracic epidural block decreases the Th1/Th2 ratio and provides for a better pain therapy immediately after surgery.

Education, Research and Presentation

15AP1-1

Pre-training evaluation and feedback improve undergraduate medical student's performance in basic life support education

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Background and Goal of Study: Feedback during basic life support (BLS) training has variable impact on trainee's performance. This study is to investigate impact of pre-training evaluation and feedback on medical student's performance in BLS education.
Materials and Methods: 40 grade-3 undergraduate medical students were randomly divided into 2 groups, C group (the control) and pre-training evaluation and feedback group (E&F group), each of 20. A 45-minute BLS theoretical l lecture was taught in both groups. Then, the C group received 45minutes BLS simulating training (including individualized feedback). The E&F group was evaluated (video-taped) in a mock cardiac arrest simulation following their BLS theoretical lecture and prior to their BLS training. 15 minutes of corrective feedback related with the students' BLS performance in the pre-training evaluation was given and a 30-minute BLS training was then instructed in the E&F group. BLS training was instructed following the guideline of American Heart Association (2005) in both groups. After BLS simulating training, both groups were evaluated with a12-item multiple-choice written examination and one-rescuer BLS skills in a 3-minute mock cardiac arrest scenario by a blinded certified instructor. Student's t-test was used to compare the difference between the two groups. A $P < 0.05$ was considered to be statistically significant.
Results and Discussion: The mean±SD mark (12 maximum) for the multiple-choice test was 9.5±1.1(C group) *vs* 10.1±1.2(E&F group) (P=0.1);the blinded mock arrest scenario mark (23 maximum) was 14.7±6.4 (C group) *vs* 19.1±0.7 (E&F group) (P<0.05).
Conclusion(s): In undergraduate medical students with no previous BLS training, pre-training evaluation and feedback following theoretical lecture improve their performance in BLS simulating training.

15AP1-2

Scientific contribution of countries worldwide in the ESA meetings (2001-2009)

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Background and Goal of Study: The European Society of Anaesthesiology (ESA) represents the global scientific activity of the European anaesthesiologists. Ten years ago, we presented one abstract[1] describing the relative and absolute contribution of every country during the first eight ESA meetings (1993-2000). The aim of the study was to analyse the relative and absolute scientific contribution for each country in the ESA meetings from 2001 to 2009.
Materials and Methods: Retrospective descriptive, observational study: all in the ESA journals published abstracts during this period were included and classified according to the origin country of the first author. The total number and percentages of abstracts for each country in each meeting every year were analysed.
Results and Discussion: 6.637 abstracts were published during the last 9 editions of the ESA meeting. The number of the participating countries raised from 39 in 2001 to 49 in 2009; in Munich 2007 the highest number of participating countries (55) was observed. Germany was the most participating country presenting 14.8% of all abstracts over this period, followed by Spain (9.4%), France (7.7%), United Kingdom (7.4%) and Turkey (6.3%). The most active non-European country was Japan (3.8%), followed by the USA (3.1%) and Korea (2.8%). Considering countries from East Europe, Poland wrote 1.7% of all abstracts. The European country that showed the most increasing contribution throughout the 9 years was Spain improving from the seventh place in 2001 to the first in the last two meetings (Copenhagen and Milan). The three countries presenting the most abstracts related to their population were Belgium, Greece and Switzerland.
Conclusion(s): In the last nine years of the ESA congress history, scientific participation has become more and more popular. The Mediterranean countries have been increasing very significantly their scientific activity and contribution in the ESA meetings over the last years, and also countries coming from East Europe and Asia are showing a trend to a stronger participation. Spain is the country with the highest number of presented abstracts in the last two years. We conclude highlighting the raising importance of the ESA as a solid scientific society not only at European level but also worldwide.

Reference:

1 Canet J, Bassons J. What countries are contributing scientifically to the ESA meetings? 9th ESA Annual Meeting. Gothenburg. April 2001. *European Journal of Anaesthesiology* 2001; 18 (Sup 19):A14.

15AP1-3

Problem-based-learning in anaesthesiology: Eight years implementation in undergraduate medical students

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Background and Goal of Study: Problem based learning (PBL) involves the medical student in a process through which problem-solving skills are developed and self-education gained, in preparation for a successful professional life. We began to use PBL in 2000 in our undergraduate optional course of Anaesthesiology with the aim of adapting our curriculum to the educational innovations planned for 2010 (Bologna Declaration). The aim of this study was to analyse the eight years' experience of our PBL implementation and to assess its effectiveness and workload of students and tutors.
Materials and Methods: Educational objectives were included in 12 PBL-sessions. During each session the tutor evaluated content, oral presentation and development of PBL-related competencies such as ability to work in a team, interpersonal skills, problem solving, self-directed learning, information gathering, and tasks supporting competencies. At the end of the course the students were asked to take an anonymous, voluntary test (100 true/false items) to assess acquired theoretical knowledge. The same test was repeated with the same students one year later. The baseline profile of the students regarding transversal competencies (instrumental, interpersonal and systemic) was self-evaluated in the first and last day of the course using a structured questionnaire as described in the Tuning Project. PBL-related workload and levels of acceptation and satifaction of students and tutors were measured. Data are presented as percentages and absolute values.
Results and Discussion: We enrolled a total of 222 5th year medical students from 2000-2008 (75% female/25% male) with a mean age of 22.8 yrs. – The levels of acceptation and satisfaction of students and tutors were excellent (8.2 out of 10). – Immediately after the course the average score of the test was 7.2 out of 10 and 8.02 one year later (p=0.002). – All transversal competencies improved significantly during the course (p= 0.041). – The initial estimated workload of students for each PBL session was 8.6 hours and the measured real workload was 17.1 hours. -The estimated workload for the tutors was 11.1 hours per session.
Conclusion(s): PBL is an effective method for meeting educational objectives among undergraduate students of Anaesthesiology: it enhances a better retention and assimilation of knowledge as a long term effect and helps students to improve their transversal competencies. The levels of acceptation and satisfaction of both students and tutors are excellent but their PBL-related workoverload is still a problem.

15AP1-4

www.AnestesiaR.org: A Web 2.0 experience

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Background and Goal of Study: Web 2.0 tools have attracted considerable attention as a means to improve health care delivery. Despite awareness of information credibility risks with Web 2.0 content, it has a role in information seeking for both clinical decisions and medical education (1). These new generation of Internet services enrich the web experience, as information is continually requested, consumed and reinterpreted, and where knowledge exchange is not controlled by private interests (2). Our aim was to develop an anaesthesia centred Web 2.0 space to help communication between Spanish speaking clinicians.
Materials and Methods: The AnestesiaR Weblog (www.anestesiar.org) was launched in September 2008. Scientific collective posting and commenting was encouraged, as well anaesthetists mail subscription. To increase participation, different anaesthesia workgroups were contacted and invited to use AnestesiaR as their Internet communication channel. In January 2009 the Electronic Journal of AnestesiaR was created (www.anestesiar.org/rear/) registered with an ISSN 1984-4090. The editorial board makes a systematic search of anaesthesia related publications. These papers are reviewed, translated, summarized and criticized. Articles are then published at the AnestesiaR WebBlog open for comments. These might be included in the definitive publication at the electronic journal later on.

Results and Discussion: Since its creation, up to date, 255 posts have been published. AnestesiaR pages have been loaded 217.313 times (up to 400 daily visits), it has 700 subscribers and 163 reviewers. Most of the visits come from Spain. Surprisingly 35.500 visits where from 98 different countries most of them Spanish-speakers such as Mexico, Colombia, Argentina and Peru. During 2009 several workgroups have joined AnestesiaR: SENSAR (Anaesthesia Spanish Safety Notification System), GATIV (Total Intravenous Anesthesia WorkGroup), GTIPO-SEDAR (Spanish Perioperative Infections WorkGroup).

Conclusion(s): Web 2.0 tools are increasingly used by Spanish speaking anaesthesiologists. AnestesiaR web is becoming a resource for continuous education and scientific discussion of increasing interest. Apart from language barriers, Web 2.0 help to establish communication between colleagues from abroad regardless their nationality.

References:

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2 Giustini D. How Web 2.0 is changing medicine. BMJ 2006;333:1283-1284.

15AP1-5

Comparison of one- versus two-person teaching of bag-valve-mask ventilation

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Background and Goal of Study: The best method for teaching bag-valve-mask ventilation (BVMV) is not defined. Our aim was to compare the efficacy of teaching BVMV performed by one or two persons assessing technical skills.

Materials and Methods: A prospective, controlled study was conducted during a certified BLS course. BVMV was taught to be applied by one person (Group 1) or two persons (Group 2). We registered participants' previous training and their clinical experience on BVMV. The efficacy of ventilation was assessed before (T1) and immediately after teaching (T2) with a ResusciAnne® SkillReporter™ manikin of BLS (Laerdal®) during one minute.

Results and Discussion: Sixty participants, 43 nurses and 17 medical doctors, were included in the study (Group 1, n=60; Group 2, n=31). Demographic data: median (P 25 -P 75) years of professional experience was 4 (2-7); 90% of participants had performed previously BVMV on a patient and their pre-study self-assessment was "acceptable". Before teaching, mean tidal volume and minute volume were significantly higher in Group 2 (t-test, $p = 0.005$ and $p = 0{,}047$, respectively). After teaching, there were more participants performing excessive ventilations in Group 2 (Chi-square test, $p = 0.03$). Group 1 improved the percentage of correct ventilations (Wilcoxon test, $p = 0.01$).

Data recorded before (T1) and after (T2) BVMV teaching

	Group	T1	T2
Mean tidal volume (mL)	G1	458.8 (191.2)	505.8 (105.2)
	G2	587.7 (201.4)*	556.1 (143.4)
Ventilations min-1 (n)	G1	26 (17.2-34.5)	25 (22-30.7)
	G2	27 (21-31)	25 (19-28)
Volume min-1 (L min-1)	G1	12.1 (6.9)	13.2 (4.1)
	G2	15 (6.1)*	13.2 (4.9)
Percentage of correct	G1	9.5 (0-50)	30.5 (8.2-68.2)#
ventilations (b)	G2	30 (0-55)	45 (15-76)
Participants who performed	G1	8 (13.3)	3 (5)
excessive ventilations (a)	G2	7 (22.6)	6 (19.4)*
Participants who performed	G1	43 (71.7)	47 (78.3)
insufficient ventilations (a)	G2	22 (71)	21 (67.7)
Participants who performed	G1	27 (45)	24 (40)
ventilations too fast (a)	G2	16 (51.6)	15 (48.4)

(a) number of participants (%); (b) median (P25-P75). (*) p <0.05 between groups; (#) p<0.05 versus T1 within the group

Conclusion(s): A two-person teaching of BVMV did not improve the efficacy of the skill and was associated with a higher risk of hyper-ventilation compared with the one-person teaching. More educational research is warranted to further improve this competence.

15AP1-6

Schools of anaesthesia in the United Kingdom. How much they publish?

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Background and Goal of Study: Recently Bulletin of The Royal college of Anaesthetists published an article on review of schools of anaesthesia in the united kingdom. It concluded all but one of the 27 schools reviewed attained overall grade of good. The schools were reviewed under various headings including Academic and research opportunities. We decided to compare the schools of anaesthesia in terms of publications acheived by the trainees.

Materials and Methods: We analysed the journal Continuing Education in Anaesthesia, Critical Care & Pain published jointly by the royal college of anaesthetist and british journal of anaesthesia. Our primary aim is to identify the number of publications acheived by trainees from the schools of anaesthesia. We also tried to group the articles under catagories to identify the areas of publication. Articles published by the Continuing Education in Anaesthesia, Critical Care & Pain over the last 3 year period from february 2007 to december 2009 were analysed.

Results and Discussion: There were 123 articles published with the majority of authors from the united kingdom. Consultants or lectures were solely responsible for only 34 articles. For the remaining articles either sprs, sho, clinical fellow, research fellow or staff grades were atleast one of the authors.

schools of anaesthesia and the number of authors

school name	number of authors
London	10
nottingham	10
north west	13
scotland	8
wales	1
leeds	12
leicester	8
anglia	6
birmingham	5

Conclusion(s): Schools from central england publish more articles than any other regions. More than half of the published articles are from these areas. There may be a variety of reasons for these schools outperform others. Schools from other regions should take part actively in research and publication to prove good training.

15AP1-7

ReAR: One year of experience of a novel anaesthesia electronic journal

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Background and Goal of Study: Scientific literature, even if we stick to a sole speciality such as anaesthesiology, is so prolific that being updated can be unfeasible. Language difficulties, especially for the non-speaking anaesthesiologists are, unfortunately, a true barrier for continuous education in many countries. We aimed to implement an anaesthesiology publication to help Spanish speaking anaesthesiologists to read a translated and commented abstract of the relevant scientific papers.

Materials and Methods: Taking advance of the new web 2.0 technologies, we launched the AnestesiaR Electronic Journal on January 2009. The journal was integrated in a broader website that included weblog, forums and twitter micro blog. We registered the journal at the Spanish National Library, retrieving an International Standard Serial Number (ISSN 1989-4090). We formed an editorial board (EB) of eight anaesthesiologists that systematically searched for relevant anaesthesia related papers. We contacted a larger reviewers board directly or thought the weblog registration form. The EB submitted to our reviewers and asked to be abstracted, translated to Spanish and commented from a methodological and clinical point of view. We established the article word limit in 1000 words in order to maintain them short enough to be read in a few minutes. Every article contained these sections: Complete reference, introduction, abstract, comment and bibliography. Every reviewed paper and the discussion bibliography were linked to the PDF paper (when available for free) and the PubMed abstract to encourage our readers to read the original papers. In order to receive all points of view, articles were published at the weblog and received comments and critics from the readers before being definitely published at the electronic journal. The EB had the final word to decide what comments were suited to be published to complete the articles.

Schools of anaesthesia and the number of authors

School name	Number of authors
London	10
nottingham	10
north west	13
scotland	8
wales	1
leeds	12
leicester	8
anglia	6
birmingham	5

Results and Discussion: During 2009 twelve issues were released with 54 articles written by 45 authors. Topic classification can be seen in table.

Conclusion(s): Web resources can help in the anaesthesiologists continuing education. We have implemented an independent tool that may help Spanish anaesthesiologists to be updated in the relevant scientific papers with a little waste of time.

Acknowledgements: To all our reviewers and the rest of the editorial board that voluntary contribute to the journal.

15AP1-8

Anaesthesia through the media, a six year review

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Background and Goal of Study: Information is critical for quality and safe anaesthesia care. Adequate patient education through information about the role of anaesthesia, and what anesthesiologists responsabilities are during their performance will induce on health consumers a more clear picture on whom we are and what we do. How media can impact anaesthesia perception and add social value to our speciality.

Materials and Methods: Search in 246 different media (newspapers, magasines, television, radio) identified 928 printed news, radio and tv programs or shows from January 1th 2004 to November 30th 2009, which included the word "Anaesthesia" in the national language. Each article was evaluated whether it conveyed a positive, negative, or neutral image of anesthesia. News regarding quality and safety of anaesthesia without the contribution of an anaesthesiologist were ranked as negative.

Results and Discussion: Media sources were divided in twelve types of media: sports(2,15%), health(1,4%), economics (3,54%), medical (13,86%), healthcare (1,4%), man (0,43%) and women (10,42%) publications, generalists publications (44,36%), generalist media with health supplements (10,96%), radio (2,69%), TV (6,34%), other specialized publications (2,47% e.g. education, motherhood, ……) Negative news involving Anaesthesia correspond 33,3%; Positive 18,1% and Neutral 48,6%. In 2002 two patients died intraoperatively on the same week in the same hospital (1). The rippple efects of this case extended to 2004, does impacting on the 2004 negative results of this survey. Women publications and life style publications are strong veihcules for Anaesthesia related topics.

Conclusion(s): A single negative case impact a huge number of reports with strong effect on a negative image of Anaesthesia. Generalist non specialized publications only addressed Anaesthesiology related issues in case of poor outcomes. General public health publications and feminine publications are good targets for "General Public" Anaesthesia awareness. Most of the concerned news did not involve any anaesthesiologist which means no accurate information was supplied. Highly visible negative outcomes should be professionaly managed when disclosed to media due to their profound and lasting effects on the credibilaty and image of Anaesthesiology. Anaesthesiologists have a reduced impact on public education regarding anaesthesia through the media. Media as the fourth power must be addressed by anaesthesiologists and their organizations.

Reference:

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15AP1-9

Do the European anesthesia training programs adequately prepare residents for airway management clinical practice? A Cediva experience

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Background and Goal of Study: Despite efforts to structure airway management training, there are few specialized centers in europe and remains a challenge to ensure that every anaesthesia trainee gains sufficient experience in airway core techniques. A fourth year anesthesia resident, with no previous experience in fiberoptic airway instrumentation, participated in a 16 hours training course on fiberbronchoscopic techniques followed by a 200 hours clinical rotation in a CEDIVA center (Centro permanente de Ensenanza e Investigacion de la Via Aerea). The goals were to obtain skills in providing airway management care independently, namely with fiberoptic intubation and to ascertain what could be a reasonable training time.

Materials and Methods: The activities during this clinical placement were manikin training, nasal flexible fiberoptic pharyngo-laryngoscopy in an otorhinolaringology clinic and operating room practice in anesthetised and awake patients. Direct Consultant coaching and video feedback were utilized for teaching and monitoring purposes (time to reach anatomical landmarks, intubation time, vital signs).

Results and Discussion: An airway intervention was performed in 39 patients, using different techniques as follows in Table 1. In respect to fiberoptic intubations, 13 were performed (Table 2). Intubation at first attempt rate was 86%, overall success rate was 100%, intubation time (sec) 90 +/- 34, Spo2 (%) 98 +/- 2, ETco2 (mm Hg) at intubation 35 +/- 4. A progressive reduction in intubation time was noted. The results are compatible with previous studies.

Table 1

Technique	Equipment	Number of patients
Bag-mask-valve Ventilation, Conventional Direct Laryngoscopy	MacIntosh blade	8
Awake Fiberoptic Pharyngo-Laryngoscopy / Intubation	FOB (3mm OD)	10
Anesthetised fiberoptic intubation	FOB (Anesthesia)	12
Rigid Fiberoptic and Videolaryngoscopic Devices	Bonfils, Airtrach, Glidesope	3
Extra-glottic Devices	cLMA, pLMA, iLMA, fLMA, i-Gel and disposable versions	5
Surgical airway FBO assisted	FBO	1

FOB - fiberoptic bronchoscope

Table 2

Intubation at first attempt rate	86%
Overall success rate	100%
intubation time (sec)	90 +/- 34
Spo2 (%)	98 +/- 2
ETco2 (mm Hg)	35 +/- 4

Conclusion(s): Airway management is one of the main causes of death, severe brain damage, airway and esophagus injuries. Adequate training can be promoted by mandatory airway rotations and accredited european centers. The CEDIVA centers offers an adequate level of training.

Acknowledgements: Dr. Juan Cardona Dr[ordf]. Francisca Llobell In memory of Dr. Valentin Madrid.

15AP1-10

Distribution of visual awareness in simulation-based scenarios of anaesthesia induction with and without a critical incident

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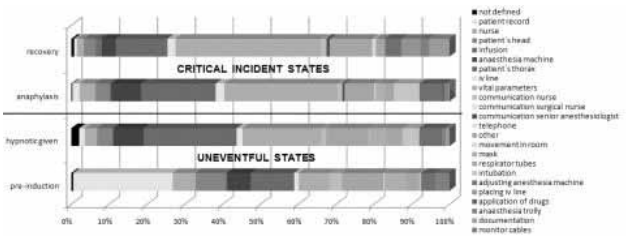
Background and Goal of Study: The non-technical skill situation awareness includes the perception of the elements in the environment within a volume of time and space. So far, little is known about where anaesthesiologists look at to get the relevant visual information (regions of interest). In this study, uneventful anaesthesia inductions were compared with inductions including a critical incident. During these different scenarios, the distribution of visual awareness (VA) was analysed.

Materials and Methods: 15 residents of anaesthesia participated in a crossover trial. Each participant wore a head-mounted eye-tracking camera system (EyeSeeCam) while inducing general anaesthesia in a full-scale simulator. In the second or third session, an anaphylactic shock was simulated. The EyeSeeCam recorded the focused regions using a gaze-driven camera. A priori, 24 different regions of interest (ROI) were defined. For analysis, scenarios were subdivided into 4 simulator states: the uneventful states "pre-induction" and "hypnotic given" and the critical incident states "anaphylaxis", "recovery". In a post-hoc video analysis, time data and classification of ROI revealed information of distribution of VA. After arcus-sinus transformation data were analyzed by ANOVA.

Results and Discussion: Uneventful sessions and critical incident sessions of 7 residents and uneventful sessions of 2 residents were analyzed. Mean duration of trials was 579 (+/-145) s in uneventful sessions and 884 (+/- 199) s in critical incident sessions. Distribution between ROIs depended significantly on simulator state ($p < 0,001$). After induction, 20% of VA was related to vital parameters. In case of the critical incident, this increased to 30%, while VA related to manual tasks decreased slightly. VA related to manual tasks in critical incidents tended to be higher in experienced subjects (not significant).



Conclusion(s): Distribution of visual awareness describes where anaesthesiologists gather information for situation awareness. More detailed analysis in future studies may extract ergonomically relevant scan paths and permit conclusions on performance.
Acknowledgements: We thank J. Vockeroth from Clinical Neurosciences at LMU Munich for technical assistance with the EyeSeeCam.

15AP1-11

Laryngeal mask airway maangement among last year school of medicine students

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Background and Goal of Study: Extraglotic devices could play an important role in initial airway management in cardiopulmonar resucitation, specially between non-experienced providers (1). Teaching medicine students in laryngeal mask airway management is a must (2). Our aim is to assest the ease of insertion and efective ventilation with both devices among last year school of medicine students.
Materials and Methods: Sixth year of School of Medicine Students without any previous contact with any extraglotic device were included from two university teaching hospitals. Students were randomly allocated to insert a i-gel laryngeal mask (group I) or LMA-ProSeal (group P). ASA I-II without difficult airway patients scheduled for surgery under laryngeal mask airway management were included, so no need of ethics committe approval was required. After briefing, the insertion technique was taught to the students once, and the student was required to insert the mask for the next patient without any help. Insertion time, number of trials (maximum of 4) and effective ventilation (thorax raise and capnography curve observed) were recorded. Data were analysed with Student's T test, Mann-Withney U or Chi Square as appropiate. A $p<0.05$ was considered significant.
Results and Discussion: A total of 30 medicine student were included, 12 from one hospital and 18 from the other one. One P group student had performed several classic laryngeal mask insertions and was excluded. Data are shown in table 1. In group I the mask was inserted and an effective ventilation achieved. In group P the mask couldn't be inserted in 4 cases (28%), although in the rest of the patients an effective ventilation could be achieved.

Table 1

	Sex (F/M)	Attempts (*)	Effective Ventilation	Time (s)(*)
Group I	12/3	1 (1-3)	15 (100%)	32 (6)
Group P	10/4	3 (1-4)	11 (73%)	98 (9)

p<0.05. Data show number, median (range), number (percentage) or mean (SD)

Conclusion(s): I-gel laryngeal mask is easier to insert than LMA-ProSeal, effective ventilation is achieved in a larger number of cases and time for insertion is shorter. With LMA-ProSeal, insertion time could be too long and facial mask ventilation is needed in some cases to prevent patient's desaturarion.
Reference:
1 Resucitation 2007;73:161-162. #2. Curr Opin Anaesthesiol 2007;20:595-599

15AP2-1

Should the anaesthetist be a physician? An audit of patients' perceptions

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Background and Goal of Study: The UK public have a poor knowledge of the role of the anaesthesiologist and their medical qualifications. This has remained unchanged since 1978 despite national information campaigns[1]. With the introduction of Physician's Assistants in Anaesthesia (PA) into UK practice, we believed that it would not matter to a patient if their anaesthetic was provided by a physician or a non-medical anaesthetist.
Materials and Methods: Following institutional approval, a quality assessment questionnaire was voluntarily offered to adults attending ear, nose and throat (ENT) and gynaecology clinics. Patients were asked if they had received any information or had had a previous anaesthetic. Further questions asked who they believed would and should administer the anaesthetic, if a physician should be present at all times in the operating theatre, if patients would feel safe with a non-medical anaesthetist, whether the presence of a physician would change their mind and if they would delay their procedure so a physician could administer the anaesthetic.
Results and Discussion: 288 patients were surveyed (188 from ENT and 100 from gynaecology clinics). 38.8% had received information on anaesthesia, and 83.3% had themselves, or a family member, undergone a previous anaesthetic. 62.4% believed a physician would administer the anaesthetic and 62.8% believed this should be the situation. 2.2% felt it didn't matter. 65.6% would feel safe if a non medical anaesthetist looked after them, but 74.2% believed a physician should be present. If a non-medical anaesthetist was due to deliver the anaesthetic, 32.3% would delay the procedure until a physician was available to anaesthetise them at a later date.
Conclusion(s): Although the public perception of the role of the anaesthesiologist has been shown to be unclear, in this sample the majority believe anaesthesiologists are doctors and that anaesthetics should be given by physicians. Nearly three quarters of patients believe a physician should be present during a procedure, although, just over two thirds of patients would not delay their procedure if only a non-medical anaesthetist was present. The introduction of the Physician Assistants into UK practice does not remove the perceived need for medically qualified anaesthesiologists.
Acknowledgements: We are grateful to all those who completed questionnaires and to Deborah Jones for administering them.
Reference:
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15AP2-2

Patient view of the role of anaesthesiologists: An Italian multicenter study

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Background and Goal of Study: The interest for an acknowledgment of their professional role has strongly increased in recent years among anesthesiologists. Previous studies have shown several misconceptions regarding the anaestheiologist's role. The aim of the present study was to evaluate the patient perception of the role of the anaesthesiologist.
Materials and Methods: With Ethical Committee approval, patients undergoing elective surgery were asked to complete a questionnaire regarding their perception of the role of the anaesthesiologist. Patients were enrolled and filled in the questionnaire while they were waiting to undergo the anaesthesiological preoperative evaluation. The study took place in Italy and was carried out in 5 hospitals: the Parma university hospital, the Reggio Emilia "Arcispedale Santa Maria Nuova" hospital, the Montecchio Emilia "E. Franchini" hospital, the Scandiano "C. Magati" hospital and the Guastalla civil hospital. Data are expressed as number of answers (percentage of group total).
Results and Discussion: A total of 531 patients were enrolled in the study, with an average age of 56±16 years. Main results are shown in the table.

Questionnaire

Questions	Options	No. (%) of answers
Is the anaesthetist a doctor?	Yes	472 (88.9%)
	No	16 (3.0%)
	Don't know	43 (8.1%)
Do you have a favourite anaesthetist?	Yes	88 (16.6%)
	No	440 (82.9%)
	Don't answer	3 (0.6%)
Do you have a favourite surgeon?	Yes	310 (58.4%)
	No	217 (40.9%)
	Don't answer	4 (0.8%)
Have you already had anaesthetics in the past?	Yes	448 (84.4%)
	No	78 (14.7%)
	Don't answer	5 (0.9%)
In case you already had anaesthetics, did your anaesthetist explain his/her role?	Yes	139 (31.0%)
	No	203 (45.3%)
	Don't remember/ Dont' answer	106 (23.7%)
In case of need, who attempts patient's CPR in the operating room?	Cardiologist	125 (23.5%)
	Surgeon	76 (14.3%)
	Anaesthetist	308 (58.8%)
	Nurse	13 (2.4%)
	Don't answer	9 (1.7%)

Conclusion(s): According to our results, patients perception of the role of anaesthesiologists is still far from recognizing the value of this professional figure. Reasons for this finding could be several, although in our opinion anaesthesiologists have to further assert their role. This could be obtained with a greater communicative effort both in the physician-patient relationship and, possibly, through media.

15AP2-4

Medical undergraduate students' attitudes towards medical errors

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Background and Goal of Study: Teamwork climate and patient safety are important parts of anaesthetists' work. In a recent review, residents' attitudes towards medical errors were affected by the culture of their institutions (1). The purpose of this pilot study was to identify medical undergraduate students' perceptions about medical errors prior to a course using high-fidelity simulation as a teaching method.

Materials and Methods: A questionnaire was distributed to 120 fourth year medical students attending hands-on session of advanced life support in groups of 7-9 students. The students had just started their clinical years. In the questionnaire, there were 20 items about patient safety (2). The questions were answered using Likert scale (1 = totally disagree, 7 = totally agree). Factor loading of the questionnaire was made using maximum likelihood analysis and varimax rotation. Five scales were constructed (*Analysis, Consequences, Blaming, Report, Shame*). Cronbach's alpha were adequate (0.72-0.50). Statistics: Student's t-test, ANOVA, Pearson Correlation.

Results and Discussion: Eighty-three students (68,3%) returned the questionnaire, 50 of them female (60.2%). Sixty-six students (79.5%) had working experience as nurses or health care technicians during their preclinical years. Working experience did not correlate with the five scales. The students were positive towards scales *Analysis* of errors (scale mean 5.59, SD 0.56) and *Reporting* (scale mean 5.58, SD 1.03) and negative about feeling *Blamed* (scale mean 2.02, SD 0.72). Female students were significantly more positive towards scales *Report* than male students (scale mean 6.12 vs. 5.54, $p<0.05$) and *Analysis* (mean 5.72 vs. 5.38, $p < 0.05$). There was negative correlation between scales *Report* and *Blaming* ($p<0.05$).

Conclusion(s): The students' general attitudes towards patient safety were as favourable as hoped for. However, there was a subgroup of students feeling reluctant to report medical errors. These attitudes were not correlated with their previous working experience. This pilot study suggests, that environmental barriers making physicians reluctant to engage in institutional error reduction exist already after their preclinical years. Our course will focus on identifying and reporting medical errors embedded in the scenarios.

References:

1 Padmore JS et al. Acad Med 2009; 84: 1765-1774.

2 Bechtold et al. Qual Saf Health Care 2007; 16: 422-427.

15AP2-5

Reasons to choose anaesthesiology: A survey among the residents of anaesthesia in Madrid (Spain)

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Background and Goal of Study: The aim of this study was to determine why the residents of anaesthesiology and reanimation (R-AR) had chosen the specialty, and analyze if this decision was related to its areas of expertise or if other aspects had influenced their decision.

Materials and Methods: An anonymous survey was sent to the R-AR of Madrid Community (CM), evaluating socio-demographic variables (age, gender, and nationality), pregraduate personal experience in anaesthesia (PPE), and if they had a previous medical specialty. Possible reasons for choosing the specialty were organized in four categories: 1. field of practice, 2. organization of work, 3. social aspects, and 4. personal reasons. Every category was divided in items. All the items were punctuated by R-AR from 1 (not important) to 5 (very important). R-AR satisfaction was evaluated globally from 1 to 5, and separately for the quality of training, working topics, social and investigation features of the specialty.

Results and Discussion: 89 of the 120 surveys (74.1%) were returned. There were 29 (32.6%) females and 60 (67.4%) males. Spanish (84.1%) and from non European countries (10,2%). 14 residents (15.7%) had a previous speciality. 39 (43.8%) had a PPE with Anaesthesiology in medical school. In category 1; theorical content for 88 and skills for 87 were relevant and their importance was (from 1 to5) 4.36±0.819 and 4.36±0.853 respectively. The possibility to work in critical care units presented an interest for 83 (93.3%) of the R-AR, and was considered quite important or very important by 80 (89,9%)In categories 2,3 and 4; we found interest for incomes in 68.5% (3.19±1.058) residents. 83% thought they had a prone personality for anesthesia with a score of 3.49±0.848. Some criteria were considered more determinant in by R-AR with a PPE, compared to R-AR with no PPE. The global satisfaction of R-AR was 4.27±0.754. The most valued criteria were the quality of the training (3.81±0.685) and laboral aspects of the specialty (3.86±0.873).

	Interest in pain treatment *		Low risk of burn out♦		Professional model to emulate†	
PPE	No	Yes	No	Yes	No	Yes
No	8 (16%)	42 (84%)	27 (54%)	23 (46%)	39 (78%)	11 (22%)
Yes	1 (2.6%)	38 (97.4%)	13 (33.3%)	26 (66.6%)	21 (53.8%)	18 (46.2%)

**p=0.037; ♦♦p=0.041; †p=0.014. Chi-square tests

Conclusion(s): Technical skills and knowledge are the most attractive aspects for our residents. PPE with anesthesiology change significatively expectatives of our residents, but not their satisfaction.

PPE and choice of the specialty by R-AR

15AP2-6

Trainers and trainees attitudes to training in anaesthesia: Is there a need for change?

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Background and Goal of Study: In the UK teaching for anaesthetic trainees is becoming increasingly challenging. Competency based training coupled with the anticipated effects of the European Working Time Directive will affect training time and it is vital to ensure that the type of teaching received is of high quality and meets the expectations of both the trainees and trainers. A balance must be reached between the trainer safely delivering their clinical commitment and satisfying the educational needs of the trainee. Our aim was to ascertain if there was any difference in the attitudes, of the anaesthetic trainers and their trainees, to current methods of training and teaching available.

Materials and Methods: We conducted a postal survey of all Anaesthetic Consultants within the Central London School of Anaesthesia. Trainees of all grades were invited to complete the same questionnaire on-line using 'Survey Monkey'. The trainees were split into two groups based on having passed anaesthetic specialty examinations. The responses for the trainees and consultants were compared. The survey questionnaire consisted of twelve statements regarding training. The respondents were asked to rate each statement on a four point rating scale.

Results and Discussion: The survey had a 60% response rate. There was agreement amongst respondents that teaching should be conducted during formal allocated sessions, as structured tutorials, and during theatre sessions. There was unanimous agreement that the trainer provides the most compelling lesson through their behavior in theatre. Problem based teaching was popular with the trainers and senior trainees, but not junior trainees with over 65% disagreeing. Over 60% of junior trainees felt teaching on offer was inadequate, whereas consultants and senior trainees disagreed. In addition, there was dissatisfaction amongst trainees with the amount of formal protected teaching, with the majority (37%) receiving less than 2 hours per week.

Conclusion(s): This survey has shown that there is agreement amongst trainees and consultants with respect to appropriate methods of teaching and training, providing a platform from which to initiate change. It is obviously of importance to ensure that sufficient time is allocated to formal teaching but similarly it is important for trainees to realize that a compromise must be achieved and theatre sessions are valuable for experience, learning and self-directed study.

Reference:

1 Greaves D. How to organize a teaching list. CPD Anaesthesia, 2000; 2(3): 122-125.

15AP2-7

A survey evaluating the effect of anesthesia rotation training on clinical practice of residents: A Chinese experience

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Background and Goal of Study: The residents of other departments except anesthesiology didn't rotate to the operating room as old rotation system in Chinese hospitals, as a result that the techniques and knowledge of anesthesia and resuscitation are limited. A new rotation system was implemented in a Chinese university hospital from 2006 that every resident must work in the anesthesiology department for 3 to 6 months. There is pressure to move toward assessment of the training system on clinical practice.

Materials and Methods: The survey used a questionnaire with a series of questions. Survey questionnaires were sent to the residents who once rotated in the department of anesthesiology.

Results and Discussion: Eighty questionnaires were sent in April 2009 and 77 completed ones were returned (response rate 96.25%). With regard to the cognition of anesthesiology, 75.2% of the residents considered that anesthesiologists

were respectable. 79.2% of the respondents thought anesthesiologists had too much work and insufficient family time. As the part of clinical techniques, 98.7% of the residents supported that new system was helpful in improving clinical techniques like intubation, laryngeal mask application and spinal puncture. In medical knowledge, 80.5% and 86.9% of the residents got more familiar with the guidelines of the medicine and fluid treatment respectively. Recently, there are some investigations focuse on the effect of the anesthesia training [1,2]. We carried out the investigation for the effect of the anesthesia rotation training on clinical practice. The data we got proved the advantages of the new system. Other open questionnaires should be taken for training program improvement and future plans.

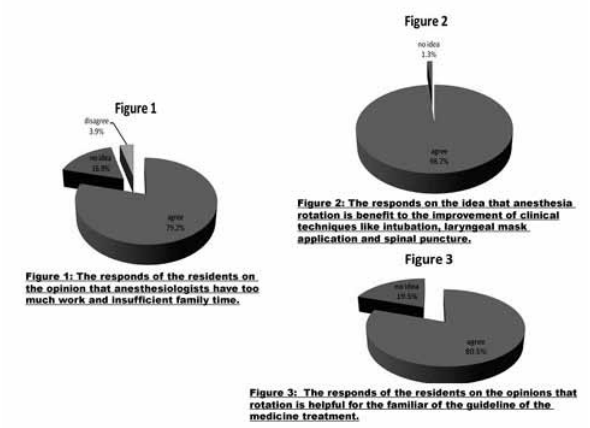

Figure 1 The responds of the residents on the opinion that anesthesiologists have too much work and insufficient family time.

Figure 2 The responds on the idea that anesthesia rotation is benefit to the improvement of clinical techniques like intubation, laryngeal mask application and spinal puncture.

Figure 3 The responds of the residents on the opinions that rotation is helpful for the familiar of the guideline of the medicine treatment.

Conclusion(s): The majority of residents who took part in the new rotation system in a Chinese university hospital are in favor of the implementation of the system.

References:

1 Bowhay AR. An investigation into how the European Working Time Directive has affected anaesthetic training. BMC Med Educ. 2008 Aug 12;8:41.

2 de Oliveira Filho GR, Dal Mago AJ, Garcia JH, Goldschmidt R. An instrument designed for faculty supervision evaluation by anesthesia residents and its psychometric properties. Anesth Analg. 2008 Oct;107(4):1316-22.

15AP2-8

Evaluation of conditions of successful endotracheal intubation from anesthesiological nursing personnel in scheduled operations

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Background and Goal of Study: Education in endotracheal intubation and the familiarity with the management of the airway is a process of great value in anesthesiology. One of the procedures for improving the level of anaesthesiology nursing personnel is to train for the patient's ventilation and the endotracheal intubation in the surgical room. In this study, conditions of sufficient ventilation and successful intubation were estimated.

Materials and Methods: After the written informed consent of 28 patients, a randomized study was undertaken during a time period of 2 months. Sex, age, ASA classification and the type of operation were recorded. Also the possibility of a difficult airway was evaluated preoperatively. The agents mainly used for the induction to anaesthesia were fentanyl and propofol in conjunction with ultiva infusion (<0,05γγ/kg/min). Cis atracurium was the muscle relaxant agent of choice. The sufficiency of ventilation through a facemask was evaluated by chest movements, recorded inspiratory pressures and capnograph and generally the facility of ventilation via corrective maneuvers in the facemask handling. Also were evaluated the successful intubation effort and the difficulty were associated with the probability of a difficult airway. The role of anaeshesiologist remains prominent not only if action is needed after the 2nd unsuccessful attempt of intubation, but also ensuring excellent conditions of induction to anaesthesia.

Results and Discussion: In all cases were recorded excellent conditions during facemask ventilation according to the recorded parameters except one due to poor facemask seal (cone shaped face). All intubations were considered to be with an easy airway and were achieved with the first attempt (21). One was relatively difficult (1) due to the intubation from the anesthesiologist and to bradyarrythmias (HR: 34/min). The remaining six were difficult with increased incidence (4/6) of anticipated difficult airway. In any case we did not observed an airway trauma, bronchospasm during intubation attempts. In one case hemodynamic instability was noted (increased systolic blood pressure) which was treated with propofol.

Conclusion(s): The small sample size does not decrease the value and the role of trained anesthesiology nurse. The high rate of successful intubations is also related with the participation of nurses of high moral status, characterized by their responsibility. Finally the role of anaesthesiologist is stressed out with the application of his knowledge and the improvement of his instructive work.

15AP2-9

A survey of surveys: The attitude of anaesthetists to participation in survey questionnaires and factors to increase the response rate

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Background and Goal of Study: The number of requests made for anaesthetists to participate in survey questionnaires has increased in recent years. With rapid expansion of the Internet and the widespread use of email, electronic questionnaires have the potential to reach a large number of respondents with rapid collection of data at less expense compared with paper questionnaires. One of the main goals in implementing a survey is to maximise the response rate. The purpose of this survey was to evaluate current attitudes of anaesthetists to participating in surveys and to identify factors to maximise the response rate.

Materials and Methods: Anaesthetists working in 2 hospitals were surveyed by face to face interview. A questionnaire was used to elucidate how many requests for survey participation were made in the last 12 months and in what format i.e electronic or paper. Respondents were asked about their attitudes to surveys, response rate and factors that would encourage or discourage response.

Results and Discussion: The sample used were all anaesthetists working in 2 medium sized hospitals. Out of a total of 99 anaesthetists, 82 were surveyed giving a response rate of 83%. 71% of all consultants were surveyed and 94% of all non-consultant grades. This survey showed that the greatest number of survey requests were via the electronic route, with 33% of respondents receiving more than 11 requests for survey participation in the last 12 months. Anaesthetists place little value in surveys with 40% of the opinion that surveys are rarely or never useful. The response rate to surveys was variable and factors which would encourage a response were identified.

Conclusion(s): The increase in the number of survey requests has the potential to lead to 'survey fatigue' with individuals being reluctant to spend time completing numerous questionnaires. This may discourage individuals from responding to future well designed valuable surveys. Our survey has highlighted areas that could improve the response rate. These include obtaining approval for the survey from the hospital research and development department and a regional or national body, making a personal request to the recipient, ensuring good design and offering incentives to complete the questionnaire.

15AP2-10

What makes a good anaesthetist?

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Background and Goal of Study: 'What makes a good Anaesthetist?" A question often asked at anaesthetic interviews, yet one which has no published data for its response. Anaesthetists make up the single largest specialty in the U.K. National Health Service and play a critical part in its running. In view of the range of situations and social interactions that anaesthetists find themselves in, working in this specialty requires a variety of knowledge, skills and attributes including an understanding of not only medicine, surgery and technical equipment, but also communication and interpersonal skills. With the diverse nature of the job in mind, this survey explores the views of anaesthetists in a London teaching hospital when asked the question 'What makes a good Anaesthetist?'

Materials and Methods: We surveyed 50 anaesthetists of all grades at our hospital. Participants were asked to rank, out of 34 choices, the five most important attributes that an anaesthetist requires. They were also encouraged to add other attributes as they saw fit. The 250 responses made were analysed.

Results and Discussion: There was no concensus. The top five most popular answers were, (in order of importance with percentage of responses); 1) Keeping

calm under pressure (12.4%) 2) Clinical judgement (12.0%) 3) Clinical knowledge (11.6%) 4) Communication skills (10.0%) 5) Attention to detail (8.8%)

What Makes a Good Anaesthetist?

ATTRIBUTE	RELATIVE IMPORTANCE (out of 250 responses)
Keeps calm under pressure	31
Clinical judgement	30
Clinical knowledge	29
Communication	25
Attention to detail	22
Knowing your limits	20
Teamwork	19
Technical skills	13
Keeps up to date with research	7
20 Other	54

Conclusion(s): This survey highlights the divided opinion as to what makes a good anaesthetist. 29 different attributes were listed among the respondents' top five. Whilst some attributes feature more regularly than others, such as "keeping calm under pressure" and "clinical knowledge", others hypothesised by us to be important are less so, such as "low morbidity and mortality." The survey has generated much discussion amongst our colleagues. Whilst it would also be interesting to see if the above results are applicable to other European or international countries, we have instigated further work into the subject, as we pose the same question to others from the multidisciplinary team including medics and surgeons. No doubt their responses will prove fascinating and insightful.

Acknowledgements: We would like to thank the department of anaesthesia at UCLH for help with this survey.

15AP2-11

The role and responsibility of anaesthesiologist and anaesthetic nurse before, during and after surgery – Preoperative survey on elective surgery patients in Martin Faculty Hospital – Slovakia

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Background and Goal of Study: The role of the anaesthesiologist as an independent medical specialist and his/her role in patients' view were examined in many international studies. Studies performed in English speaking countries show that only 54 to 89% of patients undergoing surgery realize that their anaesthesiologist has a medical qualification; this number is higher than 90% in German speaking countries and Czech Republic as well. Anaesthetic nurse is the alumna of specialized study, she prepares drugs, equipment and instruments for analgesia or leading anaesthesia. The goal of this survey was to ascertain opinions and attitude of patients hospitalized in Martin Faculty Hospital in Martin.

Materials and Methods: The questionnaire was distributed to patients undergoing elective surgery, one day before the surgery (before the visit of anaesthesiologist or anaesthetic nurse) after obtaining of allowance from the Ethical Committee of Jessenius Faculty of Medicine in Martin. The questionnaire was divided into 3 parts. The questionnaire was concerned on role of anaesthesiologist and anaesthetic nurse, on the attitude towards their importance during the surgery and obtaining information before the operation, postoperative pain treatment and length of their study, and on demographic data.

Results and Discussion: 70 completed questionnaires of 100 distributed were collected. 70% of patients think that the length of study of anaesthesiologists is 6 years, 8% of responders estimated 9 years and no one estimated longer period. 77% of responders would like to meet the anaesthesiologist before the operation. 57% of responders prefer to obtain the information from the doctor, 39% prefer from nurse, 83% of responders think the anaesthesiologist is present during the whole operation. 24%b of responders think the anaesthesiologist helps surgeon with the surgery. 46% of responders think the anaesthesia starts intravenously in the operating theatre, 11% of responders suggested inbreathing of gas, 32% of responders suggest intravenous drug in the department, and 11% of responders peroral tablet in the department.

Conclusion(s): Results showed patients' big interest in information about anaesthesia. There is notable bad awareness about the possibilities of improvement of postoperative pain-treatment. Only 40 % of patients' think there is a possibility to treat their postoperative pain. 86% of patients' considered anaesthesiologist as a physician. However, awareness about the role and responsibility of anaesthesiologist and anaesthetic nurse is relatively low.

Patient Safety

17AP1-1

Implementation of clinical practice guidelines: A multicentre prospective analysis

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Background and Goal of Study: The American College of Cardiology/American Heart Association (ACC/AHA) guidelines recommend an algorithm for a stepwise approach to preoperative cardiac assessment for noncardiac surgery. The purpose of the study was to implement these guidelines by anaesthesiologists and to compare major adverse cardiovascular event (MACE) rates before and after the development of a program focused on the diffusion of these guidelines.

Materials and Methods: A prospective multicentre audit was performed in 23 hospitals during 6 randomized weeks in 2007-2008. Eligible subjects were patients aged ≥ 40 yr undergoing intermediate or high surgery-specific risk of noncardiac surgery. The sample included patients undergoing elective and emergent surgery under general or regional anaesthesia. We collected demographic data, preoperative clinical risk factors (CRF) according to ACC/AHA guidelines, patient functional capacity (METs level), type of surgery, perioperative MACE and mortality until hospital discharge. The implementation program consisted in a three-month period of education and diffusion of the algorithm among anaesthesiologists. We collected data in two phases, before and after the implementation program. χ^2 test was used to compare qualitative variables and t test to compare quantitative variables.

Results and Discussion: 1859 patients in the pre-implantation phase (PRE) and 1529 patients in the post-implantation phase (POST) were included for evaluation. The algorithm was accurately applied in 58.4% of patients in the PRE and 61.9% of patients in the POST (P=0.041). Improvement in the adherence to the algorithm decreased the incidence of perioperative MACE from 5% in the PRE to 3.4% in the POST (P=0.021). Application of the algorithm was higher in intermediate surgery-specific risk patients than in high surgery-specific risk patients (60.6% vs 48.3%, P=0.002). According to the presence of preoperative independent CRF, the algorithm was applied in 67.7%, 43.7% and 43.8% of patients with no CRF, 1-2 CRF and ≥ 3 CRF respectively. Functional capacity was poorly evaluated, 70% of patients.

Conclusion(s): According to our study, the application of AHA/ACC algorithm is associated to a significant reduction in perioperative MACE. The adherence to the guideline was around 60%, however its application decreases in patients undergoing high specific risk surgery and in patients with independent clinical risk factors. More efforts must be made to change the attitudes of anaesthesiologists, especially in the case of high risk patients.

17AP1-2

Introduction of corrective measures after 18 months implementation of a critical incident reporting system

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Background and Goal of Study: Patient safety is the primary focus of a Critical Incident Reporting System (CIRS). It also promotes a patients' safety culture. The aim of this study was to analyse, develop and apply corrective measures after 18 months implementation of a CIRS in our department of Anaesthesiology of a university hospital.

Materials and Methods: A voluntary, anonymous, structured questionnaire form was designed according to the recommendations of the World Alliance Patient Safety. After presentation and distribution throughout our department, the CIR form was implemented in clinical practice. After 18 months' experience, a structured analysis by a multidisciplinary team took place and new corrective measures were discussed and designed.

Results and Discussion: After a detailed CIRS analysis 4 corrective strategies were introduced in the following fields: protocols, equipment and drugs related issues, supplying companies-related questions and staff formation. Pre-existing protocols were reviewed and actualized and new ones were created.

A responsible anaesthesiologist was chosen for taking charge of problems with equipment, its maintenance and periodic revisions. Carefully cleaning and checking of equipment was redefined. Immediate availability of reserve equipments without leaving the surgical area was guaranteed. Special emphasis was put on medications' prescription and administration in order to avoid errors: identification of high risk drugs was improved. Companies were consulted regarding repeated incidents related to ventilators (disconnecting lines), dysfunction of monitors, etc. Continuous staff formation in terms of safety culture was designed: sessions, alerts, reviews, information, statistics of critical incidents, etc. Feedback after analysis was highlighted.

Conclusion(s): Four corrective measures after a structured analysis could be reliably introduced in our department. Implication and participation of the whole staff (doctors and nurses) is fundamental for applying such corrective measures, because improving actions usually affect our daily clinical practice. Prerequeriments for an effective implementation of a CIRS are support from the department head and the authority to inciate changes. Correctly introduced, a CIRS provides valuable information leading to risk reduction.

Reference:

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17AP1-3

Implementation of the surgical safety checklist in the digestive surgery operating room in a general hospital

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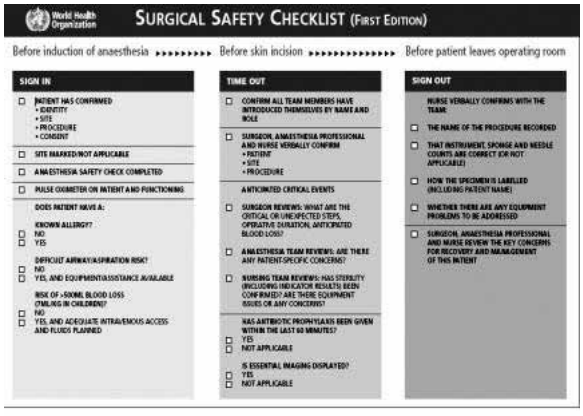
Background and Goal of Study: Surgical safety checklist has been proved as a good tool to improve team communication and reduce morbidity and mortality in surgical patients.

Materials and Methods: We designed a checklist based on the first edition of the WHO Guidelines for Safe Surgery. It was approved by the chiefs of Anesthesia, Digestive Surgery and Surgical Nursing. We began the implementation on October 2009, in two Digestive Surgery operating rooms in the morning shift. We prospectively collected data on the filling in rate of the checklist, the mistakes in the hospital system and in the filling in itself. We present the results of the first two months of implementation, October and November 2009.



Results

	Number of patients	Percentage
Total	184	100%
Filling in	107	58,15%
Complet	63	58,88%
Incomplete	44	41,12%
1 mistake	25	56,82%
2 mistakes	10	22,73%
≥3 mistakes	9	20,45%
Site marking	10	22,73%
Sterility	16	36,36%
Pulse oximeter	5	11,36%
Anesthesia safety check	4	9,09%
Critical events surgeon	4	9,09%

Results and Discussion: The total number of patients was 184. We filled in the checklist in 107, rate of filling in 58,15%. The checklist was incomplete in 44 patients (41,12%). There was one mistake in the checklist in 25 patients (56,82%), two mistakes in 10 patients (22, 73%) and there were 3 or more errors in 9 (20,45%). Most common mistakes were: sterility confirmed (36,36%), the site marking (22,7%), pulse oximeter on patient and functioning (11,36%), anesthesia safety check completed (9,09%) and anticipated critical events by surgeon (9,09%). We had a 100% success rate in evaluating the patient's allergies, difficult airway and risk of aspiration, name of the procedure recorded, correct instrument counts and correctly labelled specimen.

Conclusion(s): Implementation of the checklist involve both changes in system and changes in the behavior of individual surgical teams. In common practice it is not so easy, we have to encourage surgical teams to complete it in all the surgerys to improve patient's safety.

17AP1-4

Anaesthetists' attitudes to adverse incident reporting – Evaluation of a reporting scale

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Background and Goal of Study: Reporting of adverse incidents in our hospital could be improved. A reliable measure of the attitude of staff to incident reporting is needed to measure the effect of interventions to improve safety culture. The Reporting of Clinical Adverse Events Scale (RoCAES)[1] is a recently developed tool designed to capture healthcare staff's attitudes towards incident reporting. We aimed to evaluate the RoCAES for use by anaesthetists; to assess the reliability and validity of the tool, as well as its usefulness to identify areas for improvement in the process of adverse event reporting.

Materials and Methods: RoCAES was administered electronically to 166 consultant and trainee anaesthetists at 3 London teaching hospitals during 2009. Participants also received additional questions relating to patient safety behaviours (e.g. epidural insertion) these were used to evaluate validity. Participants also provided freetext comments. All RoCAES and additional questions were scored on a 1- 5 Likert scale. Construct and face validity were tested. Parametric (factor analysis) and non – parametric tests (Mann – Whitney)were used to analyse the data.

Results and Discussion: 102 anaesthetists completed the questionnaire (response rate 62%). The overall reliability of the questionnaire in the study group was established (α = 0.76 vs original paper $\alpha\alpha$ = 0.83) however the individual factors identified in the original paper were found to be unreliable in this population. Trainees showed significantly more negative attitudes than consultants in two factors: 'perceived blame' and 'perceived clarity of reporting procedures'. Anaesthetists who reported complying with safety recommendations for epidural insertion had more positive attitudes to adverse incident reporting. Strategies for improving local incident reporting service were also suggested e.g: improve clarity of reporting procedures and improve feedback.

RoCAES Factors Assessed

1.Perceived Blame
2.Perceived Criteria for reporting
3.Perceptions of colleagues' expectations
4.Perceived benefits of reporting
5.Perceived clarity of reporting procedures

Conclusion(s): The overall reliability of the RoCAES in a different sample group has been established however further refinements and validation should be undertaken before a recommendation can be made for its use.

Reference:

1 Wilson, B., Bekker, H. L. & Fylan, F. (2008) Reporting of Clinical Adverse Events Scale: a measure of doctor and nurse attitudes to adverse event reporting. *Quality & Safety in Health Care,* 17 (5), 364-367.

17AP1-5

Anaesthetic preoperative assessment clinics are essential to reduce complications of unnecessary fasting

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Background and Goal of Study: The aim of fasting guidelines for patients undergoing elective surgery is to minimize the volume of gastric contents while avoiding unnecessary thirst and dehydration. These guidelines, first set by Lister in 1883, were formalised in 1983 by Miller et al [1].In 1996 the American society of Anaesthesiology proposed the fasting guidelines before surgery for solids and liquids [2] Excessively long fasting periods can lead to an increase in perioperative complications. We performed a survey to identify the reasons for inappropriate fasting and also failure to follow guidelines for the taking regular medications.

Materials and Methods: A prospective survey was carried out over 4 months. A questionnaire was completed for every patient by the anaesthetist on the day of surgery. The patients were questioned on the information in the pre surgical letter sent by the hospital regarding their regular medications and fasting.
Results and Discussion: Eighty patients answered the questionnaire.11% reported receiving verbal as well as written fasting information. 73% recalled receiving a letter from the hospital. 10% said that they were given some fasting information but did not recall the specifics and 26% did not remember any information.48% of patients omitted their regular medications unnecessarily and 0.6% changed their routine timing. 41% had no fluids for 12-18 hours, 60% fasted for more than 12 hours and 16% had fluids up to 6 hours prior to coming to hospital. Our survey showed that the patients who were informed of the fasting guidelines in person at a clinic, were more likely to remember and follow them appropriately. Most patients attend pre-op clinics which are run by surgical teams. This is the ideal opportunity for them to be seen by the Anaesthetic team as well. Moreover the common myth that prolonged fasting more than the minimum 6 hours is better for the anaesthetic should be addressed with patients to avoid the complications arising from the prolonged fasting.
Conclusion(s): Anaesthetic pre assessment clinics are likely to reduce unnecessary complications or cancellation of surgery due to inappropriate fasting times.
References:

1 Miller M, Wishart HY. Gastric contents at induction of anaesthesia. Is a 4-hour fast necessary? British Journal of Anaesthesia 1983; 55:1185-8.
2 Practice guidelines for preoperative fasting and the use of pharmacological agents for the prevention of pulmonary aspiration: application to healthy patients undergoing elective procedures. Anesthesiology 1999; 90; 896-905.

17AP1-6

Assessment of cardiac mortality during routine carotid endarterectomy

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Background and Goal of Study: Perioperative cardiac complications during routine carotid endarterectomy are the main cause of mortality after cerebral complications.We designed our clinical study for reduction of cardiac mortality during routine carotid endarterectomy by the introduction of the Perioperative Management Protocol for routine practice.
Materials and Methods: Study was divided into two stages. Stage I – from 2001 to 2003 years – n=355. Stage II – from 2004 to 2007 years – n=630. We revealed cardiac mortality, cardiac complications and reasons of this serious complications. We carried the following cardiac complications: unstable cardiac complications (cardiac angina, rhythm disturbances), and persistent cardiac complications (myocardial infarction).
Results and Discussion: During first stage total mortality was 6,4% (n=23), the primary cardiac mortality was 2,25% (n = 8). After the analysis of mortality we identified the major causes of fatal outcomes. 1. The subcompensated comorbidities – R=0,44 (p<0,000000001) – diabetes, ischemic heart disease, arterial hypertension. 2. The intra- and postoperative hypotension (decrease BPsis 20% of the standing figures BP patient) R=0,14 (p<0,007). We developed Perioperative Management Protocol based on the data of the first stage. The introduction of our Protocol in daily practice in our clinic reduced the number of cardiac complications and mortality significantly.

Structure of cardiac complications

Complications	Stage I (n=355)	Stage II (n=630)
Transient	17,7% (n=63)	8,1% (n=51)
Persistent (MI)	3,9% (n=14)	0
Cardiac mortality	2,25% (n=8)	0

MI - myocardial infarction

Conclusion(s): Observance the Perioperative Management Protocol allowed: 1. To reduce the number of the cardiac complications to 8,1% against 21,6% (p<0,05). 2. To exclude the cardiac mortality.

17AP1-7

Effect of WHO checklist implementation on the quality of post-operative prescribing in orthopaedic surgery

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Background and Goal of Study: Following the introduction of the WHO 'Surgical Safety Checklist' in 2009, a global multi-centred trial has shown the checklist to be effective in reducing both morbidity and mortality in the perioperative patient population.[1] The 'sign-out' process allows two consultants to plan post-operative management, including the prescription of medications central to patient care. We hypothesised that implementation of a checklist 'sign-out' process, adapted from the WHO template, would improve the quality of post-operative prescribing.
Materials and Methods: We collected recovery data on patients undergoing major lower-limb joint replacement surgery over a 1 month period, as a baseline measure. Prescription charts were reviewed immediately post-operatively to assess adequacy of post-operative prescribing. The primary focus was on prescription of antibiotics, analgesia, antiemetics, thromboprophylaxis, intravenous fluids and autologous blood. 6 months after implementation of the WHO checklist in orthopaedic theatres, the survey was repeated in the same manner and comparisons made.
Results and Discussion: There was an equal spread of cases pre and post WHO implementation; Table 1. Our results showed significant improvements in the prescription of autologous blood transfusion (p<0.001) and in the completion of intrathecal opiate forms (by 19%); Table 2. Increases in the prescription of post-operative antiemetics,intravenous fluids and in the documentation of blood transfusion haemoglobin trigger were also evident.

Number of cases

	Pre-checklist	Post-checklist
Hip replacements	16	17
Knee replacements	16	18
Total	32	35

Comparison of post-operative prescribing

	Pre-checklist	Post-checklist
2 Post-operative doses of cephradine prescribed	27/28 (96%)	31/33 (94%)
Appropriate thromboprophylaxis prescribed	30/32 (94%)	32/35 (91%)
Analgesia prescribed	32/32 (100%)	35/35 (100%)
Intrathecal opiate observation form commenced	3/6 (50%)	9/13 (69%)
At least 1 PRN antiemetic prescribed	31/32 (97%)	35/35 (100%)
Intravenous fluids prescribed	30/32 (94%)	34/35 (97%)
Autologous blood prescribed	10/22 (45%)	17/18 (94%)
Blood transfusion trigger recorded	14/32 (44%)	18/35 (51%)

Conclusion(s): The implementation of an adapted surgical checklist was associated with an increase in the quality of post-operative prescribing in patients undergoing major lower-limb arthroplasty.
Reference:

1 Gawande et al. 'A surgical safety checklist to reduce morbidity and mortality in a global population' *NEJM 2009;360:491-9.*.

17AP1-8

Introduction of a national critical incidents reporting system in anaesthesia. SENSAR initiative

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Background and Goal of Study: The report and analysis of critical incidents is a useful tool for improving patient safety. A mixture of local reporting and analysis system and a wide approach is recommended in the literature. We present our experience with the introduction (starting from two local systems) of a national reporting system of incidents in anaesthesia.
Materials and Methods: Starting with two local systems of report and analysis of incidents (both of them internet-based), an introduction plan was designed for enrolling more hospitals from January 2010. The report and analysis is performed through a web-based form and database, with access restricted. For discussion, an internet page was used (www.sensar.org). Successive workshops were scheduled in order to explain the "how-to" of report and analysis of incidents using the internet form. The goal was the grouped exploitation of the data collected. This allows to the organizations to apply changes directed to their particular characteristics, showing the corrective measures locally adopted to its own organization and to all the rest of the hospitals involved in the program.
Results and Discussion: Since the first workshop, it has been conducted 15 more, taking part 143 anaesthesiologists and 37 hospitals, reporting in 10 months 486 incidents. The global distribution in all the hospitals can be seen in the table. If this data are compared with one of the hospitals involved (our hospital), we can see that the incidents reported are very similar. Differences observed can be understood as organization peculiarities (Kruskall-Wallis test, p=0.037).

Incidents distribution (global vs local).

Organization	6	2
Infrastructures	3	3
Equipment	23	18
Medication	26	24
Clinics	27	34
Behavior	2	1
Communication	8	11
Others	5	7

All data in %

Conclusion(s): The application of an incident reporting and analysis system contributes to know critical points in the organization. A local reporting system can gather information about specific characteristics of the organization. When data from local and global reports are confronted a uniform pattern is observed, although with some little differences.

Reference:

1 "Safety in anaesthesia: reporting incidents and learning from them". AF Merry. Anaesthesia. Vol 6, Issue 4, 337-9.

17AP2-1

The ability of anaesthetists to identify the position of the right internal jugular vein using surface landmarks

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Background and Goal of Study: In 2002 the National Institute of Health and Clinical Excellence (NICE) UK recommended the use of ultrasound guidance (USG) for the insertion of internal jugular vein (IJV) central venous catheters (JVC)[1], whilst requiring maintainance of landmark technique (LT) skills. The majority of JVCs are now inserted using USG[2]. It is unclear if the widespread acceptance of USG has affected this LT skill. Our goal was to determine the ability of anaesthetists to identify the IJV using the LT in a human model.

Materials and Methods: The local ethics board stated formal approval was unnecessary. Informed consent was given. A single model with normal right IJV anatomy was used. Participants were asked to demonstrate their intended needle insertion point and direction of needle advancement using an US probe (marked at the midpoint). Model position was at the discretion of the participant. The screen was blinded to participant and model. Stored images were reviewed by two blinded investigators and graded (hit /miss) according to the position of the IJV relative to the midline 'trajectory' of the probe. Fisher's exact test was used for statistical analysis.

Results and Discussion: All 85 invited anaesthetists agreed to participate. 79 (93%) stated they normally use 'realtime' US guidance. 58 had been practicing anaesthetists prior to the implementation of the NICE guidance (Group Pre-US) whilst the remainder had not (Group Post-US). Only 6/27 (22%) in the Post-US had inserted > 10 CVCs during their career using the LT, compared to 55/58 (95%) in the Pre-US group. The success rate was 36/58 (62%) in Pre-US and 6/27 (22%) in the Post-US group (P<0.001). Three participants in each group would have hit the carotid artery (5% Pre-US and 11% Post-US respectively; P=0.206).

Conclusion(s): In our cohort, junior anaesthetists had a failure rate of over 75%, implying that they do not perform the LT for IJV cannulation frequently enough to be safe. We suggest that either a change in training to enhance this skill or a review of the current NICE guideline is required.

References:

1 National Institute of Clinical Excellence. Guidance on the use of ultrasound locating devices for placing central venous catheters. Technology Appraisal Guidance No. 49, September 2002. http://www.nice.org.uk.

2 Wigmore TJ et al. Effect of the implementation of NICE guidelines for ultrasound guidance on the complication rates associated with central venous catheter placement in patients presenting for routine surgery in a tertiary referral centre. Br J Anaesth 2007;99:662-5.

17AP2-2

What is discussed during handovers from the operating room to recovery or ICU?

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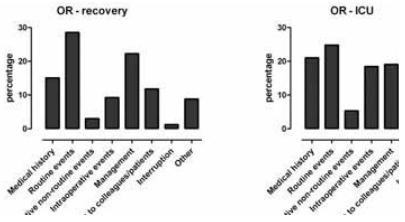
Background and Goal of Study: The perioperative process is highly complex, involves many healthcare practitioners and contains multiple patient handovers. Perioperative handovers are often unstructured, informal and error prone. Structured handover procedures such as SBAR ("Situation Background Assessment Recommendation") have been advocated, but many are not suited to the perioperative process. Little is known about the exact contents of the verbal exchanges during patient handovers. Therefore we explored patient handovers from the operating room (OR) to the recovery room and from the OR to the ICU to gain a better understanding of the characteristics of these handovers.

Materials and Methods: A total of 102 handovers from the OR to recovery room (n=51) and from the OR to ICU (n=51) were videotaped in two academic, four teaching and one community hospital in The Netherlands. The verbal exchanges within the handovers were analysed. Two observers independently coded the medical content of handovers using event logging software (The Observer XT, Noldus, The Netherlands). The coding scheme was designed using literature on handovers and included medical history, routine events, preoperative non-routine events (e.g.,hypertension before induction), intraoperative events (e.g.,major blood loss), clinical management, requests to colleagues/patients ("please close the curtains", "take a deep breath") and interruptions.

Results and Discussion: Handovers typically started with patient name and type of surgery, but no structured sequence of topics could be identified. The figure shows time spent on different topics of verbal exchanges. During handover 29% (OR to recovery) and 25% (OR to ICU) of the conversation time concerned routine events such as type of surgery and type of anaesthesia. The next frequently discussed items were patient's history and clinical management. In comparison with OR to recovery, intra-operative events received more discussion time during OR to ICU handovers (9% vs 18%).



Conclusion(s): Routine events consumed a quarter of conversation time during handovers from OR to recovery room or ICU. The data implicate that formally structuring the handover process might lead to more efficient and complete handovers.

17AP2-3

What to do when it goes wrong: A simulated approach to epinephrine auto-injector usage in anaphylaxis for patients and caregivers

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Background and Goal of Study: Anaphylaxis is a severe, potentially fatal systemic allergic reaction that is rapid in onset and may cause death. Fatal anaphylaxis has been associated with failure to administer epinephrine promptly, so the primary indication for prescription of epinephrine auto-injector is a history of anaphylaxis in an individual who may re-encounter the triggering agent outside of a medical setting. Patients and caregivers are often reluctant to use auto-injector despite instruction to do so. This occurs for a variety of reasons, including failure to recognize anaphylaxis; spontaneous recovery from a previous episode; reliance on oral antihistamines or asthma-relief inhalers efficacy; fear of needles and injections; and concern about adverse effects of epinephrine. Recent ILCOR guidelines for health personnel training in medical emergencies recommended changing the training method from instructor-oriented to task-oriented scenario-based. Trying to apply this recommendation to lay individuals, a team of anesthetists specifically trained in simulation applied to medicine, set up a one-day full-scale simulator training course on anaphylaxis recognition and treatment –mainly focused on adrenaline autoinjector usage– for adult patients and caregivers.

Materials and Methods: The course developed in four phases: **T1**: introductory theoretical session **S1**: getting to know the full scale mannequin and the simulation room, to become confident with environment and equipment; **S2**: simulated anaphylaxis scenario sessions, for a single o two participants **S3**: debriefing session, analyzing recorded videos of scenarios. Ten volunteers took part in the course. Multiple-choice questionnaires were administered to the participants at beginning, after phase 1 and at the end of the course, in order to self-assess their preparedness to face an anaphylactic emergency and to use the adrenaline autoinjector.

Results and Discussion: Self-reported preparedness to face an anaphylactic emergency and to use epinephrine autoinjectors improved after each stage, with the most dramatic increase observed after the simulation session.

Conclusion(s): We believe that prompt recognition and adequate treatment of anaphylaxis is crucial to patient's safety and that simulation-based practical courses could improve the rate of successful treatment for anaphylaxis occurring in community settings. This first experience suggests that simulating a scenario could increase self-preparedness to the use of epinephrine auto-injectors.

17AP2-4

Anaesthetic emergency drug preparation and storage

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Background and Goal of Study: We set out i. to evaluate the current practice of preparation and storage of anaesthetic emergency drugs in the anaesthetic department of a large teaching hospital, ii. to conduct a survey among the anaesthetic doctors regarding their practice of handling drawn up drugs with a view of increasing safety. The ultimate goal was to reduce the risks of errors, potential of tampering by third party and the significant wastage with associated cost implications.
Materials and Methods: For a 30 day period, we followed up the anaesthetic emergency drugs stored in the fridges of operating theatres, intensive care unit and labour ward [1] with the view of estimating the type and quantity of stored drugs along with a cost calculation. We also collected information form pharmacy regarding the price and shelf life of drawn up drugs. A questionnaire was distributed to all anaesthetic doctors regarding their recent practice, previous experience and improvement suggestions for emergency drug handling in anaesthesia.
Results and Discussion: During the 30 day study period the most frequently stored drawn up drugs in fridges were: suxamethonium, atropine, ephedrine, phenylephrine, propofol and thiopentone. Out of 86 trays stored in fridges 29% were dated, 20% signed and 12% mentioned drug concentrations. The estimated total cost of emergency drugs left in fridges during the study period was 1361 Euro. Fifty nine anaesthetists were asked to fill out a questionnaire. The response rate was 100%. The majority of anaesthetists think that the preparation of emergency drugs is a potential source of error (48/59), has potential for tampering (41/59) and infection (37/59), but only 25% (15/59) consider it a waste of drugs. Most anaesthetists would welcome a designated bag/tray (57/59) and a sticker showing the drug concentration, date, time and signature (54/59).
Conclusion(s): Departmental protocols would be useful for the minimum required drugs to be drawn up in each designated location (operating theatres, intensive care unit, maternity unit). The on-call person seems to be ideal for preparing and labeling the syringes in all dedicated locations. All emergency drugs should be discarded after 24 hours strictly. Where possible, introduction of pre-filled syringes would be advisable.
Acknowledgements: We wish to thank the following for their contribution, advice and commentary: Rajesh Jain, Manju Verghese, Osman Ahmed.
Reference:
1 Stone JP et al. Int J Obstet Anesth. 2009; 18(3):242-8.

17AP2-5

Multitasking during patient handover in the recovery room and ICU: Videotaped handovers show simultaneous transfer of equipment and information

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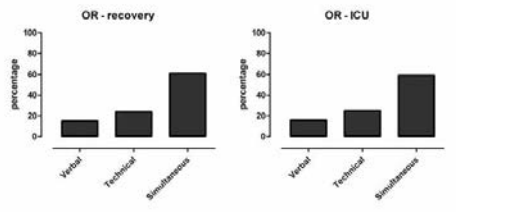
Background and Goal of Study: Improving handovers is a key factor to improve patient safety. Patient handover is a crucial moment in the continuity of care, but loss of information occurs frequently. Breakdown in communication contributes significantly to serious adverse events. Multitasking is likely to increase the risk on loss of information during handover. After surgery, patient handover in the recovery room or in the ICU includes both handover of monitoring equipment (connecting ECG, calibrating arterial lines etc) and information. We explored to what extent this transfer of equipment and information occurs simultaneously in daily practice during handovers from OR to the recovery room and ICU.
Materials and Methods: A total of 102 patient handovers from OR to the recovery room (n=51) and from OR to the ICU (n=51) were videotaped in two academic hospitals, four teaching hospitals and one community hospital in the Netherlands. Two observers using event logging software (The Observer XT, Noldus, The Netherlands) independently coded what percentage of time was used to: 1. Simultaneously transferring equipment and information; 2. Only verbally exchanging information; 3. Only connecting equipment.



Results and Discussion: Multitasking (simultaneous transfer of equipment and information) occurred during 61% of the total duration of videotaped handovers from OR to recovery room and during 59% of the total duration of handovers from OR to the ICU. In only 11 out of 51 handovers from OR to recovery and in only 8 out of 51 handovers from OR to ICU transfer of information and transfer of equipment occurred strictly sequentially.
Conclusion(s): Simultaneous transfer of equipment and information was observed during two-third of handover time. This implicates that multitasking during patient handover is common both in the recovery room and ICU and might lead to loss of information. Creating awareness on the risk of multitasking during patient handover is advisable. The participating centres have all adopted sequential transfer of equipment and information during patient handovers.

17AP2-6

Emergency availability of Intralipid 20%® for local anaesthetic toxicity

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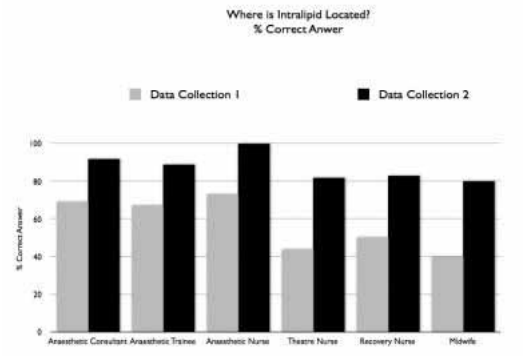
Background and Goal of Study: The Association of Anaesthetists of Great Britain and Ireland (AAGBI) guidelines recommend that Intralipid 20%® should be immediately available in all areas where potentially cardiotoxic doses of local anaesthetic are administered along with guidelines for its use [1]. We audited this standard across our hospital site.
Materials and Methods: Clinical areas were audited for the presence of Intralipid 20%® and guidelines for its use. Staff working in these areas were asked what Intralipid is used for, where it is located and where the guidelines for its use are located by an on-the-spot questionnaire. Staff were educated and the audit was repeated four weeks later.
Results and Discussion: Five clinical areas including operating theatres and the A&E department were evaluated. Questionnaires were completed by 82 members of staff. 92% of consultant anaesthetists questioned knew what Intralipid 20%® was used for, increasing to 100% following education. 69% of these knew where it was located, increasing to 92%. 100% of anaesthetic trainees knew what Intralipid 20%® was used for and 67% knew where it was located, increasing to 89%. 73% of anaesthetic nurses, 50% of recovery nurses, 44% of theatre nurses and 40% of midwives questioned knew where Intralipid 20%® was located (increasing to 100%, 83%, 82% and 80% respectively). When questioned regarding the location of guidelines the results were lower across all groups. Intralipid 20%® with guidelines for its use were present in 3/5 of the areas audited, this standard improved to 4/5 with education. Guidelines for use were present in 4/5 of the clinical areas. Neither Intralipid 20%® nor its guidelines were present in the A&E Department.



Conclusion(s): Theatre areas across our hospital site now all stock Intralipid 20%® in accordance with AAGBI guidelines. It is important to educate all staff when new drugs are introduced to practice, especially nursing and midwifery staff who may be asked to run and get the drug or treatment in the emergency situation. Intralipid 20%® guidelines should be stored with the drug.
Reference:
1 Association of Anaesthetists of Great Britain and Ireland. Guidelines for the Management of Severe Local Anaesthetic Toxicity, 2007.

17AP2-7

Pilot study: Eye-tracking provides workload assessment in anaesthesia simulator environments

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Background and Goal of Study: High amounts of workload may cause human errors [1]. So far, little work examined the relationship between workload, quality of care and the patient's safety. Self-rating techniques, observer ratings, heart rate measures, analyses of tasks and action densities have been used to assess workload in general [2]. In this study, we examined whether the eye-tracking-based parameters pupil size, saccadic amplitude and duration of fixation correlate with an increase of workload for anaesthesiologists during a simulated critical incident.
Materials and Methods: 15 residents of the department of anaesthesia were invited to participate in the project in a randomized cross-over trial. Each participant had to wear a head-mounted eye-tracking camera system (EyeSeeCam) while inducting general anaesthesia in a full-scale simulator during three different sessions. In the second or third session, a critical incident was simulated (anaphylactic shock). Pupil size, duration of fixations, saccadic amplitude, and heart rate of each participant as well as the simulator state were registered continuously and synchronized. Data were statistically modeled using mixed effects regression analysis.
Results and Discussion: 11 residents completed all three sessions and were analysed. Pupil size and heart rate increased significantly with increasing difficulty of the simulated critical incident. When the simulated patient recovered, the anaesthesiologist´s pupil size decreased slowly but significantly. The parameters saccadic amplitude and duration of fixations remained unaffected by altered simulator conditions. Mean heart was 95 bpm in normal sessions and 103 bpm in critical incident sessions ($p < 0{,}001$). However, pupils were larger in normal sessions (arc radius 6,44 pixel) than in critical incident sessions (5,81 pixel; $p < 0{,}001$).
Conclusion(s): Anaesthesiologists´ pupil sizes and heart rates seem to be appropriate indicators for the assessment of workload fluctuations. In contrast to heart rate, pupil size seems not to be appropriate for objective workload comparison between two sessions. Saccade amplitude and duration of fixation did not reflect increased workload and may be influenced mainly by manual and monitoring tasks. Further studies need to validate this method in real operation theatre environment.
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Acknowledgements: We thank J. Vockeroth from Clinical Neurosciences at LMU Munich for technical assistance with the EyeSeeCam.

17AP3-1

The effect of rapidly infused intravenous room temperature fluids in occurrence of perioperative mild hypothermia

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Background and Goal of Study: Hypothermia frequently accompanies anesthesia and can be associated with postoperative complications including wound infection, coagulopathy, morbid cardiac events, reduction of drug metabolism and shivering (1). Surgical patients become hypothermic because of redistribution of heat within the body due to anesthetic-induced vasodilation, exposure to a cold operating environment, instillation of cool fluids into body cavities and inhibition of thermoregulatory response by anesthetics (2). Furthermore, IV infusion of cold blood or room temperature fluids aggravates hypothermia (3). Thus, prevention of perioperative hypothermia should be considered seriously. The goal of this study was to assess the effect of IV infusion of room temperature crystalloid solutions on the body temperatures prior to administration of regional anesthesia.
Materials and Methods: This prospective descriptive study was approved by the hospital ethics committee and patient informed consent was obtained before entering the study. In the operating room, eighty healthy women who were scheduled for elective cesarean section under regional anesthesia were entered into the study. Before administration of anesthesia, core (tympanic) as well as skin (ear) and IV fluid temperatures were measured. Then 10ml/kg room temperature crystalloids were infused rapidly (10ml/kg/15min) and the body temperatures were re-evaluated subsequently. Differences in the patients' mean temperature values were assessed using paired t-test. Data are presented as mean ± SD and. $P < 0.05$ was considered significant.
Results and Discussion: Age of patients was 28.37 ± 4.07 years (range: 20 to 37 years) and temperature of intravenous ringer solutions was 23.48 ± 0.08°c. Patients' core and skin body temperatures significantly reduced after rapid infusion of fluids by 0.5 ± 0.12°c and 0.6 ± 0.31°c, respectively (P=0.001). Mild hypothermia is a well-known consequence of anesthesia and surgery. Our results showed that infusion of room temperature crystalloid solutions can contribute to inducing mild hypothermia and therefore, infusion of warmed fluids may help to reduce the occurrence of this peiroperative complication.
Conclusion(s): Preoperative infusion of room temperature intravenous crystalloid solutions result in perioperative mild hypothermia.
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17AP3-3

Banning succhinylcholine from routine use: Does it improve patient safety?

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Background and Goal of Study: Succhinylcholine has been in routine use in anesthesia for many years to facilitate tracheal intubation. Side-effects are severe hyperkalaemia (1), malignant hyperthermia (MH) (2), rhabdomyolisis(3), and cardiac arrest(4). The German Society of Anesthesia and Intensive Care Medicine (DGAI) recommends to restrict the use succinylcholine to rapid sequence inductions for patients with a high risk of aspiration (5). Succinylcholine was routinely used at the Department of Anesthesia at the University of Dresden, Germany. In compliance with the new guideline, in 2003 the department changed the standard of care and began to use only non-depolarising muscle relaxants for routine cases. In order to investigate the impact of changed clinical practice on patient safety and cost, we compared the anesthesia cases before and after the new policy.
Materials and Methods: With ethics committee approval, we analyzed our electronic anesthesia record database of the years 2002 and 2004, excluding all cases without endotracheal intubation, emergency cases, and patients with contraindications for succinylcholine.
Results and Discussion: We retrieved a total of 14,570 cases. There were no clinically significant differences between the two cohorts' demographics. From 2002 to 2004, Succinylcholine use decreased from 64% to 3%, being replaced by rocuronium (51%) and atracurium (44%). We did not see an increase in intubation problems but a lower rate of laryngeal spasms (0.3% vs. 0.1%). Since the database started in 1996 until 2004 no case of MH occurred in over 200,000 patients. Without succinylcholine, the rate of hypotension and bradycardia during induction of anesthesia was significantly higher ($p<0.05$), and anaphylactic reactions were reported almost four times as often. Induction time and time to extubation increased significantly by 12% and 19%, which translates into an increase in cost of almost €250,000 per year (anesthesia staff salary and operating room cost). The cost for muscle relaxants increased by more than €16,000.
Conclusion(s): Banning succinylcholine from routine use did not improve patient safety in our sample of patients, but the cost of anesthesia care increased.
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17AP3-4

The effects of the combination of intraoperative warming methods in the core temperature in obese and non-obese patients during intravenous anesthesia and surgery

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Background and Goal of Study: Intraoperative (IOP) hypothermia is a common event during surgery and often induces adverse outcomes[1]. Obese shows less hypothermia because of a higher vasoconstriction threshold[2]. The combination of warming methods may be better than an isolated warming method to prevent IOP hypothermia. We aimed to evaluate if the combination of heat and moisture exchanger (HME) on the inspired gas with IOP air-forced warming blanket or warming intravenous (IV) fluids prevents hypothermia in obese and non obese women under total intravenous anesthesia (TIVA) during gynecological abdominal surgery.
Materials and Methods: Forty female ASA I-II patients received TIVA with propofol and remifentanil with target control infusion. All patients had a HME between y-piece of respiratory circuit and tracheal tube. The patients were randomized in four groups according to BMI and IOP thermal management. In 10 obese (OB) with body mass index (BMI) between 30 and 39 kg/m^2 and 10 non obese (NOB) (BMI between 18,5 and 24,9 kg/m^2) patients, air-forced warming blanket (WB) in lower limbs was used. Ten obese and 10 non obese patients received warming IV fluids (WH). Tympanic temperatures

were recorded at baseline and at 30-minute intervals after anesthesia induction. Operation room (OR) temperatures were recorded and kept between 21-23°C.

Results and Discussion: We found no significant differences between groups in age, height, ASA physical status, OR temperature and IV fluids volume. There were significant differences in weight and BMI, surgery duration, and total consumption of propofol and remifentanil (obese > non obese) (P<0.05). The OB/WB group had core temperatures significantly more elevated than the other groups (P<0.05). The OB/WB group had also more patients (6 in 10) with core temperature above 36°C in relation to other groups at the end of surgery (2 in 10 in the NOB/WB group and 0 in 10 in the OB/WH and NOB/WH groups) (P<0.05).

Conclusion(s): The intraoperative warming methods used in this study do not avoid hypothermia in obese and non-obese patients, but skin-surface warming combined with HME minimizes hypothermia in female obese patients.

Acknowledgements: Governmental Financial Support: Scholarship by FAPESP Proc. 2008/53271-3 and PIBIC/CNPq.

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17AP3-5

The influence of the anaesthetic technique (regional vs. general) on the apnea/hypopnea-index in patients with obstructive sleep apnea

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Background and Goal of Study: Obstructive sleep apnea (OSAS) is very common in surgical patients and a daily problem of anesthesiologists. 2% of women and 4% of men suffer from it. Still it is not clear witch anesthesiological method is to be preferred in these patients. Until now only recommendations exist that describe the perioperative handling. With this pilot study we would like to determine whether a regional anesthesia is to be preferred over a general anesthesia or not.

Materials and Methods: In the anesthetic ambulance we screened all patients with the eppworth sleepines scale for sleep apnea. With a score >= 10 or manifest OSAS patients were included. We examined 40 patients with a polysomnography the preoperative and the postoperative night. The patients were randomized into 2 groups. 20 got a regional anesthesia and 20 a general anesthesia. Primary parameter was the AHI = Apnoe/Hypopnoe-Index.

Results and Discussion: So far 31 patients were included of whom 17 got a general anestesia and 14 a regional anesthesia. All of them were examinated with a pre- and postop polysomnography. The AHI did not differ significantly between the pre- and postoperative night in the groups, nor between the groups. Though preoperative AHI between the two groups showed a significant difference. This groupdifference might be due to the little number of patients that we examined. The missing examinations might adjust that discrepancy.

AHI

Group	preop	postop	
general	22,7 [7; 37]	21,4 [6,1; 37,5]	p>0,05
regional	7,9 [2,1; 17]	6,5 [1,1; 13]	p>0,05

Conclusion(s): So far there is no obvious difference in the postop AHI between patients who get a general anesthesia or regional anesthesia. If this trend stiffens, the current recommendations would have to be changed or at least adjusted. It seems now as if general anesthesia itself has no significant influence on the severity of OSAS, especially the postop AHI. Of course this is a very limited study and far more research is needed to confirm these findings. Also there might be many other influences on the AHI that we did not follow in this study, like the severity of OSAS or BMI.

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17AP3-6

A simple technique to improve oxygenation, prevent severe desaturation and reduce risk of fire hazard during MAC/TIVA

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Background and Goal of Study: Desaturation (Desat) is common in patients receiving deep sedation or TIVA while on nasal cannula (NC) O_2. Increasing O_2 flow to improve oxygenation also increases O_2 level under the drape close to surgical site and risk of fire hazard. A plastic sheet has been shown to convert NC to a face tent and improves oxygenation in deeply sedated patients during upper GI endoscopy without increasing O_2 flow.[1-2] Our goal was to confirm its effectiveness in improving oxygenation during MAC/TIVA cases while assessing O_2 level under the drape.

Materials and Methods: This retrospective review of patients undergoing various procedures in supine or lithotomy position identified 2 groups. Group 1 received NC O_2 (NC, n=44). Group 2 received NC O_2 plus a face tent (FT, n=68) using a plastic specimen bag covering the nose and mouth.[1-2] Standard monitors were used. Patients received NC O_2 (3-10 l/min) and only iv propofol. Data collected included age, weight, height, O_2 saturation (Sat), need for assisted ventilation, amount of propofol, the duration, FiO_2 and $ETCO_2$. 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: There were no differences in age (NC:52±16 yrs; FT:54±18), ASA status (NC:2.0±0.8; FT:2.1±0.8), room air O_2 Sat (98±2%), O_2 Sat 5 min after O_2, the duration (NC:42±28 min; FT:46±27), $ETCO_2$ and average propofol doseage (NC:149±8 ug/kg/min; FT: 170±8). There were differences in BMI (NC:26±5; FT:29±7), the highest O_2 flow (NC:5.5±2.0 l/min; FT:4.5±1.1), FiO_2, O_2 level under the drape and the lowest O_2 Sat, severe Desat (O_2 Sat <85%) and need for assisted ventilation. Six NC patients experienced severe Desat (84±11%) and their O_2 Sat improved after adding this face tent (5-min intervals: 93±4%, 95±3%, 98±2% and 100±1%).

Effects of Face Tent on Oxygenation during MAC/TIVA

	O2 Sat 5 min After O2	Lowest O2 Sat	Severe Desat (O2 Sat <85%)	Assisted Ventilation Dosage (ug/kg/min)	Average Propofol	FiO2	O2 Level under Surgical Drape
Group 1 (NC, n=44)	100±1%	92±8%#	6/44	3/44	149±8	33±9%	41±13%
Group 2 (FT, n=68)	100±1%	97±4%*#	1/68*	0/68*	170±8	68±19%*	22±1%*

(*)Significantly different from NC; (#)5 min after O2, p=0.0001-0.05.

Conclusion(s): Our data show that this simple technique improves oxygenation and prevents severe desaturation in patients undergoing various MAC/TIVA cases. It may reduce the risk of fire hazard by decreasing O_2 level under the surgical drape.

References:

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17AP3-7

Feasibility and safety of percutaneous radiofrequency ablation of pulmonary tumours under conscious sedation with intravenous remifentanil and spontaneous ventilation

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Background and Goal of Study: Percutaneous radiofrequency ablation (PRFA) is a new and less invasive alternative to surgery for pulmonary tumours in selected patients[1]. We evaluated the feasibility and safety of conscious sedation with intravenous infusion of remifentanil for PRFA of pulmonary tumours in spontaneously breathing patients.

Materials and Methods: We retrospectively recorded all patients who underwent PRFA since 2003. Anaesthetic protocol consisted on TIVA remifentanil 0.1 $mg.Kg^{-1}.min^{-1}$ (range: 0.05- 1.5), local anaesthetic infiltration, supplementary oxygen, prophylactic iv cephalosporin, iv ondansetron and iv paracetamol combined with a NSAID for postoperative analgesia. PRFA was performed under CT scanning with single cool-tip electrode (46.3%) or umbrella-shaped electrode (53.7%). Postoperative destination and intra and post-procedure complications were registered. A CT scan was repeated 24h later and, in the absence of significant findings, patients were discharged.

Results and Discussion: Forty-one PRFA procedures were performed (13 primary tumours, 28 metastases) in 33 patients. Patients were positioned in prone (29), supine (11) or lateral decubitus (1) position. All patients were able to cooperate as required and underwent the procedure under spontaneous ventilation. Airway management was not required in any case. In one case it was necessary to stimulate the patient to revert respiratory depression. Six cases needed complementary bolus of propofol; 4 cases anti-hypertensive therapy and 2 cases repeated dose of ondansetron. One procedure could not be performed

for uncontrolled pain. Procedural complications were: atelectasis (26/41); pneumothorax (15/41); minimal haemoptysis (4/41) pulmonary bleeding (2/41); haemothorax (2/41); phrenic paralysis and axillary nerve damage, one case each. Two patients required a chest drain (1 pneumothorax, 1 haemothorax). Patients stayed at the recovery room for 2-3h and were then transferred to a general ward. None needed to be transferred to the ICU. One patient with haemothorax stayed hospitalized for 4 days. One patient developed neuropathic pain. We did not register any case of pneumonia nor other severe complications or death.

Conclusion(s): Conscious sedation with intravenous remifentanil and spontaneous ventilation showed to be a feasible and safe anaesthetic technique for PRFA of pulmonary tumours in selected patients

Reference:

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17AP3-8

Oxygen safety valve protects against barotrauma when a mask, trachea cap or nasal cannula is improperly connected to a patient with an airway device

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Background and Goal of Study: Oxygen therapy with a mask, nasal cannula or trachea cap is given everywhere in the hospital using the hospital pipeline at 5 bar. A Rota meter regulates the flow and reduces the pressure at the same time without pressure stabilization. This means that at occlusion of the flow pressure will rise up to 5 bars till patient's lung, tubing or humidifier explode. At a flow of 10 L/min, within 30 seconds a pneumothorax will occur at pressures above 90 cmH20, the humidifier nor the tubing or tube connection will loose or explode at 5 bars. A simple pressure relief valve connected to the Rota meter has to stay closed above 60 cmH20 to allow oxygen to flow through the small tubing. Adaptation of the tubing diameter or including a pressure relief valve at the mask will never allow 100% security for every patient.

Materials and Methods: The solution build now exists of a pneumatic flow dependent pressure relief valve connected to the Rota meter allowing all existing oxygen devices to be used further and provide 100% safety protection ones all Rota meters are adapted. Three different oxygen mask (A,B,C) with their tubing were evaluated with or without an active oxygen safety valve. The Rota meter flow was set at 10 L/min, A low compliant balloon of 1 liter is connected to the mask tubing imitating a wrong connection. The pressure and flow before the oxygen safety valve and in the balloon are measured till balloon pressure exceeds 60 cm20 or till balloon pressure stabilized.

Results and Discussion: Without active oxygen safety valve, pressure was initial higher (A:40cmH20, B 25 cmH20 and C: 56 cmH20) before the non active oxygen safety valve. The pressure in the balloon rose to its maximum pressure plateau pressure above 60 cmH20. With the active oxygen safety valve, flow was initial identical before and after the valve (10L/min) indicating no oxygen loss. Pressure in the balloon rose according to its compliance to a maximum of 40 cmH20. At this level the safety valve removed all oxygen flow further creating an identical pressure of 40 cmH20 before the valve and in the balloon.

Conclusion(s): This Oxygen safety valve protect the patient from barotrauma by human error.

17AP3-9

BIS guided N_2O-free low-flow anaesthesia technique: Is medical air safer than N_2O?

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Background and Goal of Study: Nitrous oxide free anaesthesia is easy to administer and ecologic, besides there are reasons to question the continued use of N_2O as a carrier gas; should we then assume medical air safer in low fresh gas flows? This prospective randomized BIS controlled study was conducted to compare N_2O-free low-flow anaesthesia technique in two different remifentanil groups with a low-flow anaesthesia technique; N_2O as a carrier gas.

Materials and Methods: Fortyfive ASA I-II unpremedicated women scheduled for abdominal hysterectomy/myomectomy were randomly divided into three groups; Group N, Group RI and Group RII. Anaesthesia was induced with propofol 2 $mgkg^{-1}$ and rocuronium 0.6 $mgkg^{-1}$ in all groups. Remifentanil groups received 0.5 μgkg^{-1} as loading dose and 0,2 $\mu gkg^{-1}dk^{-1}$ (Group RI) and 0,05 $\mu gkg^{-1}dk^{-1}$ (Group RII) infusions as maintenance. After intubation, 50% O_2 with N_2O (Group N) or medical air (Group RI, RII) in 4 Ldk^{-1} fresh gas flow with 2% sevoflurane volume was started. Following five minute high flow period fresh gas flow was reduced to 1 Ldk^{-1} and sevoflurane was increased to 2.5% volume. Opioid infusions were constant as sevoflurane was adjusted to maintain BIS 50±10. Hemodynamic parameters and SpO_2, $ETCO_2$, FiO_2, $FetO_2$, %sevoflurane volume, Fi_{sevo}, Fet_{sevo}, MAC, for Group N Fi_{N2O}, Fet_{N2O}, time for extubation and eye opening, complications and treatments were recorded. Consumption and costs for sevoflurane were calculated with Dion Formula represented as per person per minute.

Results and Discussion: For all recording times FiO_2 was statistically greater in Group N. The difference between delivered O_2 and FiO_2 was the lowest in Group N. Heart rate and mean arterial pressure were lower in Group RI and RII than Group N. There was no significant difference in sevoflurane consumption and costs per patient per minute between groups.

Conclusion(s): Lower FiO_2 values in remifentanil groups revealed that medical air is not safer than N_2O in low fresh gas flows. Special regards with volatile anaesthetic consumption and prevention of hypoxia no superiority was shown with N_2O-free low flow anaesthesia. Monitoring FiO_2 is essential in both air/oxygen or N_2O/oxygen mixtures; both are safe to administer unless FiO_2 is lower than %30. Appropriate remifentanil doses provided better hemodynamia without increasing sevoflurane consumption. BIS controlled sevoflurane with its low solubility quickly adapted to variable anesthetic depth levels.

17AP3-10

Pressure required to force water through breathing system filters – A laboratory study

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Background and Goal of Study: Breathing systems filters are widely used in anaesthesia. They are either pleated hydrophobic or electrostatic. Despite using filters, contamination of both breathing systems[1] and machine side of filters can occur.[2] Condensed liquid can be forced through filters if sufficient pressure is applied causing cross contamination and infection.[3] We aim to determine the pressure required to force water through breathing system filters.

Materials and Methods: We assessed 10 samples each of 6 different filters. Each filter was attached to one port of a water filled system. 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. 2 tests were carried out on 5 samples of each filter. For Test 1, a ventilator was connected to a second port of the system above the surface of the water. The ventilator, set at a pressure limit of 40cmH_2O, was used to attempt ventilation through each filter for a maximum of 4min at 12 breaths min^{-1} to see if water was forced through. If the filter withstood this test, water was added into a third port of the system from an infusion pump at a rate of 400ml min^{-1} to find the pressure at which water leaked, up to a maximum of 125cmH_2O. Test 2 involved using the infusion pump only set at the same rate. New samples of filters were used in tests 1 and 2.

Results and Discussion: Results are displayed in table.

Table 1

Manufacturer/Filter	Type	Test 1		Test 2
		Withstand 40 cmH2O?	Pressure at leak (cmH2O)	Pressure at leak (cmH2O)
Vygon/HEPA 551.53	A/p	Yes 5/5	81(22)	64(31)
Pall/Ultipor BB25	A/p	Yes 5/5	110(17), 2/5*	101(14)
DAR/Hygroboy	P/e	No 0/5	15(1)	15(5)
DAR/Hygrobaby	P/e	No 0/5	15(1)	12(2)
Teleflex/Iso-gard HEPA Light	A/p	Yes 5/5	>125	>125
GE/HMEF750/S	A/e	No 0/5	15(2)	18(6)

A: Adult; P: Paediatric; p: pleated; e: electrostatic; Mean (SD); *: Withstood >125 cmH2O

Conclusion(s): Electrostatic filters allowed water to pass through at pressures lower than the pressure limit setting on the ventilator. Water did not pass through any pleated hydrophobic filters in test 1: the pressure required to force water through these filters was much greater than a commonly set pressure limit. Such filters would protect the patient from cross-contamination if water collected over the surface of the machine side of the filter during artificial ventilation.

References:

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17AP4-1

Central venous catheters' infection in surgical patients with tracheostomy. Preliminary data

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Background and Goal of Study: Although the largest body of research on catheter-related infection up to day poor data about the influence of tracheostomy in incidence of central venous catheter-tip colonization and catheter-related bacteremia are available (1). The goal of this study was to assess the risk of central venous catheter infection with respect to the site of insertion in surgical patients with tracheostomy. In particular peripheral and subclavian sites were studied.
Materials and Methods: In this prospective study we enrolled fifty patients admitted to an ENT surgery unit of a University Teaching Hospital undergoing major surgery of the neck with transient or permanent tracheostomy and requiring a central venous access for parenteral nutrition or chemotherapy. The patient population was divided randomly in two groups: group A and group B. In the first we designed to use the ultrasonographically guided cannulation of the brachial or basilic vein by means of a 60 cm, 4-French catheter (Lifecath PICC, Vygon, Italy), positioning the tip in the superior vena cava. In group B we inserted conventional triple lumen, nonantibiotic impregnated catheter (Arrow model), placed percutaneously trough the subclavian vein in the superior vena cava. In the same time we took a sample from the trachea.
Results and Discussion: Until now we have examined forty-two cases (19 for group A and 23 for group B, respectively). All catheters were removed one week after the insertion. The tip was analyzed to evaluate catheter infection and colonization. Four patients in group B exhibited a catheter tip infection (Candida Spp*, Staphilococcus Aureus, Streptococcus Epidermidis*). All the catheter tips in the group A resulted sterile. These data showed that the peripherally inserted central venous catheters seem to be associated with a lower incidence of infection than the subclavian access in surgical patients with tracheostomy.
Conclusion(s): To our knowledge there are very little studies concerning brachial or basilic vein as route of access in comparison with the conventional insertion sites in ENT surgical patients with tracheostomy. The preliminary results of the present work should confirm that an alternative access must be considered in such kind of patients.
Reference:
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17AP4-2

Infections incidence of temporary CVC in hemodyalised patients

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Background and Goal of Study: Use of temporary central venous catheters (CVC) in the patients with renal failure (RF) to achieve the hemodyalise carry infection risks caused during the placement procedure or throughout usage period. **Aim:** We wanted to evaluate the incidence of this complication depending on the setting of CVC placement: in the operating block or in the wards.
Materials and Methods: Patients with RF treated by hemodyalise during 2008-2009 were enrolled in the study. Based on the setting where the temporary CVC was placed by the anesthesiologist, patients were divided in 2 groups: Gr1 in the operating block, Gr 2 in the wards. ARROW 2-lumen catheters were used. Infection rate was considered by evaluating colonization of the withdrawn catheter tips.
Results and Discussion: 197 adult patients were enrolled: Gr 1=124 patients (85 subclavia, 29 jugularis interna), Gr 2= 73 patients (57 subclavia.,16 jugularis interna). Usage period was 25+/-7 days. Results of positive colonization were: Gr 1 = 23% of patients (of which 8% occurred in the first 15 days), Gr2= 39% of patients.(54% of which occurred in the first 15 days). The difference of infection rate between the two groups in the first 15 days after the insertion procedure resulted important ($p<0.001$). with the lengthening of CVC usage time, the tendency of increasing the colonisation rate was due to problems related to the usage and maintenance procedures of catheter in the wards (especially in the Gr. 1).
Conclusion(s): In order to minimize the incidence of infections in hemodyalised temporary CVC patients, it is recommended that the insertion procedure is completed in the operating theatre, applying strict sterile technique from experienced operators. Also, catheter care should be performed by nursing staff following the correct procedure throughout the whole usage time.
Reference:
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17AP4-3

Anaesthesia-related drug allergy: Clinical history versus positive tests

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Background and Goal of Study: Clinical manifestations of allergy include mild and severe reactions. The aim of the study was to determine if the severity of the symptoms predicts the prevalence of positive allergy tests.
Materials and Methods: 65 patients with a previous history of anaesthesia-related drug allergy (anaesthetics, antibiotics and antiinflammatory drugs) were tested for the culprit agent: 26 presented in the history mild reactions (urticaria, pruritus, facial edema) and 39 presented severe reactions (bronchospasm, dyspnea, hypotension, tachycardia, anaphylactic shock). In vivo tests included the skin prick test (SPT) for all patients, intradermal test (IDT) was performed for those with negative SPT. In vitro tests included the basophil activation test (BAT) (Flow2Cast technique, Bühlmann Laboratories, Switzerland) and the detection of drug-specific antibodies using radioimmunoassay (RIA). Chi square test with Yates' correction was used to ascertain the statistic difference.
Results and Discussion: More patients with severe reactions presented positive SPT, IDT, BAT and RIA (table 1), but the rate of positive tests did not differ significantly between the two groups. BAT and RIA are complementary to skin tests[1]. There is a significant statistical difference between the rate of positive results when the four diagnostic tests are used. 46.15% of the patients with mild symptoms and 71.79% of those with severe symptoms had at least one positive test ($p<0.05$). Flow2Cast technique confirms allergy in patients with both severe and mild symptoms, in sharp contrast to previous methods (the histamine release test)[2].

Table 1. Positive diagnostic tests for the patients with mild and severe symptoms.

Test	Positive test/patients with mild symptoms	Positive test/patients with severe symptoms	p
SPT	1 (3.85%)	6 (15.38%)	0.29
IDT	4 (16%)	7 (21.21%)	0.87
BAT	3 (11.54%)	11 (28.21%)	0.11
RIA	8 (30.77%)	19 (48.72%)	0.15
SPT & IDT	5 (19.23%)	13 (33.33%)	0.21
BAT & RIA	9 (34.62%)	23 (58.97%)	0.05
SPT & IDT & BAT & RIA	12 (46.15%)	28 (71.79%)	0.04

Conclusion(s): The severity of clinical manifestations predicts the chance of positivity for at least one diagnostic tests.
References:
1 Hausmann OV, Gentinetta T, Bridts CH, Ebo DG. The Basophil activation test in immediate –type drug allergy. Immunol Allergy Clin N Am 2009; 29: 555–566.
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17AP4-4

Study of hypersensitivity reactions and anaphylaxis during anesthesia in Poland

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Background and Goal of Study: Several studies have identified neuromuscular blocking agents (NMBA) as the most common cause of anaphylaxis during general anesthesia. There are few reports from Poland, probably due to the low prevalence of reactions.
Materials and Methods: For 5 years (2005-2009), all the patients who presented perioperative anaphylactic-type reactions, were studied in University Hospital (Szczecin, Poland). The diagnostic protocol consisted of case history, anesthetic charts, serum tryptase measurements, skin tests and specific immunoassays (asIgE).
Results and Discussion: In 52 cases, one or more substances were suspected. An IgE-mediated mechanism was confirmed on complete match in 19/52 patients. The etiological agents were thiopental in 5 cases, antibiotics in 4 cases, latex in 4 cases, NMBA in 3 cases, opioid analgesics in 3 cases. In 33 cases there was a partial match, the right substance being suspected, but investigations showed an additional allergen or several substances, including the right substances being suspected.
Conclusion(s): Some patients may be labeled with a wrong allergy, leading to unnecessary warnings against harmless substances, and some patients may be put at risk of subsequent re-exposure to the real allergen. Patients with suspected allergic reactions during anesthesia should be referred for investigation in specialist centres whenever possible.

17AP4-5

Basophil activation test and quantification of specific IgE versus skin tests in anaesthesia-related allergy

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Background and Goal of Study: The study is a comparative analysis between the quantification of the drug-specific IgE and the expression of the CD_{63} marker on basophils in patients with positive history and possible positive skin tests proven anaesthesia-related allergy and patients with negative history and negative skin tests.
Materials and Methods: 99 matched allergy tests for drugs that are used during anesthesia were randomly chosen. Antibiotics, anaesthetics and anti-inflamatory drugs were tested in vivo and in vitro in patients with previous history and possible positive skin tests (65 observations) and in patients with no positive history and negative skin tests (34 observations): 57 for antibiotics, 36 for anaesthetics and 6 for antiinflamatory drugs. For all substances we performed the skin prick test (SPT), the intradermal test (IDT), the detection of drug-specific antibodies through radioimmunoassay (RIA-sIgE) and the flow-cytometric analysis of in vitro activated basophils (BAT) (Flow2Cast technique, Bühlmann Laboratories). The analysis was performed using accuracy, sensitivity and specificity for binary data.
Results and Discussion: BAT and sIgE compared to the SPT and the IDT are presented in Tables 1 and 2. The accuracy of BAT vs. SPT is high for all drug classes. The sensitivity of BAT vs. SPT is high for anaesthetics, but low for antibiotics and the combination of drugs. The sensitivity of BAT vs. IDT is very low. BAT has a high specificity. RIA-sIgE has low accuracy and specificity, but has a high sensitivity as compared to the SPT for anaesthetics. A test with high sensitivity and low specificity carries a high risk of false positive results. The sensitivity of RIA-sIgE vs. IDT is low. BAT has a higher accuracy and specificity than RIA-sIgE.

BAT accuracy, sensitivity and specificity compared to SPT and IDT.

BAT	Accuracy vs. SPT	Accuracy vs. IDT	Sensitivity vs. SPT	Sensitivity vs. IDT	Specificity vs. SPT	Specificity vs. IDT
Anaesthetics	77.78	51.52	75.76	16.67	100	71.43
Antibiotics	84.21	81.82	50	33.33	87.27	91.3
Anaesthetics, antibiotics, antiinflammatory drugs	81.82	71.74	57.14	23.81	83.7	85.92

IgEs	Accuracy vs. SPT	Accuracy vs. IDT	Sensitivity vs. SPT	Sensitivity vs. IDT	Specificity vs. SPT	Specificity vs. IDT
Anaesthetics	55.56	51.52	100	50	51.52	52.38
Antibiotics	56.14	60	50	55	58.18	60.87
Anaesthetics, antibiotics, antiinflammatory drugs	55.56	57.61	42.86	52.38	56.52	59.15

Conclusion(s): BAT is more valuable than RIA-sIgE in the diagnosis of drug allergy.

17AP4-6

Accidental extubation in the operating suite: Analysis of 11 years of anaesthetic activity

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Background and Goal of Study: Accidental extubation (AE) under general anaesthesia (GA) is a clinically relevant adverse event(1). Its prevalence and its association with other complications remain uncertain but are necessary to determine preventive policies.
Materials and Methods: We performed an analysis of 11 years of anaesthetic activity of a 350 beds teaching hospital. The anaesthetic department is equipped of an electronic database that collects the characteristics of each anaesthesia and adverse events, notably AE. The data base was queried for cases of AE during GA.
Results and Discussion: Data are presented in mean (+/- SD) or n (%) Between November 1998 and November 2009, 45384 procedures were recorded. 35345 (77.9%) were performed under GA and a total of 29 AE were collected. 2 cases were excluded because of irrelevant data. Incidence rate in our institution was 7.64 (95% CI 5.03-11.11) per 10 000 GA (Poisson distribution). 23 (85.2%) were of men gender and 4 (14.8%) female, the mean age was 44.4 (+/-20.2) years. The ASA status was: 1: n=8 (29.6%), 2: n=13 (48.1%), 3: n=6 (22.2%). 1 (3.7%) AE concerned a patient hospitalised in intensive care unit transferred in the tomodensitometry room, 21 (77.7%) events occurred in the operating room (OR) and 5 (18.5%) in post-anaesthetic care unit (PACU). Access to upper airway before event: 1 (3.7%) tracheotomy canula, 3 (11.1%) laryngeal masks and 23 (85.2%) orotracheal tubes. Anaesthetist had more than 1 patient under his responsibility in 14 (51.9%) cases. Gender, ASA status and proportion of cases with more than one site per anaesthetist were compared (Khi-Square test) with data of general population. No significant difference was identified.
Conclusion(s): AE during GA is a rare adverse event who can be analysed only with large databases. We found a 7.64 (95% CI 5.03-11.11) per 10 000 GA incidence in our institution. This may occur in OR as well as in PACU. We did not identify any risk factor.
Reference:
1 Lee PJ, MacLennan A, Naughton NN, et al.: An analysis of reintubations from a quality assurance database of 152,000 cases. *J Clin Anesth* 2003; 15: 575-81.

17AP4-7

The pre-operative opioid challenge test in patients undergoing gastric bypass surgery

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Background and Goal of Study: Morbidly obese patients frequently have risk-factors predisposing to respiratory failure in the peri-operative period. The combination of a reduced carbon dioxide response and hypoxaemic drive, together with residual anaesthetic agents and then the use of opioid analgesia may combine to cause hypercapnic narcosis and respiratory arrest. For six years our unit has used a simple test to assess patients' sensitivity to opioids which then guides us in our choice of post-operative analgesic regimen. We describe our initial experience in analysing this opioid challenge.
Materials and Methods: A series of patients undergoing primary gastric bypass surgery were observed in the operating room under full monitoring immediately prior to induction of anaesthesia. Following placement of lines, and in a calm environment, a dose was given of 1mcg of Fentanyl and 20 mcg of morphine for every kilogram of actual body weight, up to a maximum of 200 mcg and 4mg. Breathing room air the percutaneous saturation was recorded every 30 seconds for 4 minutes (9 time points) or until the saturations fell below 80% at which point the test was terminated. Demographic data, Epworth Score and the presence of Obstructive Sleep Apnoea (OSA) were recorded. The mean of the second three and final three saturation measurements were noted. A fall of 10 points in SpO2 defined early desaturaters, late desaturaters and non-desaturaters.
Results and Discussion: Forty patients have thus far been studied, with a mean age of 44, a median BMI of 58 kg/m2 (46-72) and a median weight of 164 kg. 19 de-saturated significantly following the opioid challenge (6 within three minutes) with a fall in SpO2 by a mean of 17%. 14 were non-desaturaters (fall in SpO2 of <5%). A further 7 patients had equivocal and late falls, of between 6 and 9%. There were no clear associations between 'desaturaters' and any specific factors.
Conclusion(s): The mechanism and the dose of opioids used appear to be adequate to separate patients into two roughly equal groups, those with marked desaturations and those with equivocal or no desaturation. This allows reduction in post-operative opioid dosing in those that desaturate with this challenge. Patients with OSA who are compliant with CPAP do not seem to desaturate significantly. Much more work needs to be done to develop this test further.

17AP4-8

Safety of xenon based anesthesia for ASA I/II patients in daily routine use. The regiXuser database

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Background and Goal of Study: Xenon (Xe) is available for GA in ASA I-II patients in Europe since 2007. Early 2008, Xe database (RegiXuser) was created to collect informations from Xe anesthesia.
Materials and Methods: A questionnaire was filled by anesthesiologists to provide regular analysis on Xe use and safety. Screening of preoperative condition of patients, nature of surgical procedures, Xe requirement for general anesthesia, administration of other anesthetic, postoperative management of the patient, and safety issues were collected.
Results and Discussion: 189 cases ASA I/II patients were included from March 08 to Oct 09 in France (28%), Germany (59%), Italy (2%) and Portugal (11%). 61% were female, 39% male. Surgeries were distributed as follows: **28% visceral, 17% orthopaedic, 16% neurologic, 16% plastic, 14% cardiac/vascular. Population's description** (median value*[range]*): age 54yr *[20-97],* BMI 26,2kg/m2*[16.2-41.9].* Patients history*: 37% APFEL* >2, 46 % any cardiovascular history, 15.7% PONV, 9% Non Insulin Dependant Diabetes, 6% Chronic Obstructive Pulmonary Disease, 3.8% history of post-Operative Cognitive

Dysfunction. **Anesthetic procedure:** median duration 220min *[61-612],* 77% from 150 to 250min (cardiac, neuro, plastic, uro, vascular and visceral surgeries), 19% from 100 to 150 min (orthopaedic and trauma surgeries), 4%> 250min (only reconstructive surgery). Xe inhalation median target was 61% (cardiovascular only 50%), associated either with i.v. remifentanil (79.4%), fentanyl (15.9%) or sufentanil (4.2%). **Safety data:** intra-op; 11 cases (6%) only needed to add on another hypnotic to Xe. 25 Adverse Event (AE) were reported intra-op (18 anesthesia related). Post-op; 125 patients (66%) had at least one Event (27 anesthesia related: 10 extreme pain, 8 nausea, 6 hypertension, 5 hypotension, 4 vomiting, 2 hyperglycemia, 1 arhythmia, 1 bleeding, 1 sedation, 5 other). Post-op pain was reported for 64 patients (33.9%), median VAS=2 (66.7% [VAS 1-4], 14.1% [VAS 5-7], 19.2% [VAS>8]). No post-op SAE or fatal AE was reported. **Discussion:** These data although showing smaller adverse event rate than found in the Xe registration files, didn't change the known efficacy/safety profile of the product. Cautious is warranted for the monitoring of anesthesia deepness, blood pressure level being not relevant in this type of anesthesia anymore.
Conclusion(s): When using Xenon, anesthesiologists must consider to have moved to a new management of the anesthesia procedure.

17AP4-9

Investigation of organic contamination on both sides of small electrostatic breathing system filters in the clinical setting

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Background and Goal of Study: Breathing system filters are intended to be used to prevent cross-infection in anaesthesia. The pleated type is considered to be more effective than electrostatic and large filters more effective than small [ref 1]. Previous studies (involving mainly pleated filters) have shown a relationship between contamination on the machine side of the filter and the patient side [ref 2]. This study investigated organic contamination on both sides of a small electrostatic filter.
Materials and Methods: Contamination on 86 used Venticaire Mini Bacterial Viral filters HME (Flexicare Medical Ltd, UK) was measured. The internal surfaces of the connectors on both patient and machine side were swabbed. The swabs were assessed for contaminating soil with the use of adenosine triphosphate (ATP) bioluminescence and the Biotrace Clean-Trace system. Results are expressed in Relative Light Units (RLU), which is proportional to the amount of organic soiling present on the swab. A value of >50 RLU was considered significant contamination.
Results and Discussion: 8/86 (9%) filters had excessive contamination on the machine side. However, only one of these was also contaminated on the patient side. Previous studies have mainly shown contamination on the machine side if it also occurred on the patient side. Lower levels of contamination on the machine side were observed in the current study compared to previous testing of electrostatic filters (9% versus 13%) [ref 2]. However, previous data for electrostatic filters was from a paediatric population where patient side contamination levels were higher. There did not appear to be a significant difference in 'failure rate' between the small electrostatic filter in this study and a pleated filter in a previous study (8% vs 9%) [ref 2].

Results

Filter type	sample	median RLU patient side (range)	median RLU machine side (range)	number with RLU >50 (machine side)
Venticaire mini bacterial and viral HME	86	19 (5-992)	16 (8-240)	8

Conclusion(s): Performance of electrostatic filters in the clinical setting may not be worse than pleated filters. Factors other than patient contamination levels and laboratory performance of filters are likely to contribute to contamination on the machine side. Further studies are required to elucidate these other factors, which may include how the breathing circuit is left between cases.
References:
1 Wilkes T. Business Briefings: Medical Device Manufacturing and Technology 2004 (August) 70-1.
2 Rees LM, Sheraton TE, Modestini C, Wilkes AR, Hall JE. Anaesthesia 2007; 62: 67-71.

17AP4-10

The intraocular pressure during the laparoscopic radical prostatectomy. A prospective study

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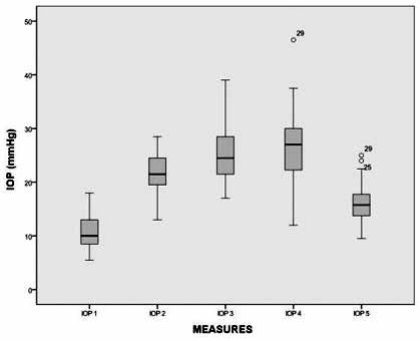
Background and Goal of Study: Laparoscopic radical prostatectomy (LRP) is an increasingly used technique because it has allowed us to reduce many of the drawbacks of open surgery. Patients with glaucoma have a relative contraindication to this technique as the position and insufflation of CO_2 cause increased intraocular pressure (IOP) secondary to increased central venous pressure. This study has quantified the increase in IOP during these surgeries in patients without pre-existing ocular pathology.
Materials and Methods: Prospective study wich measures IOP in 33 patients with Tonopen XL® during LRP. IOP was measured with the patient under anaesthesia before tracheal intubation (M1), after the insufflation of the abdominal cavity with CO_2 and in the Trendelenburg position (M2), after an hour of surgery (M3), after three hours of surgery (M4) and when the surgery had finished before the awakening process and with the patient supine (M5). A multivariate ANOVA was applied for processing statistical data.
Results and Discussion: We have found increases in the average IOP (mmHg) compared to baseline (M1=10.5±3) of 10.6 when placing the Trendelenburg position and intraabdominal CO_2 insufflation (M2=21.07±3.7); of 14.5 after an hour of surgery (M3=25±4.9); of 16.5 after 3 hours of surgery (M4=27±6.9) and a persistence of an increase in IOP of 5.5 at the end of the surgery (M5= 16±7.4). The other confussion variables studied have not proven to influence the variation of IOP.



Conclusion(s): The study confirms a significant increase in IOP during LRP. The IOP are kept at values outside normal ranges (normal 10-21 mmHg) in all M3 and M4 measures. The IOP did not regain its initial value at the end of surgery and remained with an increase with regard to the initial measure (M1). The maximum elevation of IOP belonged to M4, after three hours of surgery. The IOP increase is related to the Trendelenburg position and the increase in abdominal pressure caused by CO2 insufflation. The other studied parameters that can influence IOP do not vary significantly during surgery (TA average, FC, pressure of airways, ET CO_2).

Perioperative Care of the Elderly

18AP1-1

Xenon in patients undergoing aorto-bisiliac bypass

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Background and Goal of Study: Xenon, a gas with anaesthetic and analgesic properties, has gained a greater interest because of a rapid emergence from anaesthesia. Because of the limited data of Xenon in vascular surgery, this study is aimed to evaluate its effects on patients with known cardiovascular risk factors (hypertension, hypercholesterolemia, long story of smoking and age).
Materials and Methods: After Ethic Committee approval and informed consent we evaluated 20 patients undergoing elective abdominal aorto-bisiliac bypass for abdominal aneurism repair or Leriche syndrome, of both genders, aged between 70 and 85 years. The patients were randomly assigned to either xenon (Xe, n= 10) or sevorane (Se, n = 10) group.Mean duration of surgical

procedure was 240 ± 55 minutes. Propofol, cisatracurium and fentanyl were used for the induction of anaesthesia, while fentanyl, cisatracurium and either xenon or sevofluorane were administered for the maintenance. All patients were monitored for haemodynamic parameters (Vigileo ® Monitor) including cardiac output (CO), cardiac index (CI), systemic vascular resistance, arterial systolic pressure (PAS), arterial diastolic pressure(PAD), heart rate, central venous pressure; neuromuscular function (TOF Guard ®); anaesthesia depth (Bispectral Index ® (BIS) monitor); postoperative sedation (Aldrete Score). Postoperative intensive care was assured to each patient at least for 24 hours. Data were analyzed using the two way ANOVA test.

Results and Discussion: CO, CI, PAS and PAD were higher in the xenon group compared to sevorane due to the lack of myocardial depression. The other parameters were similar. All these values did not influence the maintenance of anaesthesia and did not require supplemental doses of fentanyl. The awakening time was sensibly shorter and the Aldrete score was higher in the xenon group (250 ±55 sec vs 600±45, p< 0.001; 10/10 vs 6/10).

	Xe	Se
CO (l/min)	5.51±0.30*	4.51±0.41
CI (l/min/m2)	3.14±0.30*	2.31±0.30
PAS (mmhg)	146.40±21.30**	114.90±7.25
PAD (mmhg)	73.10±10.04*	62.20±4.89

*p<0.05; ** p<0.001

Conclusion(s): The use of xenon in the elderly patients offers an advantage in the stability of the haemodynamic parameters and on the anaesthetic management. The awakening time and the general comfort observed in each patient make it a safe agent in this class of patients which is commonly considered at risk for general anaesthesia.

18AP1-2

Early multidisciplinary referral and length of stay of elderly emergency surgical patients

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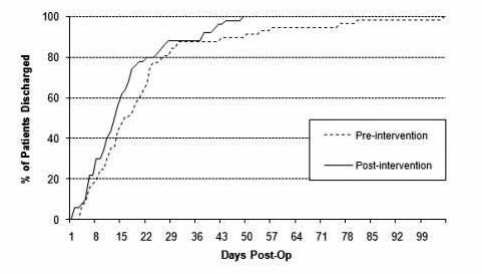
Background and Goal of Study: Harari et al showed that proactive care of elderly elective surgical patients (POPS) resulted in a reduced length of stay (LOS)[1]. We conducted a pilot study in emergency colorectal surgery patients to establish whether highlighting at risk elderly patients to the Care of the Elderly team would expedite their discharge planning and hence reduce their length of stay.

Materials and Methods: Ethical approval was not required. Patients aged over 65 years having emergency colorectal surgery were eligible. In the intervention group high risk patients were identified using modified POPS criteria (including past history of heart failure, stroke, lung disease, dementia, falls, poor nutrition, use of warfarin or need for assistance with personal care). Recruitment took place between March and May 2009. A similar retrospective control group of patients from our hospital was used. Post-operative LOS data was collected using the hospital computer system. Patients not surviving to discharge were excluded. LOS data for all patients over 65 (not just POPS criteria) was analysed using Microsoft Excel and GraphPad Prism.

Results and Discussion: There were 107 eligible patients, 50 in the post intervention group and 57 in the pre-intervention group. The age, sex and P-POSSUM scores of the patients were not significantly different between the two groups. The median post-intervention stay (IQR [Range]) was 13.5 [8,18.75] days compared to 16.0 [11,23] days. Using Mann Whitney U the p value was 0.1145. The time to discharge graph is below. Log Rank (Mantel Cox) test shows the LOS curves are not significantly different (P=0.0560, odds ratio 1.495 CI 0.990-2.257). However our analysis has been limited by the use of a retrospective control group which did not allow us to identify POPS triggering patients specifically.



Conclusion(s): Our pilot has shown that there is likely to be a difference in LOS when the modified POPs criteria are used to highlight at risk patients. A powered prospective study and a more proactive approach to these patients is required.

Acknowledgements: Susan Gordon, Discharge Coordinator and Elizabeth MacDonald.

Reference:

1 Harari D, Hopper A, Dhesi J, et al. Age and Ageing. 2007;36:190-196.

18AP1-3

Achievement of fracture neck of femur pathway project in a district general hospital

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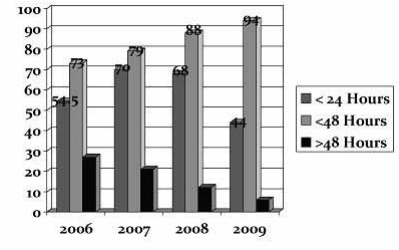
Background and Goal of Study: A reorganised pathway of services in the form of a multidisciplinary fracture neck of femur pathway project led us to improve our operating rate of less than 48 hrs from time of admission from 73 % to 94% and a reduction in the 30 day mortality from 18.5% to 9% *What prompted us to implement a pathway*: Long waits in the Emergency Department, Delays prior to surgery, Theatre capacity problems, Issues with Ortho-geriatric input, Issues with Physiotherapy and Occupational Therapy, Issues with pain management.

Materials and Methods: Project initiatives and activities include[br]• Multidisciplinary Trauma team,[br]• Electronic Trauma Board :[br]• Patients to be fast tracked through Radiology in Emergency Dept;[br]• Increased Operating capacity[br]• Fracture Neck of Femur patients to be nursed in the speciality bed base[br]• Early & appropriate physiotherapy and occupational therapy[br]• Pain management protocol[br]• Appropriate Ortho-geriatric input[br]• Post operative Planned admission to High Dependency Unit for 2 days[br]• Enhanced physiotherapy 7 days a week.

Results and Discussion: Achievements over 4 years include improved operating rate within 48 hours from 73% to 94%, and reduction of mortality (a) overall 30 day mortality from 18.5 to 9%, (b) mortality in patients with 3 or more co morbidities from 60% to 30%.



What we achieved over 4 Years

Opearating rate	2005 (%)	2009 (%)
< 48 Hours	73	94
> 48 Hours	27	6
30 Day Mortality	18.9	9
Mortality for Patients with 3 or>3 comorbidities	60	30

Improved our Operating rate within 48 hours by 29% and reduced our 30 day mortality rate by 48% and reduced our mortality in patients with 3 or >3 comorbidities by 50%

Conclusion(s): A coordinated multidisciplinary management to fracture neck of femur patients will not only reduce the length of stay and reduce the costs to hospital but also reduce the mortality and morbidity.

References:

1 Mortality associated with delay in operation after hip fracture: observational study BMJ 2006;332:947-951 (22 April), (published 22 March 2006).
2 NICE Guidelines (Management of Hip Fracture in adults).
3 Scottish Intercollegiate Guidelines Network (Management of Hip Fracture in elderly patient 2002 & 2009).

18AP1-4

Haemodynamic effects of spinal anesthesia in elderly patients undergoing hip fracture surgery

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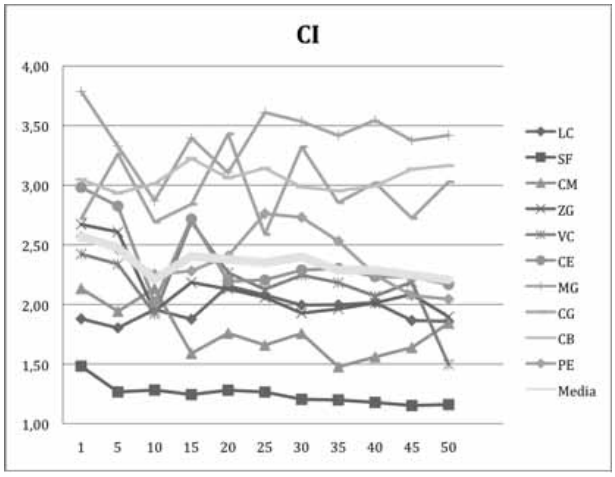
Background and Goal of Study: Hip fracture represents a common problem in the geriatric population. Age and concurrent diseases make these patients

at high risk for perioperative complications. Despite regional anesthesia has a better postoperative outcome, hypotension is common and increases the risk of myocardial ischaemia. Haemodynamic effects of spinal anesthesia was mostly studied observing arterial pressure and heart rate. The aim of this study was to survey haemodynamic change following spinal anesthesia with high time-resolution.

Materials and Methods: We investigated 10 ASA 3 patients aged over 80 years scheduled for hip fracture repair. Haemodynamic assessment was achieved using a pulse wave algorithm derived from the radial artery pressure curve, after calibration with lithium chloride (LiDCOplus). Data were collected until the end of the surgery. Reduction in mean arterial pressure (MAP) < 15% of baseline value or in cardiac output was treated with hydroxyethyl starch 250 ml, then with bolus of ephedrine (5 mg). We used Ringer lactate solution for manteinance (3 ml/kg/h).

Results and Discussion: The main effect of spinal anesthesia was the reduction of systemic resistances (SVRI) which were reduced by 18% ± 17,2%. The average cardiax index (CI) was initially reduced by 6,6 ± 5,2 %, and it was persistently reduced during the surgical period. Stroke volume index (SVI) had the most important effect on MAP, compared to the HR. The average MAP was manteined within 15% of baseline value for 69,7 ± 14,4 % of the surgical time. Just 4 patients were initially considered "fluid responders" because of a rising of SVI more than 15% after fluid challenge and they received fluids as first line treatment of hypotension. Hypotension occurred to "fluid non responders" was treated with ephedrine. Patients "fluid responders" had a smaller CI reduction after spinal anesthesia compared to "non responders" (p = 0,02).



Conclusion(s): The effects of monolateral spinal anesthesia are complex and not just related to SVRI reduction. Continuous hemodinamic monitoring in elderly high risk patients receiving spinal anesthesia is crucial for a correct treatment of hypotension in order to avoid an excessive and probably useless fluids consumption.

18AP1-5

Morbimortality of patients scheduled for major orthopaedic surgery

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Background and Goal of Study: Major orthopaedic surgery of moderate to severe complexity (total hip and knee arthroplasty, hip fracture and spinal fusion) is highly prevalent and affects elderly patients with associated comorbidity and high transfusion risk. The aim of this study is to evaluate postoperative complications and mortality of patients undergoing this type of surgery and the different evolution if it's urgent or elective.

Materials and Methods: Data from a prospective multicenter cohort study (ARISCAT) performed in 59 hospitals (Catalonia, Spain) during seven randomly selected days in 2006, were analyzed. We selected the cohort of patients undergoing major orthopaedic surgery, urgent or elective. The study variables were: sex, age, BMI, physical status according to ASA score, amount of bleeding, transfusion, surgical time, postoperative complications and 30-day mortality. Xi^2 or t-Student were used to statistical analysis.

Results and Discussion: We included 389 major orthopaedic surgery patients (15.8% of 2464 in patient surgery), with a mean age of 70 years old and 66% female. The distribution by type of surgery was: total knee (41%) and total hip (20%) replacement, femur fractures (17.5%) and spinal fusion (9.4%). The prevalence of preoperative anaemia (Hb < 10g/dl) was 9.5% and the overall perioperative transfusion rate was 32%. The incidence of postoperative complications was 16.5% and the overall mortality was 2.8%. Twenty percent of cohort was urgent surgery patients and they were significantly more elderly, with lower BMI and higher comorbidity. The surgical time was lower but the bleeding rate was similar. The transfusion rate was not significantly higher (38.8% vs 29.8%; p 0.81), even tough there were more patients with severe anaemia. Postoperative complications (14.6% vs 23.8%; p < 0.05) and mortality (1.6% vs 7.5%; p 0.01) were significantly higher in orthopaedic urgent surgery.

Conclusion(s): Orthopaedic surgery of moderately-severe complexity had a high transfusion rate and carries a high risk of postoperative complications. The emergency surgery affects older patients with greater comorbidity. Despite this surgery had less bleeding and surgical time is associated with higher risk of perioperative complications and higher mortality.

18AP1-6

The efficacy of an algorithm for goal-directed haemodynamic treatment (GDHT) to elderly patients with proximal femoral fracture

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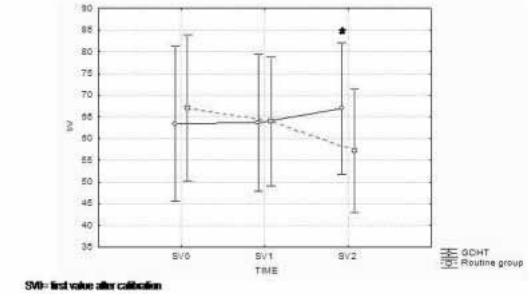
Background and Goal of Study: Among the elderly population in Sweden the postoperative three-months' mortality after femoral neck fracture is 15-20%. By optimizing the cardiac performance using repeated intravenous fluid volume loading length of hospital stay may be shortened[1]. The haemodynamic profile for this group of patients has not previously been described and the optimal DO2I is not known. We aimed to study the efficacy of an algorithm for GDHT compared to routine care directed by blood pressure and heart rate. Primary outcome was change in stroke volume (SV) and secondary outcome was number of patients that achived the oxygen delivery index (DO2I) < 350 ml/min/m^2.

Materials and Methods: Patients > 70 years, scheduled for operation of proximal femoral fracture were randomised prospectively. Both groups were monitored by the Litium Dilution Cardiac Output (LiDCO) monitor, but in the routine group a standardised protocol (fluid and vasopressors) was used and the LiDCO parameters were not available for the anaesthesiologist. In the GDHT group stepwise volume loading was given to increase the SV by 10%. If SV response was < 10% and DO2I < 350 ml/min/m^2, inotropic support was given.

Results and Discussion: 37 patients were successfully randomised. Patient characteristics were similar (figure 1). The SV was significantly increased in the GDHT group (figure 1). In 12 of 37 patients DO2I<350 ml/min/m^2 was found as an initial value which could indicate heart failure[2]. Five patients in GDHT recieved inotropic support and of these two did not reach predefined goals mainly because of a slow increase in dose of inotropics.

	Age (SD)	Male /Female	ASA 1/2/3/4	Total given fluid ml (SD)	Inotropic drug (n)	DO2I<350 ml/min/m^2 at first value (n)
GDHT (n=17)	84 (5)	5/12	0/3/12/2	800 (352)	5	9
Routine group (n=20)	82(8)	5/15	1/7/11/1	700(520)	0	3



SV0= first value after calibration
SV1= before anaesthesia start
SV2= end of operation
* p< 0.05 Denotes significantly difference between the groups for changes of SV over time

Conclusion(s): Goals for GDHT were not reached suggesting that the algorithm should allow an earlier and more rapid increase in inotropic support in this elderly group of patients

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18AP1-7

Efficacy translated to cost-effectiveness. Goal directed haemodynamic treatment for elderly with proximal femoral fracture

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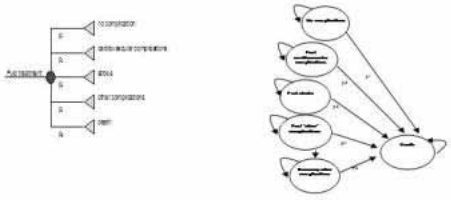
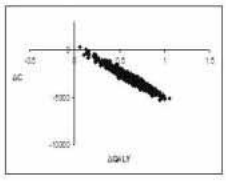
Background and Goal of Study: For policy decisions both efficacy as well as cost-effectiveness of new treatments are needed. Cost-effect analysis considers the clinical effectiveness, costs and long-term health outcome (quality adjusted life years, QALYs). These data can rarely be drawn from a single source and an analytic tool is needed to create a network between data sources. We developed a tool, a model to translate efficacy of goal directed per-operative fluid treatment (GDHT) to cost-effectiveness for patients >75 years following proximal femoral fracture.

Materials and Methods: The GDHT considers strategies targeted by oxygen delivery (>600 l • min^{-1} • m^{-2}) and cardiac index index (>4.5 l • min^{-1} • m^{-2}). The Lithium Dilution Cardiac Output monitor was assumed as monitor. A two-part model[1] was developed: a decision-tree for the postoperative short-term and a Markov structure for long-term outcome (10 years). The model was populated with the best available data drawn from meta-analysis[2] and national registries. For the input parameters probability distributions were defined. By Monte Carlo simulation the input parameters were randomly drawn from these distributions 1000 times. The result is the difference between costs (ΔC) and effects (ΔE). Two alternative scenarios were also assessed: a three times higher costs for monitoring and two times less effective strategy.

Results and Discussion: The GDHT has lower cost (– 4 817 €) and better effect (+ 0.613 QALY). It is dominant for all simulated values for base case and also for scenarios. The result is robust as we used the best available input data.



The decision-tree with the selected postoperative end-points. The Markov structure illustrates the long term survival.



Monte Carlo simulation. It represents 1000 simulations randomly drawn from the defined probability distributions of input parameters.

Conclusion(s): Even strategies with a modest efficacy are cost-effective, may influence the health of patients and reduce the health care costs. Clinical trials on GDHT at elderly are justified.

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18AP1-8

Evaluation of the haemodynamic and respiratory effects of sedation with remifentanil in orthopaedic operations under unilateral spinal anaesthesia in geriatric patients

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Background and Goal of Study: In our study we aimed to compare the effects of remifentanil infusion on cardiovascular and respiratory systems and sedation quality in geriatric patients undergoing orthopaedic operations under unilateral spinal anaesthesia.

Materials and Methods: This clinical study was designed as a prospective randomized controlled trial. After the approval by our Medical Ethics Committee of our Hospital and written informed consent, 60 patients aged over 60 years in ASA I-II physical status were enrolled the study and premedicated with iv 0.05 mg/kg midazolam. After volume preloading with 7-8 ml/kg cristaloid solution, spinal anaesthesia was performed with the side of the surgery down, in lateral decubitis position, from L_{3-4} intervertebral space with 2 ml of %0.5 hyperbaric bupivacaine. The lateral decubitis position was maintained for 10 minutes. Patients were randomized to two groups to receive 0.9% NaCl solution in Group C or 6 µg/kg/h remifentanil infusion following bolus dose of 0.5 µg/kg remifentanil in Group R. Mean arterial pressure (MAP), heart rate (HR), peripheral O_2 saturation (SpO_2), respiratory rate (RR) and sedation score were recorded before and after spinal anaesthesia, at 1., 5.,10., 15. and 20.minutes after sedation and 10 min intervals peroperatively. At the end of the operation patients were transferred to recovery room and these values were also recorded at postoperative 1., 5. and 15. min. Adverse effects were recorded.

Results and Discussion: MAP, HR, RR values were comparable between the groups. The peroperative lower values of MAP and RR compared to basal values In Group R were evaluated clinically insignificant. Sedation scores were significantly higher at all intervals in Group R compared to Group C ($p<0.05$). Adverse effects were not different between the groups.

Conclusion(s): We conclude that; remifentanil can be preferred as a sedative agent in spinal anaesthesia in geriatric patients with minimal effects on haemodynamic and respiratory parameteres with sufficient sedation level.

18AP1-9

Efficacy and adverse effects of intravenous or epidural patient-controlled analgesia in the elderly after major abdominal surgery

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Background and Goal of Study: Patient-controlled analgesia (PCA) with intravenous morphine and patient-controlled epidural analgesia (PCEA), using an opioid in combination with a local anesthetic (sufentanyl- bupivacaine), are two major advances in the management of pain after major surgery. However, these techniques have been evaluated poorly in elderly people. This prospective, randomized study compared the effectiveness on postoperative pain and safety of PCEA and PCA after major abdominal surgery in the elderly patient.

Materials and Methods: After obtaining written informed consent, 60 patients older than 70 yr of age and undergoing major abdominal surgery were assigned randomly to receive either combined epidural analgesia and general anesthesia followed by postoperative PCEA, using a mixture of 0.125% bupivacaine and sufentanil (PCEA group-34 patients), or general anesthesia followed by PCA with intravenous morphine (PCA group – 26 patients). Pain was assessed postoperatively using a verbal analogue pain scale (VAS, 0-10) during rest, mobilization, and coughing. Adverse effects including nausea, vomiting, pruritus, urinary retention, sedation, motor block, and respiratory depression (< 8 breaths per minute) were recorded. Postoperative evaluation included mental status, cardiorespiratory and gastrointestinal functions, and patient satisfaction scores.

Results and Discussion: Pain relief was better at rest ($P = 0.001$) and after coughing ($P = 0.002$) in the PCEA group during the 5 postoperative days. Satisfaction scores were better in the PCEA group. Although incidence of delirium was comparable in the PCA and PCEA groups (18% vs. 20%, respectively), mental status was improved on the fourth and fifth postoperative days in the PCEA group. The PCEA group recovered bowel function more quickly than did the PCA group. Cardiopulmonary complications were similar in the two groups. Nausea and vomiting were most common in the intravenous morphine group ($p<0.05$). Pruritus occurred least often in patients who received epidural analgesia ($p < 0.05$). No respiratory depression was found in any patient.

Conclusion(s): After major abdominal surgery in the elderly patient, patient-controlled analgesia, regardless of the route (epidural or parenteral), is effective. The epidural route using local anesthetics and an opioid provides better pain relief and improves mental status and bowel activity.

18AP1-10

Incidence and risk factors of postoperative delirium in elderly patients after major abdominal surgery

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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. The aim of this study was to investigate the occurrence of postoperative delirium (POD) in elderly patients undergoing major abdominal surgery and to identify factors associated with delirium in this population.

Materials and Methods: Data were collected prospectively from 60 patients aged 70 years or more. Symptoms of delirium were assessed during the

first 6 postoperative days using Diagnostic and Statistical Manual of Mental Disorders-4th Edition criteria. Preoperative, intraoperative and postoperative data, including education, preoperative cognitive functioning, pre-existing medical conditions, medications, vital signs, conduct of the surgery and anesthesia, complications, and details of pain control, were collected and statistically analyzed.

Results and Discussion: Delirium occurred in 43% of the patients during the first 6 days after surgery. Longer duration of delirium was related to lower education, preoperative depression, and greater preoperative psychoactive medication use. Characteristics of the surgery and hospital stay were unrelated to the development of delirium. Logistic regression analysis indicated that the most powerful preoperative predictors of delirium were number of pack years smoked (P =.001), mental status scores (P =.003), and number of psychoactive medications (P =.005).

Conclusion(s): A significant proportion of elderly patients undergoing elective major abdominal surgery are susceptible to the development of delirium and are at risk for cognitive dysfunction after surgery. Our findings have implications for promoting long-term lifestyle changes, including smoking cessation and improved management of mental health as risk-reduction strategies.

18AP1-11

Influence of age on the pharmacodynamic parameters of cisatracurium, rocuronium and vecuronium in males during total intravenous anaesthesia

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Background and Goal of Study: With aging, the effect of many drugs is changed. The aim of this study was to compare the pharmacodynamics of cisatracurium, rocuronium and vecuronium following a single dose (2 × ED95) in young and elderly males during total intravenous anaesthesia.

Materials and Methods: Following local ethics committee approval and patients' informed consent, two age groups (20-40, 60-75 years) of male patients scheduled for surgery under TIVA with tracheal intubation were studied. Both groups were randomly divided into three subgroups in which the patients received a single bolus dose (2 × ED95) of one of the following neuromuscular blocking agents: cisatracurium, rocuronium or vecuronium. After setting up neuromuscular monitoring (Datex-Ohmeda S/5 Anaesthesia Monitor with an NMT module, train-of-four (TOF) stimulation of the ulnar nerve at 10-second intervals, electromyographic response of the adductor pollicis muscle), 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. Mann-Whitney test was used to compare differences between young and elderly patients.

Results and Discussion: The results are summarized in Table 1.

Table 1 Pharmacodynamics of NMBA in young and elderly males

	cisatracurium		rocuronium		vecuronium	
group of patients	younger (n = 25)	elderly (n = 26)	younger (n = 28)	elderly (n = 22)	younger (n = 23)	elderly (n = 23)
age (years)	31 (28;38)	66 (62;71)*	29 (26;34)	64 (61;67)*	32 (25;36)	66 (64;70)*
BMI (kg m^{-2})	25.29 (23.62; 26.63)	23.95 (23.41; 27.64)	26.48 (23.25; 27.83)	25.06 (22.77; 25.78)	23.23 (21.69; 27.25)	25.85 (23.19; 26.89)
onset time (sec)	210 (180; 235)	260 (225; 295)*	90 (85; 105)	140 (120; 150)*	210 (181; 220)	250 (219; 276)*
clinical duration (min)	44 (36;52)	44 (39;52)	36 (28;42)	58 (51;62)*	32 (28;37)	60 (53;67)*
full recovery (min)	71 (66;77)	77 (72;81)	60 (52;68)	103 (86;106)*	56 (51;60)	92 (85;99)*

Data are presented as median and interquartile range, *p < 0.05 compared to group of younger patients

Conclusion(s): The onset time of all studied NMBA was slower in the elderly. Both clinical duration and interval to full recovery for rocuronium and vecuronium was longer in the elderly whereas these parameters for cisatracurium were age-independent.

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Airway Management

19AP1-1

Supreme-LMA vs Cobra PLA

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Background and Goal of Study: The Cobra Perilaryngeal Airway (PLA) and LMA Supreme provide better sealing pressure than the classical LMA models during positive-pressure ventilation in adults. We aimed to compare CobraPLA with LMA Supreme in assessing the success rate, time of insertion, and airway sealing pressure in adult.

Materials and Methods: After approval by the institutional human studies committee and obtaining patient consent, 80 ASA physical status I–II patients were included into our study. The patients were randomly assigned to LMA Supreme Group (Group S, n=40) and Cobra PLA Group (Group C, n=40) for airway management. Demographic parameters, mallampati scores were recorded. For anaesthesia induction, 1mgkg_1 fentanyl and 0.6mgkg_1 rocuronium bromure were administered, and 1% propofol was applied until BIS value was below 60. In order to insert the Supraglottic Airway Device (SGAD), maximum two attempts were made for each group. The cuffs of both airway devices were inflated to 60cmH_2O success rate of inserting SGAD, the duration of insertion, the number of attempts and the insertion complications were recorded for each group. During operation, the percentage of the tidal volume leakage, Ppeak, Pmean, ETCO2 and airway sealing pressure values of all patients were recorded. Data were compared with unpaired Student's t-test and Fisher's exact tests; P<0.05 was significant.

Results and Discussion: Demographic data of patients and the mallampati scores were similar in each group. In Group S and Group C, SGAD was successfully inserted in 95 % and 90% patients, respectively (P>0.05). The duration for SGAD insertion for the Group S (18.1± 2.7 sec) was shorter than the Group C (20.3 ± 3.0 sec) and a significant difference was found between the groups (P<0.05). There was not any difference between the two groups in Ppeak, Pmean and ETCO2 values, percentage of the tidal volume leakage and airway sealing pressure values measured by the ventilator. After operation, three patients complained of sore throat in Group S and seven patients had sore throat in Group C (P>0.05). Postoperative blood staining of SGAD was minimal, occurring in 12,5% patients of Group S versus 32,5% patients of Group C and a significant difference was found between the groups (P<0.05).

Conclusion(s): The Cobra PLA airway performed as well as the LMA Supreme during anesthesia in adult patients. Ventilation was provieded with both SGA devices without leakage in high presures but LMA Supreme was found superior to Cobra PLA with shorter insertion time and less side effects.

19AP1-2

In vitro study of the magnetic resonance imaging artifacts of six supraglottic airway devices

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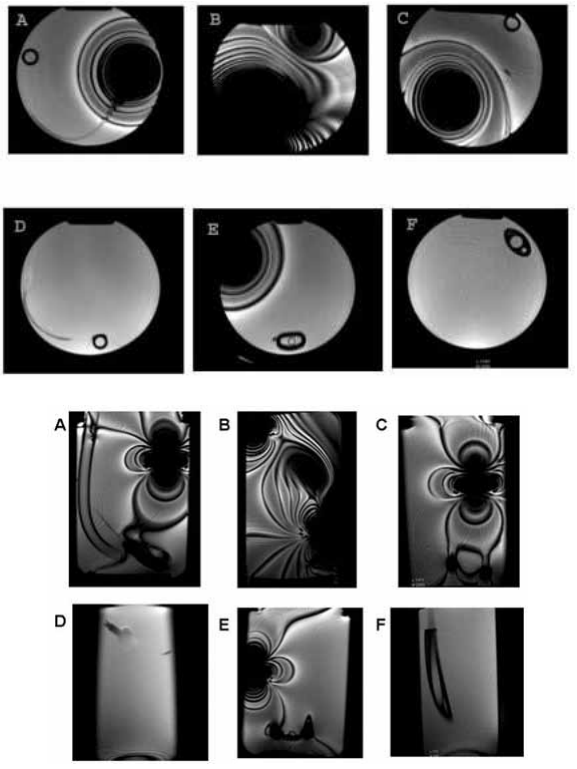
Background and Goal of Study: The use of laryngeal mask airways (LMA) in magnetic resonance imaging (MRI) has become one of the standards of care for patients who can not remain still or cannot otherwise cooperate. LMAs devices have a variable quantity of ferromagnetic material that could reduce image quality or could affect patient security because of potential dislodgement. Recently, news supraglottic airway devices are commercially available, however little information is available on safety and artefacts during MRI with these devices. This study was to investigate the size of artifacts of six different supraglottic airway devices during a MRI procedure in a 1.5-Tesla MR system using a typical Gradient Echo sequence.

Materials and Methods: A 1.5-Tesla clinical MRI system was used. We evaluated the artifacts of six supraglotic devices: A: the Classic LMA, B: the LMA ProSeal, C: the LMA Unique, D: the Ambu® Disposable Laryngeal Mask, E: the LMA Supreme, F: and the I-gel supraglottic airway. The devices were placed on top and inside of a phantom simulator at a situation similar to how it would be positioned in vivo. The MR scan was performed using T2-weighted GE images.

Results and Discussion: The magnetic susceptibility artifact was more prominent with the LMA ProSeal. The artifacts of the LMA Classic, the LMA Unique and the LMA Supreme were similar and related to the ferromagnetic material in the pilot balloon valve. There were no artifacts with the Ambu Disposable laryngeal mask nor with the I-gel supraglottic airway.



Conclusion(s): Concerning the risk of artifacts, the Ambu Disposable laryngeal mask and the I-gel supraglottic airway showed the best image quality during MRI procedure, and would be more appropriate when the area of MRI lies in proximity with the airway.
Acknowledgements: To Enma Cid and Alejandro Blanco. We are grateful for their technological support.

19AP1-3

The intubating laryngeal mask airway in out-of-hospital cardiopulmonary resuscitation

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Background and Goal of Study: Paramedics often perform pulmonary ventilation, using bag-and-mask technique, during out-of-hospital cardiopulmonary resuscitation (OH-CPR). However, mask ventilation can prove difficult due to upper airway obstruction by macroglossia, dentures, and other airway abnormalities, which may cause inappropriate oxygenation as well as regurgitation and pulmonary aspiration of gastric contents. The intubating laryngeal mask airway (ILMA) is easy to place and has a steep learning curve. The aim of this observational study was to evaluate the efficacy and safety of the ILMA used by paramedics of the fire and rescue service during OH-CPR.
Materials and Methods: After University Research Board approval, paramedics of the fire and rescue service were trained to the use of the ILMA during OH-CPR and the device (Fastrach*, LMA Company, UK; sizes 3, 4, 5) were included among the equipment of the ambulances. We recorded the success rate with ventilation and subsequent tracheal intubation through the ILMA as well as the incidence of regurgitation and aspiration during airway control performed by the paramedics. Cases with tracheal intubation (TI) performed by emergency physicians using laryngoscopy were excluded from the analysis.
Results and Discussion: Between November 1 2005 and October 31 2010, paramedics placed 305 ILMA during OH-CPR. Criteria for potential difficult tracheal intubation were present in 27 cases. After ILMA placement, but before TI, ventilation was considered as adequate in 262 (86%) cases. The reasons for failure to ventilate included failure to introduce ILMA due to small mouth or trismus (n=4; 1%), major leak (n=27; 9%), and obstruction to ventilation (n=12; 4%). Of the 243 attempts to TI through the ILMA after adequate ventilation, 214 (88%) were successful. TI via the ILMA was successful in 11 cases where ILMA ventilation was ineffective due to leaks while TI via the ILMA was not successful in any of the 12 cases with obstructed ventilation. Causes of failure to intubate included inability to forward the tracheal tube (n=6) and obstruction to ventilation (n=23). Regurgitation of gastric contents occurred in a total 34 cases (11.1%). This occurred in 11 cases (3.6%) before the rescue arrival, in 18 cases (5.9%) before and 5 cases (1.6%) during ILMA placement.
Conclusion(s): The ILMA allows effective airway management during OH-CPR by paramedics. The incidence of regurgitation (11.1%) was lower than that reported previously (28%) during OH-CPR (1).
References:
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19AP1-4

Laryngeal mask and ventricle-peritoneal shunt surgery

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Background and Goal of Study: We describe the use of ProSeal laryngeal mask airway(PLMA) in ventricle-peritoneal shunt (VPS) surgery. For this surgery, head and neck is maximally turned to facilitate tube tunnelling and it is completely covered with the surgical drapes, so PLMA must be well secured and air leakage is not acceptable.
Materials and Methods: We analyzed retrospectively all VPS patients ventilated with PLMA from 2006 to Oct 2009. We recorded patient characteristics, type of anaesthesia, preoperative difficult airway prediction, ventilation quality and perioperative complications.
Results and Discussion: 43 patients were included (21 M-22 F; 58±16 yo). Monitoring: ECG, blood pressure, pulse oximetry, BIS, capnography. Propofol and remifentanil (TCI) was used in all of them but one (sevoflurane). Muscle relaxants were used in 4 patients. Fifteen (35 %) patients meet some preoperative criteria of difficult airway. PLMA were inserted with the guided technique. The gastric tube was left in-situ to function as a guide to reinsertion in the event of displacement. Patients' lungs were mechanically ventilated to maintain the ETCO2 (35-40 mmHg) and peak airway pressures < 25 cmH2O. Three patients (7%) presented air leakage when the head was placed on the forced surgical position and required tracheal intubation to allow surgery to start. In one case surgeon manoeuvres displaced the LMA and air leakage persisted so patient was managed with facial mask ventilation and fibre optic intubation was necessary. Insertion and ventilation with PLMA was efficient in 39 (91%) patients. Mean airway pressure was < 20 cmH2O in all patients, no laryngospasm was described. The median surgical time was 53 minutes. Eduction was uneventful in all cases.
Conclusion(s): Although LMA ventilation was difficult in some patients due to the forced neck position, when correctly placed, LMA were securely maintained for the surgical procedure. The use of PLMA for airway management during VPS is feasible.

19AP1-5

Sore throat and supraglottic airways: Size matters!

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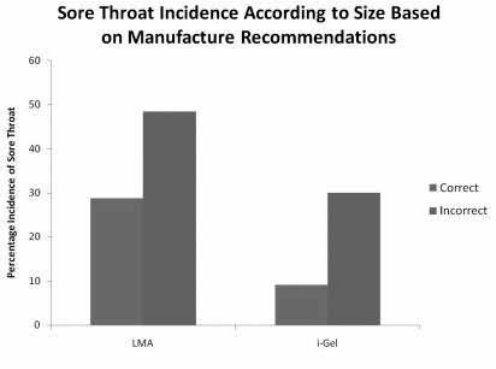
Background and Goal of Study: The incidence of postoperative sore throat is quoted as 17.5% with supraglottic airways (SAs)[1]. Manufacturers state that SAs should be appropriately sized according to patient weight (table 1). One study demonstrated an increased incidence in sore throat when a larger sized supraglottic airway (SA) was used[2] but little else is reported. Does inappropriate sizing of SAs increase incidence of sore throat?

Manufacture Recommendations of Sizing Supraglottic Airways

Size of SA	Weight (Kg) for Fannin LMA	Weight (Kg) for i-Gel
3	30-50	30-60
4	50-70	50-90
5	70+	90+

Materials and Methods: Patient weight was measured preoperatively and size of SA in theatre recorded (involving anaesthetists of all grades) and then compared with manufacture recommendations. Fannin Integral single use laryngeal mask airway (LMA) and i-gel SAs were included. Patients were asked to score sore throat on a visual analogue scale in recovery. Exclusion criteria were ENT procedures, dementia, <18 years of age and other types of SA. A questionnaire was completed by anesthetists in our department testing their knowledge of weight ranges for SA size.

Results and Discussion: 115 patients were studied. Of 83 with LMA, 37.3% were incorrectly sized by weight. Sore throat occurred in 28.8% if correctly vs. 48.4% if incorrectly sized. In the 32 patients with i-gel, 31.3% were incorrectly sized. Incidence of sore throat was 9.1% if correctly vs. 30% if incorrectly sized (fig.1). 87.8% of wrongly sized SAs were too small. 27% of anaesthetists of all grades knew correct weight ranges for LMAs. None knew correct weight ranges for i-gel (n=33).



Conclusion(s): Inappropriate sizing of SAs increases incidence of sore throat. There is a lack of knowledge amongst anaesthetists of appropriate weight ranges by size. We suggest that by inserting the correct size SA according to patient weight, incidence of sore throat can be minimised.

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19AP1-6

Postoperative sore throat

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Background and Goal of Study: To assess patients' postoperative sore throat, its incidence and risk factors. The study was approved by the local ethics committee.
Materials and Methods: This prospective observational study comprised 1,942 patients after elective surgery who were inquired about sore throat and other complaints on the 1st postoperative day. If sore throat or hoarseness were present they were re-examined on the 3rd postoperative day. Patients with pain persisting until the 3rd day were referred for otolaryngologic examination. Patients from the University Hospital Olomouc departments of surgery, traumatology, plastic and aesthetic surgery, urology and gynaecology were assessed. Patient records from recovery room and wards as well as anaesthetic records were used to find out how demographic data, anaesthetic management and administered drugs affect sore throat. The output data were processed by the SPSS statistical software and compared using relevant statistical tests at a significance level of 0.05.
Results and Discussion: A total of 16.2% of patients had postoperative sore throat on the day of surgery, with various frequencies depending on the type of airway management during general anaesthesia. Sore throat was most frequent after endotracheal intubation (18.3%) and laryngeal mask insertion (12.8%). The lowest rates of sore throat were reported after face mask ventilation (4%). The way of tracheal tube tip preparation prior to tracheal intubation has a prominent influence as well. Both trimecaine jelly and water increased the incidence of sore throat two-fold as compared with the K-Y jelly or no pre-treatment. Gender (p = 0,712), BMI (p = 0,982), anaesthesiologist's experience (p = 0,311), nasogastric tube insertion (p = 0,522) or smoking (p = 0,691) did not influent sore throat markedly.
Conclusion(s): The technique of perioperative airway management and lubricant use during general anaesthesia significantly affect the incidence of postoperative sore throat.
Acknowledgements: This study was supported by the Czech Ministry of Health Internal Grant Agency – project NS9618-4/2008.

19AP1-7

Rescue ventilation following apnoea – Effect of oxygen concentration

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Background and Goal of Study: The various effects of different methods of pre-oxygenation on the subsequent speed and degree of desaturation have been widely studied[1,2]. Few studies have addressed re-oxygenation after apnoeic desaturation (i.e. rescue ventilation). We investigated the effect of varying inspired oxygen concentration (F_IO_2) on arterial PaO_2 during ventilation after a period of apnoea.
Materials and Methods: Using the Nottingham Physiology Simulator we simulated a healthy 70kg man firstly with an open and then with a closed airway during apnoeic desaturation. After pre-oxygenation with 90% oxygen, ventilation stopped and the ambient oxygen was reduced to 21%. When the subject's oxygen saturation reached 50% rescue ventilation was instigated at a rate of 20 breaths per minute, tidal volume of 500mL, and F_IO_2 of 100, 50, or 21%. The study was repeated without pre-oxygenation.
Results and Discussion: The effect of F_IO_2 on re-oxygenation in the subject pre-oxygenated prior to apnoea is shown in figure 1. The initial rate of increase in PaO_2 was similar for all oxygen concentrations, and all achieved an adequate PaO_2. Opening the closed airway resulted in a rapid rise in PaO_2, accounted for by the entrainment of gas into hypobaric lungs.The effect of F_IO_2 on re-oxygenation when no pre-oxygenation has taken place is shown in figure 2. The rate of rise in PaO_2 was slower for the lower oxygen concentrations although all eventually achieved an adequate PaO_2.

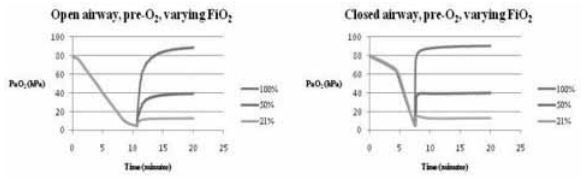

Figure 1.

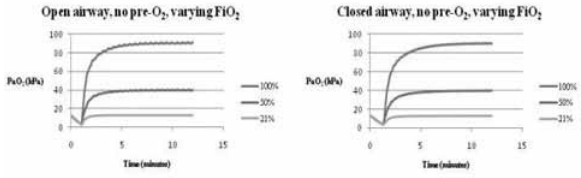

Figure 2.

Conclusion(s): After a period of apnoeic desaturation, rescue ventilation with air is as effective as 100% oxygen in rescuing subjects if the subject was pre-oxygenated before apnoea commenced. If no pre-oxygenation has taken place, then additional oxygen achieves a clinically appropriate arterial saturation more quickly.

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19AP1-8

Rescue ventilation following apnoea – Effect of tidal volume

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Background and Goal of Study: Few studies have investigated the effects of different methods of rescue ventilation following a period of apnoeic hypoxia. We investigated the effect of tidal volume (V_T) on PaO_2 during ventilation after a period of apnoea.
Materials and Methods: Using the Nottingham Physiology Simulator we modeled a healthy 70kg man. After pre-oxygenation with 90% oxygen, ventilation stopped and the ambient oxygen was reduced to 21%. An open and closed airway during apnoea were compared. For each, when the SaO_2 reached 50% rescue ventilation was started with 100% oxygen at a rate (RR) of 20 breaths per minute. Tidal volumes of 500mL, 100mL and 50mL were studied. We repeated the study without pre-oxygenation.
Results and Discussion: Figure 1 illustrates the effect of varying the V_T in a patient who has been pre-oxygenated. When the airway remained patent during apnoeic haemoglobin desaturation, a larger V_T increased PaO_2 more quickly. V_T 50mL and RR of 20 failed to prevent worsening hypoxaemia. If the airway was closed when desaturation occurred, rapid re-oxygenation was independent of V_T, and tidal volumes as low as 50mL were adequate for

re-oxygenation. The effect of different tidal volumes during rescue ventilation when no pre-oxygenation took place is shown in figure 2. For both open and closed airways a larger V_T more rapidly achieved re-oxygenation, and a volume of 50 mL was inadequate to prevent worsening hypoxaemia.

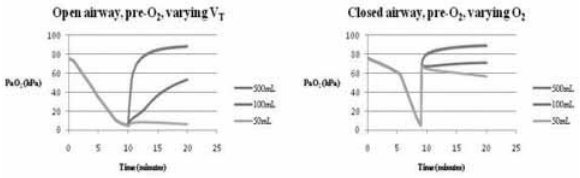

Figure 1.

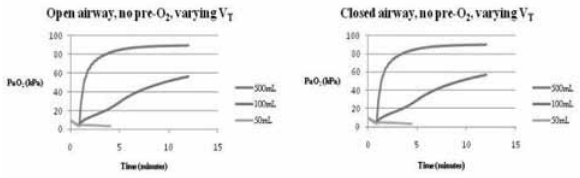

Figure 2.

Conclusion(s): Greater tidal volumes more rapidly achieve an adequate PaO_2 during rescue ventilation, except where the airway is closed following pre-oxygenation. In this scenario small volumes of oxygen are required. This has implications for rescue ventilation following needle cricothyroidotomy – high pressures and large volumes appear unnecessary.

19AP1-9

Fast recovery from severe hypoxia through a 2 mm transtracheal catheter in pigs with a completely obstructed upper airway

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Background and Goal of Study: A needle airway is the most frequently used emergency cricothyroidotomy technique. However, a ventilator that can provide adequate and safe ventilation through a small lumen cannula in an obstructed upper airway is still lacking. A recently developed, portable ventilation device (DE5) has been shown in vitro to achieve a minute volume of 7 L/min through a 2 mm ID catheter by applying suction-generated expiratory ventilation assistance (EVA) [1, 2]. The aim of this study was to investigate the efficiency of EVA on gas exchange in an acute hypoxic animal model with a completely obstructed upper airway.
Materials and Methods: After approval by the local Animal Welfare Committee six pigs (61-76 kg) were anaesthetized and ventilated (IPPV) via a cuffed endotracheal tube (ET) with a tidal volume of 10 ml/kg and an FiO2 of 40 %. The rate was adjusted to maintain paCO2 around 40 mmHg. Monitoring lines were placed and a 75 mm long transtracheal catheter (TC) with an inner diameter of 2 mm was inserted. After baseline recordings the ventilator was disconnected. After 2 minutes of apnea reoxygenation was initiated through the TC with the ET completely blocked. EVA was applied using the DE5 connected to an oxygen flowmeter set at 15 L/min. The initial inspiration / expiration ratio of 1 to 1 was adjusted to keep the intratracheal pressure between 0 and 10 mmHg. Arterial blood samples were collected at baseline (before 2 minutes of apnea), at the start of the intervention (0) and after 10, 20 seconds (s) and 15 minutes (min). Descriptive statistical analysis was performed and the data are presented as median [range].
Results and Discussion: The minute volume necessary to maintain normoventilation during IPPV was 9.9 [9.1-12.0] L/min. After 2 minutes of apnea EVA restored oxygenation within 10 seconds.

	baseline	0	10 s	20 s	15 min
paO2 (mmHg)	171 [156-200]	25 [20-31]	84 [47-208]	254 [178-310]	537 [490-565]
sO2 (%)	100	45 [33-60]	96 [82-100]	100	100
paCO2 (mmHg)	38 [37-40]	54 [46-56]	55 [48-60]	55 [50-62]	57 [56-75]

Conclusion(s): EVA proved to be efficient in restoring oxygenation quickly and limiting hypercarbia over a period of 15 minutes through a 2 mm transtracheal catheter in hypoxic pigs with a completely obstructed upper airway.

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19AP2-1

Communicating information about patients with difficult airways

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Background and Goal of Study: Patients now receive multisite care therefore comprehensive inpatient records (and anaesthetic charts) may not be immediately available. Computerization of Primary Care records allows a printed summary to be generated for hospital referrals. This relies on information from from any previous episodes of care being converted into 'NHS Clinical Terms' or 'Read Codes'. The Read code.SP2y3 denotes difficult tracheal intubation. Our survey objective was to establish how we communicate information about patients with difficult airways and use of the.SP2y3 code.
Materials and Methods: A questionnaire was emailed to College Tutors and departmental secretaries to cascade to Consultant Anaesthetists in 257 UK hospitals (excluding Scotland). Results were collated with Microsoft Excel.
Results and Discussion: We received 502 replies from 107 hospitals. When communicating difficult airway episodes, 220 (44%) write letters, 175 (35%) record the information elsewhere and 75 (15%) simply inform the patient. Of those that write letters, 190 (86%) do so after a failed intubation, 180 (82%) when laryngoscopy grade was 4, 128 (58%) when 3b and 67 (30%) when bag valve mask ventilation was difficult. Content of letters includes: Cormack and Lehane grade by 183 clinicians (86%), method used to secure the airway by 186 (89%) while 135 (65%) suggest a future management strategy. Only 101 (46%) are always successful in writing such letters. Four hundred and fifty-eight clinicians (95%) had been alerted to a difficult airway by anaesthetic charts, 409 (85%) by a patient, 196 (41%) by a letter from an anaesthetic colleague while 112 (23%) had found out from a hospital computer system or departmental database. Fifiteen clinicians (4%) knew a Read Code existed. A majority (77%) thought it would be useful. and 141 clinicians (40%) planned to use the code in future letters. Reporting our survey findings is hampered by the lack of a denominator; we believe this is mitigated by the opportunity to reflect actual practice. Survey fatigue may explain response rate but this may also be due to firewalls blocking access.
Conclusion(s): Less than half of the clinicians responding to the survey write 'difficult airway letters'. Clinical circumstances prompting such a letter, its contents and recipients are not standardised. Use of a code (.SP2y3a) may complement current communication standard and improve the safety of patients with a difficult airway. Few clinicians were aware such a code existed.
Acknowledgements: Edinburgh Anaesthesia Research and Education Fund.

19AP2-2

Cricothyroidotomy – Are you up to it? A national survey

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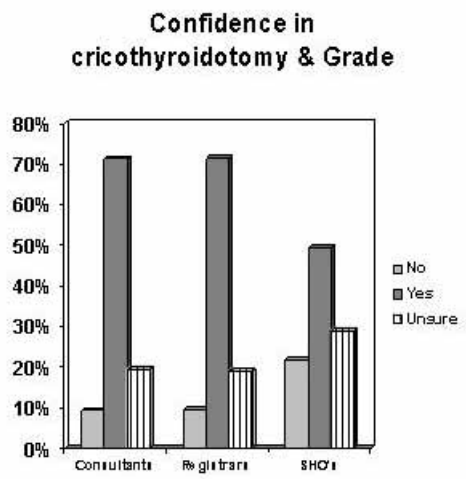
Background and Goal of Study: Emergency cricothyroidotomy is a procedure that one rarely performs, and is usually performed in a life death situation. Performance confidence in a procedure can determine the speed at which it is performed. We conducted a national online survey to determine the confidence levels in performing this life saving procedure among practising anaesthetists in England.
Materials and Methods: We emailed link to the survey to all the trainees and consultants in the country through respective anaesthetic secretaries. As part of a national survey on airway management, the respondents were asked 1. Have you performed cricothyroidotomy? 2. In a cannot ventilate cannot intubate (CVCI) scenario, do you feel confident to proceed to a cricothyroidotomy?
Results and Discussion: There were 1253 responses – consultants -744 (59.4%), Trainees – 509 (41.6%). 25% of the respondents had performed cricothyroidotomy (elective or emergency) on patients, 62% on mannequins/cadavers/animal larynx, while 13% never had the experience. 67.8% of the respondents said they would confidently proceed to cricothyroidotomy in a CVCI situation, 11.2% were afraid they lacked confidence, while the rest were unsure. There was a significant difference in the confidence levels between consultants and trainees (71.2% vs 62.6%) p=0.0017 Fischer's exact test. The confidence levels jumped significantly p=0.0001 as one moved from SHO to Registrar. The confidence levels of Consultants and Registrars were nearly identical. Cricothyroidotomy is a life saving skill that every anaesthetist needs to be skilled and confident in performing. Only half the junior trainees are confident

in this life saving skill. With experience, the confidence levels improved and plateaued with only 70% of Registrars and Consultants confident in this skill. This is probably due to inadequate training, and rarity of event requiring this skill. Increased familiarity with task increases confidence, and we need to be prepared for this rare event to avoid harm to patient.



Conclusion(s): Significant proportion of practising anaesthetists in England do not have confidence in emergency cricothyroidotomy necessitating the need for training in this life saving skill.

19AP2-3

The effect of different mouth-head-neck positions on the effectiveness of mask ventilation in paralyzed pediatric patients undergoing adenotonsillectomy

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Background and Goal of Study: The aim of the study was to investigate the effect of different mouth-head-neck positions on the effectiveness of mask ventilation in paralyzed pediatric patients undergoing adenotonsillectomy, during sevoflurane anaesthesia.

Materials and Methods: Under local ethics committee approval, 40 patients, aged 5-11 years, ASA-I who was scheduled for elective adenotonsillectomy were enrolled in the prospective, randomized study. Exclusion criteria included bleeding tonsil, risk of aspiration, obesity, difficult intubation and cases in which there were contraindications to inhaled anaesthesia. Patients with tonsil size of grade-3/4 and adenoid size of grade-4 were enrolled. Induction of anaesthesia was induced with sevoflurane 8% in 50%N_2O-O_2. After the maintenance of 1MAC level adapted for age for 5 min, 0.1mgkg^{-1} vecuronium was administered. Three min after the administration of vecuronium, patients were randomized according to the first mouth-head-neck position. Three positions were applied: Position CN (closed mouth- neutral head and neck position), position CS (closed mouth-sniffing position), position OS (opened mouth-sniffing position). Volume-controlled ventilation (VCV) was started. Peak inspiratory pressure (PIP), tidal volume (V_T), expiratory tidal volume (V_{Texp}) and end-tidal CO_2 pressure were recorded. The primary endpoint of the study was to determine a difference in expiratory tidal volume (V_{Texp}) and peak inspiratory pressure (PIP) among three positions. Statistical analyses were performed using Repeated Measures of Variance Analysis with Bonferroni Adjustment and Friedman test with Bonferroni Adjusted Wilcoxon Sign Rank test.

Results and Discussion: Thirty-seven patients were ventilated adequately during induction and enrolled in the study. There was a statistically significant difference among three positions for V_{Texp} and PIP values (p=0.002, p<0.001). It was seen that position OS offers advantage in terms of higher V_{Texp} values when compared to that of position CN (p=0.022). The position OS was significantly better than the other two positions for lower PIP values (p<0.001 and p=0.004, for position CN and CS, respectively). The position OS offered least leak during mask ventilation when compared to other two positions, also.

Conclusion(s): We concluded that sniffing position combined with mouth opening offers advantage in terms of the effectiveness of mask ventilation in paralyzed pediatric patients with adenotonsillar hypertrophy, during sevoflurane anaesthesia.

19AP2-4

Does neuromuscular blockade facilitate mask ventilation?

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Background and Goal of Study: Neuromuscular blockade (NMB) potentially facilitates mask ventilation (MV) by increasing chest wall compliance [1], but on the other hand it could make MV difficult by inducing upper airway collapse [2]. We aimed to determine the effect of NMB on the efficiency of MV.

Materials and Methods: After IRB approval and written informed consent we studied 271 patients (ASA 1-3, age 17-85 yr, weight 42-128 kg, M/F: 176/95). Criteria for inadequate MV were defined as follows: $SpO_2 \leq 92\%$, need to increase gas flow to >15 l/min, no perceptible chest movements or capnogram, need to perform a two-handed MV, change of operator required. The efficiency of MV under general anaesthesia was evaluated before and after NMB by using a four-point scale to grade difficulty. Adequate MV without or with an oral airway was defined as grade (G) 1 or 2 respectively. According to the number of criteria of inadequate MV the cases were ranked as difficult (G3: two or three) or impossible (G4: four or more).

Results and Discussion: After NMB 48 patients improved their MV grade from 3a to 2b, 17 from 4a to 3b and eight from 4a to 2b.

MVS	Pre-NMB (a)	MVS	Post-NMB (b)
1a	91 (33.6)	1b	91 (33.6)
2a	90 (33.2)	2b	146 (53.9)
3a	58 (21.4)	3b	27 (10.0)
4a	32 (11.8)	4b	7 (2.6)

( ):%, MVS: mask ventilation scale. Comparison between pre-NMB and post-NMB in MVS grades 1 & 2 vs. 3 & 4: Chi-square test, P< 0,0001, OR= 3.5

Conclusion(s): In patients with difficult MV after induction of general anaesthesia, NMB may improve the conditions of MV.

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19AP2-5

Does neck circumference predict difficult laryngoscopy in morbidly obese patients?

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Background and Goal of Study: Morbidly obese patients are reported to be more difficult to intubate than the general population. The single greatest predictor of difficult intubation is suggested to be a neck circumference of ≥50cm, this is based on a study of 100 patients[1]. For the past three years we have entered neck circumference data onto our anaesthetic database and have analysed it to confirm or refute this assertion.

Materials and Methods: Between January 2008 and December 2009, 836 Morbidly Obese patients (149 with BMI >60 kg/m^2) underwent Roux-en-Y Gastric Bypass or Gastric Banding at our Bariatric Unit. All patients were seen pre-operatively in a multi-disciplinary outpatient clinic where demographic data including neck measurement and Mallampati score were recorded. On the day of surgery the grade of laryngoscopy, according to the classification of Cormack and Lehane, was recorded. Notes were reviewed and data entered onto the database. Analysis of Variance between the patients grouped by grade of laryngoscopy was performed using the Kruskal-Wallis test.

Results and Discussion: Full data was available on 503 patients (126 male, 25%) with a median age of 44 years (range 17-73). The median BMI was 51kg/m^2 (range 32-100) and the median weight was 143 kg (range 89-289 kg). ANOVA demonstrated a highly significant difference between the median values. (p<0.0001) The overall incidence of Cormack & Lehane Grade 3 or 4 Laryngoscopy was 6.6%. In the 91 patients with a neck circumference ≥50cm the incidence was 21%.

Cormack + Lehane Grade	1	2a	2b	3 or 4
Median Neck Circumference (cm)	43	45	46	50.5
Interquartile range	41 - 47	42 - 49	43 - 50.3	43.8 - 58

Conclusion(s): There is a clear and stepwise correlation between difficult laryngoscopy and neck circumference in these patients. The overall incidence of difficult laryngoscopy is not high, but a neck circumference ≥50cm does appear to be a strong predictor.

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19AP2-6

National survey on lung isolation techniques

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Background and Goal of Study: There is a wide variation of lung isolation techniques among cardiothoracic units in the United Kingdom (UK). The source of this variation in practice may be based on equipment availability or the training of individual anaesthetists. We decided to survey the current practice.
Materials and Methods: A postal questionnaire was sent to the lead cardiothoracic anaesthetist in each of the 36 cardiothoracic units. Information was sought on method of lung isolation, double lumen tube (DLT) sizing criteria scored on a visual analogue score (VAS) (0mm=not used at all, 100mm=always used), management of patients with unpredicted difficult airway, method for checking bronchial cuff seal and method for confirming DLT position.
Results and Discussion: Twenty-six of the 36 (72%) cardiothoracic units responded. The VAS mean scores on criteria used for sizing the DLT were 82mm for gender, 81mm for height, 46mm for weight and 22mm for CXR tracheal diameter. All 26 units (100%) used the "listen and feel for leak" technique to check bronchial cuff seal and no unit used the underwater seal.

Survey results

Lung isolation technique	Number of units
DLT	26 (100%)
Bronchial blocker (BB)	15 (58%)
Method of lung isolation in unpredicted difficult airway*	
Tracheal tube introducer, Single lumen tube (SLT), BB	14 (54%)
Tracheal tube introducer, DLT	19 (73%)
Fibreoptic scope, DLT	8 (31%)
Method of confirming DLT position	
Clinical examination	2 (7.7%)
Fibreoptic scope	5 (19.2%)
Both	19 (73%)

*responders chose one or more options.

Conclusion(s): The findings of this survey suggest that the majority of units use DLT as the method of lung isolation. This may be related to the well documented advantages of DLT over BB [1]. Our findings suggest that gender and height are most likely to be used to predict DLT size. Although the CXR tracheal diameter is more predictive [2], it was the least used criteria. When managing an unpredicted difficult airway, 73% of units used tracheal tube introducer to guide DLT insertion. Caution is advised when this technique is used as the Frova, current gold standard single-use introducer, is not recommended for use with DLT. When confirming DLT position, 7.7% of units use clinical examination, 19.2% of units use fibreoptic scope and 73% of the units use both methods. Fibreoptic confirmation is recommended given the anatomical variations in the tracheobronchial tree and the adverse complications of a misplaced DLT.

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19AP2-7

Coopdech and Arndt bronchial blockers are similar in positioning and achieving lung isolation in right and left thoracic surgery

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Background and Goal of Study: Endobronchial blockers are being used in thoracic surgery and offer some advantages over double lumen tubes: difficult airways, rapid sequence intubation, selectively collapsing lobes or patients with an existing tracheotomy. **The aim of the study** was to compare the time required for the positioning and effectiveness of two bronchial blockers: Arndt and Coopdech in right and left thoracic surgery.
Materials and Methods: A prospective, randomized study was planned. Sample size was calculated. Institutional and patient consent was obtained. All bronchial blockers were introduced in the side to be operated according to manufacturer recommendations. All devices were introduced by experienced staff. 95 patients (71 men and 24 women) were included in the study. The variables recorded were: time to position the device (once the ETT was fixed), adequacy of lung collapse once the chest was opened, frequency of malpositions. Statistical analysis were performed with ANOVA and X2 test for qualitative variables. Results were considered to be statistically significant when P value was less than 0.05.
Results and Discussion: All the groups were similar with regard to gender, age, weight and ASA classification. Arnd blocker needed significantly longer time to be positioned than Coopdech although when we use an ANOVA of 2 independent factors (blocker and side) no statistical difference was found in introduction time (p= 0.125) The number of malpositions was significantly more frequent in right side but no differences were found between both blockers.

Positioning time, collapse quality and malpositions

	Right side (n=47)	Left side (n=48)	p	Arndt (n=48)	Coopedech (n=47)	p
Time (s)	142±119	215±233	0.064	224±209	132±153	0.016
Poor quality collapse	6.5%	0%	0.15	0%	6.4%	0.20
Malpositions	54.3%	8.3%	0.000	35.4%	25.5%	0.25

Time in seconds (Mean±SD)

Conclusion(s): In hands of experienced anaesthesiologists, the use of bronchial blockers need a similar introduction time independently of the side and the kind of device. All devices presented similar frequency of malpositions although blockers in the right side presented significantly more malpositions. The quality of lung collapse was excellent for most of patients independently of the side of surgery and the blocker used.

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19AP2-8

Combining the McGrath videolaryngoscope with the fiberoscope for orotracheal intubation

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Background and Goal of Study: The videolaringoscopes (VLSs) are devices designed to offer improved viewing of the glottic entrance over direct laryngoscopy. The use of a stylet to perform the orotracheal intubation is often required when the blade of the VLS has no inbuilt channel for the tracheal tube [1] and complications have been reported in this context [2]. The fiberoptic intubation (F) is the gold standard when facing a predicted difficult airway. F under general anesthesia (GA) is facilitated by the use of a VLS and combining F with VLS allows avoiding the use of a rigid stylet [3]. The goal of this observational preliminary study is to assess the feasibility and the potential advantages of combining the fiberoptic device and the McGrath VLS (MG, McGrath series 5, Aircraft Medical).
Materials and Methods: With informed consent, 30 consecutive ASA I-III patients undergoing elective neurosurgical procedures were included. The GA protocol included propofol-TCI, sufentanil and cis-atracurium. With a TOF=0/4 and F_EO_2>85%, the orotracheal F was performed alone (F group) the even weeks or with the help of MG videolaryngoscopy (MG+F group) the odd weeks. The mouth-to-carena time (t_1)and the total time from the beginning to the first capnography curve (t_2) were recorded. In case of failure (SpO2<94% or t_1>240 sec.), a second attempt was made by the same opperator after further 3 minutes of mask ventilation. In case of two successive failures, the airway was controlled by a senior anesthesiologist with the method of his choice. Cough, hoarseness and dysphagia were sought for in the recovery room.
Results and Discussion: Both groups (F, n=15 and MG+F, n=15) were similar for age, BMI or predictable difficult airway. In the MG+F group, 14 patients were successfully intubated from the first attempt and 1 needed a second attempt. The F group saw 2 failures and 3 out of the other 13 patients needed 2 attempts to be intubated (NS). The t_1 and t_2 times were lower in the MG+F group (94 ± 29.08 sec. vs. 145.92 ± 52.96 sec. p=0.003 and 149.60 ± 46.50 sec. vs. 192.30 ± 43.03 sec. p=0.01 for the MG+F and F groups respectively). By the end of the procedure, the SpO_2 was equivalent across the two groups. No per or post-operative complications were noticed in these series.
Conclusion(s): The MG+F association seems to allow faster F in patients under GA with no more complications. A larger study will evaluate other potential advantages of this association.

References:
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19AP2-9

Tracheal cuff leak in morbid obese patients intubated with a taperguard or a hi-lo cuffed endotracheal tube evaluated by bronchoscopy

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Background and Goal of Study: Post operative pneumonia is more frequent after abdominal surgery and in morbid obese patients. Tracheal cuff might leak and cause silent aspiration when blood or fluid accumulates in the oral cavity. During the leak test after a gastric bypass operation some methylene blue non sterile water might leak in the trachea and cause aspiration pneumonia. A new tapered cuff is developed by Covidien having no plica at one level and it might therefore prevent aspiration as shown in vitro.
Materials and Methods: 63 patients with a BMI above 40 and scheduled for a gastric bypass operation with a methylene blue leak test were randomly intubated with a Hi-Lo cuffed tracheal tube or a TaperGuard tracheal tube. All patients were volume controlled ventilated with 5 cm peep. Patient informed consent and approval by the ethical committee was obtained. After intubation cuff pressure was automatically controlled to 25 cmH20 for the whole procedure. 2 ml Methylene blue is diluted in 150 ml water and used to perform the leak test after the gastric bypass at the end of the laparoscopy. 150 ml Water followed by 150 ml air is very fast injected in the gastric pouch while the surgeon closes the distal connection (1). This methylene bleu colored water flows back in the oral cavity and drips out of the mouth. Before clearing the remaining fluid at the end of the procedure the tracheal tube is inspected above and below the cuff by bronchoscopy. The test is positive when methylene blue is visualized below the tracheal cuff between tracheal wall and tube. Patient is excluded if no methylene blue is visualized above the tracheal cuff.
Results and Discussion: All 31 patients with the Taperguard tube were negative. 13 of the 32 patients with the Hi-Lo cuffed tracheal tube were positive. Taperguard tube with their tapered cuff shape protects against silent aspiration. 5 cm Peep alone does not protect sufficient against silent aspiration.
Conclusion(s): A taperguard tube provide 100% protection against silent aspiration in morbid obese patients ventilated with 5 peep.
References:

1 Dillemans et al. Standardization of the Fully Stapled Laparoscopic Roux-en-Y Gastric Bypass for Obesity Reduces Early Immediate Postoperative Morbidity and Mortality: A Single Center Study on 2606 Patients. Obes Surg 2009: DOI: 10.1007/s11695-009-9933-4.

19AP3-1

The influence of laryngeal mask airway (LMA) cuff pressure on postoperative sore throat

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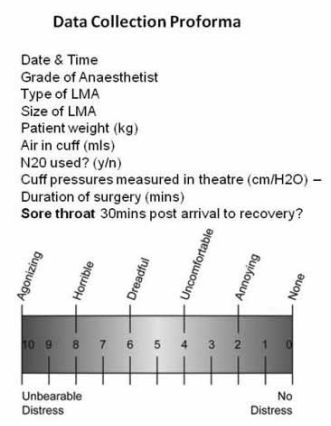
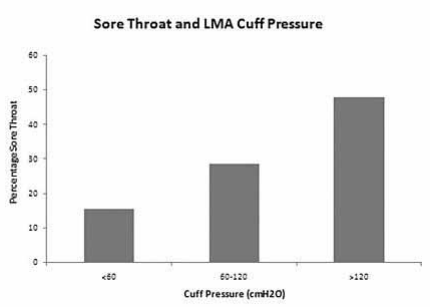
Background and Goal of Study: The incidence of postoperative sore throat is quoted as 17.5% with LMA[1]. Clinical evidence has failed to show a consistent link between LMA cuff pressures (CP) and sore throat[1,2]. However, LMA manufacturers state that CP should remain <60cmH_2O. Does cuff over inflation contribute to sore throat?
Materials and Methods: LMA CP was measured in theatre and patients scored sore throat on a visual analogue scale in recovery (fig.1). Exclusion criteria were: ENT surgery, <18 years old or dementia. Fannin Integral single use LMA was used in all patients. A questionnaire was completed by anaesthetists in our department, investigating their knowledge of recommended CP and if it was routinely measured.



Results and Discussion: 89 patients were studied. Operation duration was 15-285mins. Median CP was 120cm$H_2$0. 14.6% patients had CP <60cm$H_2$0. Incidence of sore throat was 15.4% in this group vs. 40.8% in patients with CP > 60cm$H_2$0 (fig.2). No sore throat was observed when CP <48cmH_2O (n=10). LMAs inserted by consultants resulted in 22.7% vs. 41.8% sore throat with trainees. One anaesthetist was aware of maximum recommended CP and none routinely measured CP (n=33). A positive correlation was shown between CP and sore throat. No link was found between duration of LMA in situ and sore throat. Trainees were almost twice as likely to cause sore throat than consultants. Knowledge of CP recommendations were poor.



Conclusion(s): Increasing LMA CP contributes to sore throat. Maximum recommended CP is largely unknown by anaesthetists and CP is not monitored. We suggest that CP should be routinely measured and reduced to <60cm$H_2$0 in accordance with manufacture recommendations.
References:

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19AP3-2

Role of LMA in airway management during upper airway laser treatment

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Background and Goal of Study: Laser ablation is a novel and effective mode of treating airway lesions due to prolong intubation and cancer. Airway management and ventilation is a major concern during this procedure. The aim of this study was to define the role of LMA in ventilating patients undergoing laser treatment of upper airway lesions.
Materials and Methods: This randomized clinical trial was performed on patients undergoing laser ablation of airway lesions. Patients were randomly allocated to two groups; first using LMA and second using rigid bronchoscopy for ventilation. Induction and maintenance of general anesthesia was similar in both groups. Complications, vital signs, and patient and physician satisfaction was recorded.
Results and Discussion: Seventy seven patients were enrolled, among which 45 underwent LMA ventilation and 32 underwent rigid bronchoscopy. Mean age of patients was 51.3±16.8 years and 53 were male. The most common complication was hemorrhage, with no statistically significant difference between two groups. But the most important complication was hypoxemia which was significantly prevalent among the rigid bronchoscopy group
Conclusion(s): Using LMA for airway management during upper airway lesions is not only safe and effective but also lacks flammability and causes less hypoxemia during the procedure.

19AP3-3

Supreme laryngeal mask vs endotracheal tube during gynaecological laparoscopy in Trendelenburg position

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Background and Goal of Study: To assess the insertion conditions, airway seal and efficacy of ventilation with supreme (SLMA) during laparoscopic gynecological surgery and trendelenburg position compared to endotracheal tube (ETT).
Materials and Methods: Prospective, controlled and non blinded clinical study. 30 non obese women (ASA I-II) undergoing laparoscopic surgery without con-

traindication to the use of laryngeal mask were studied. Anesthesia was induced with propofol/fentanyl and maintained with desflurane/air. Patients were randomized to receive mechanical ventilation (VT:8 ml/Kg-1) through SLMA (n=15; size 4) or the ETT (n=15; size 7.5). Ventilatory settings were adjusted according to lean body weight. Number of insertion attempts and time to establish an effective airway were recorded. Each cuff was inflated to the manufacture's recommended volume and afterwards cuff pressure was measured and adjusted to the ideal pressure. Ease of placing the gastric tube was measured by number of attempts. Airway leaks were detected by stethoscope pharyngeal auscultation and it was measured the leak fraction (difference between inspiratory and espiratory VT divided by inspiratory VT). Airway pressures, ETCO2, minute ventilation and respiratory compliance were recorded at rest, after pneumoperitoneum and after Trendelenburg position. Differences were assessed with t tests and $\chi 2$ tests.

Results and Discussion: Number of insertion attempts (1.1 vs 1) and time to establish an effective airway were similar (14s vs 17s; SLMA and ETT, respectively). Mean cuff volume and pressure used were 28.3(3.3)ml and 3.1(0.3)ml, and 72.3(24)cmH2O and 37(3) cmH2O for SLMA and ETT, respectively. Two leaks were detected by auscultation in SLMA group but non with ETT ($p<0.05$). In spite of the auscultatory leaks, the leak fraction was similar in both groups [5(1.3)% SLMA; 4(1.8)% ETT]. Airway pressures, ETCO2, minute ventilation and respiratory compliance were similar in both groups at different moments studied.

Conclusion(s): SLMA is a practicable approach for laparoscopic gynecological surgery in trendelenburg position.

19AP3-5

The LMA Supreme™ laryngeal mask as an alternative to tracheal intubation in prolonged procedures

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Background and Goal of Study: Tracheal intubation (TI) has been traditionally used in airway management for prolonged anesthesia for two reasons: facilitation of positive pressure ventilation and protection of the airway due to an increase in aspiration risk with time[1]. The LMA Supreme™ (SLMA) with its unique antiaspiration strategy has been well described in a study [2] of 100 patients with a mean surgical time of 64 minutes. We decided to study SLMA in prolonged procedures.

Materials and Methods: Patients undergoing microsurgical procedures over 180 minutes were studied. Anaesthesia was induced with midazolam, sufentanil and propofol and maintained with isofluran, sufentanil, atracurium. PCV, FGF 0_2/AIR 500 ml/min and PEEP 5cmH_20 was maintained during anesthesia.

Results and Discussion: Continuous data are presented as median (quartiles), categorical data number of observation (%). The SLMA was successfully used in all cases (n=41,M/F 19/22, age 49 (33; 57), weight 75 (69; 87)kg, height 172 (162; 178)cm, BMI 27,18 (23,18; 29,52). **Mallampati 3**:4 patients 10%, **Mallampatti 4**:2 patients 5%. **Cormack-Lehane(CL) 3**: 2patients 5%, **CL4** 2patients 5%. The insertion of SLMA was in all cases independent of Mallampatti and Cormack-Mc Lehane score grade[3].The first time insertion success rate was 93%. SLMA cuff pressure 50 cm H_20. Oropharyngeal leak pressure: median 30 cmH_20 (27-32). Gastric tube was inserted using SLMA gastric drain tube (first attempt success rate 100%).Gastric content in the end of anaesthesia: 8ml(0;32) ml. In 19 cases (46%) gastric content was 0 ml. **Ventilation time with SLMA**: 349 (253; 476) min. There was no perioperative aspiration – SLMA cuffs were observed after use and in all cases internal and external parts were clean. There were no major postoperative complications or morbidity. Despite the rigid shape of SLMA, mild sore throat was reported by only 2patients(5 %).

Conclusion(s): SLMA is a suitable and safe alternative to TI in prolonged anesthesia. The main advantage of SLMA is smooth insertion and quick and easy access to the respiratory and gastrointestinal system. In our experience there is no increase in aspiration risk with prolonged ventilation time due to its antiaspiration strategy. Postoperative sore throat was rare and no patient reported dysphagia or dysphonia.

References:

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2 Timmermann A,et al.Anesthesiology 2009;110:262-5.
3 Voyagis GS,et al,Middle East J Anesthesiol 1997; 14:25 – 31.

19AP3-6

Comparison of propofol, sevoflurane, and sevoflurane plus propofol use in induction to laryngeal mask placement conditions

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Background and Goal of Study: Aim of this study is to compare is to compare sevoflurane and propofol and combination of propofol-sevoflurane in terms of convenience of LMA insertion procedure,effects on hemodynamics and upper airway reflexes and patient satisfaction at postoperative period.

Materials and Methods: A total of 84 patients whose ASA physical status I-II, were involved in this prospective, randomized and double blinded study. Exclusion criteria involved difficult intubation, morbid obesity, gastroesophageal reflux, neuromuscular disease, upper respiratory tract infection in recent two weeks and active chronic obstructive lung disease. Patiens were randomly divided into three groups, sevoflurane (S)(n=28), propofol (P)(n=28), sevoflurane-propofol (SP)(n=28), and after induction, loss of consciousness and jaw openning time, number successfull LMA insertion attempts were recorded. An irrigation with 1 ml isotonic saline via FOB (fiberoptic bronchoscopy) was performed to evaluate the upper airway reflexes and the responses were recorded. Laryngeal reflexes were scaled from 0 to 6. Subjective symptoms such as dysphagia, dysphonia, nausea and vomiting and sore throat were recorded at postoperative 0., 2., and 24. hours.

Results and Discussion: The data was analized in SPSS 11.5 programme. The distribution of demographic data of patients in groups was convinient. When groups compared, loss of conscious time in group SP was significantly shorter (10.6±2.23, 49.7±13.82, 14.5±4.71sn, $p<0.001$, respectively) jaw opening was longest in group S(80.0±18.61, 75.1±15.10, 93.8±15.30 $p < 0.001$, respectively). While LMA insertion success at first attempt was 100% in SP group, it was 85% in P group. The hemodynamic parameters were similar in all groups. Disphagia was most observed in group S, sore throat was least observed at SP group(16 (%57.1), 12 (%42.9), 3(10.7) $p <0.001$, respectively) in some respects propofol and sevoflurane have some superiorities to each other but combination of two agent had better induction, vital and laryngeal reflex parameters and also patient satisfaction.

Conclusion(s): Although propofol and sevoflurane have some superiorities to eachother, our results showed that, when they used together, theyimproved the induction, laryngeal and vital parameters.

19AP3-7

ProSeal LMA™ management in prone position

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Background and Goal of Study: The use of the classic laryngeal mask airway (classic LMA) in the prone position is controversial, but the PLMA (ProSeal LMA) may be more suitable as it achieves a better seal and provides access to the stomach [(1)]. We describe our experience with the insertion and maintenance of anaesthesia with the PLMA in patients adults in prone position for orthopaedic and plastic surgery.

Materials and Methods: We retrospectively reviewed 194 patients, ASA II-III, aged 17-70 years, operated between January 2000 and November 2009 of different orthopaedic and plastic surgery procedures in prone position; 12 idiopathic scoliosis, 10 thoracic arthrodesis, 36 lumbar arthrodesis, 6 thoraco-lumbar arthrodesis, 27 bifid spine, 21 removal of thoracic metal work, 12 removal of lumbar metal work, 32 ischiatic pressure sores in paraplegic patients, 17 reconstructive procedures requiring a flap from the back and 21 debridement post spinal surgery. TIVA anaesthesia was induced. A single attempt with size 4 deflated PLMA was inserted in each patient in supine, using a manoeuvre combination between lateral approach described by Lee and Wobble´s technique. If the first attempt wasn´t successful, at the second attempt the PLMA was inserted with laryngoscope. Gastric tube was inserted in supine and afterwards the patient was turned into prone with the head down. Neuromuscular monitoring (TOF) and intracuff pressure control (PIC) was registered. Motor Evoked Potentials monitoring in the idiopathic scoliosis.

Results and Discussion: Total operative time ranged 1 to 7 h. All cases placed gastric tube at the first attempt, 32.98 cases (17%) placed ProSeal at the second attempt with laryngoscope, PIC was always < 60 cmH_2O. All cases were woken up at the end of surgery. PLMA was always placed by experienced anaesthetists.

Conclusion(s): PLMA[(TM)] showed feasible placement and effective airway control in prone surgery in 194 patients (Plastic and orthopaedic back surgery) by experienced users, it gives a tighter seal against glottis opening, separates the digestive tube from the respiratory tract and allows gastric tube placement against possible regurgitation. Laryngoscope showed effective insertion PLMA in the cases that didn´t show at first attempt.

References:

1 Brimacombe JR et al; The proseal laryngeal mask airway in prone patients: a retrospective audit of 245 patients. Anaesth Intensive Care. 2007 Apr;35(2):222-5.

19AP3-8

Laryngeal mask and endotracheal tube: Comparison of postoperative comfort by patient's self evaluation

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Background and Goal of Study: Patient's satisfaction is one of the relevant and important indicator in evaluating quality of medical care in general. Endotracheal tube (ETT) and LMA classic are both effective, realible and safe; intubation is old gold standard,more safe but more agressive and LMA classic is relativly new,with limited indications,less safe and less agressive. Postoperative comfor,releted to laryngopharyngeal morbidity is still not exactly defined for each devices of airway menagement beacause of dificulty in measuring it.
Materials and Methods: We compare postoperative comfor and laryngoharyngeal morbidity by patient's self evaluation, using "face to face" and "self- releted" questionaire on 4h and 24h after surgery, investigating general satisfaction, sore throat, difficulty of swallowing and hoarsness. The study is clinical,prospective,randomised and single blinde, with only one, experiensed, anestesiologist to perform anethesia and to be investigator. Seventy patients divided in two groups by LMA and ETT, ASA physical status class I or II, aged 18-60 yr, Mallampati I or II, no smokers, BMI <30 kg/m2 undergoing elective abdominal, gynegological and orthopedic surgery, and urological endoscopic interventions, lasting one hour.
Results and Discussion: Groups were homogen by few caracteristics possible to influent postoperative discomfor: sex, age, number of insertion attempts and educational level releted to understanding and way of ansering questions. General feelings of satisfaction: 17 patients decler exellent in LMA group and only 8 in ETT group. There were no hoarsness in LMA groupe, only two patients in ETT group after 4h. Sore throath was presented by six patients in LMA groupe, comparing to 12 patients in ETT groupe after 4h. After 24 hours in each group were 10 patients with above mentioned simptom. In LMA groupe dysphagia had 2 patients and 5 in ETT groupe after 4h. After 24h there were 6 patients in LMA groupe,without any in ETT groupe.
Conclusion(s): There were no significant differences regarding postoperative comfor between anesthesia with the LMA or intubation on the day of surgery and first postoperative day. Also, there were no specific laringofaryngeal morbidity model folowing LMA insertion comparing the intubation.

19AP3-9

Insertion of the supraglottic airway device i-gel in the lateral position: Preliminary results

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Background and Goal of Study: The airway management in the lateral position presents some peculiarities. Intubation in the lateral position is more difficult than in supine position. The use of the supraglottic airway devices allows a new approach for these situations. The aim of our study is to evaluate the difficulty of insertion of the supraglottic airway device i-gel in the lateral position.
Materials and Methods: We included ASA I-II patients without predicted difficult airway undergoing scheduled surgery with general anesthesia. We divided them in two groups, those in whom surgery was performed in the supine position and a second group of the lateral (right and left) position. Anaesthesia was induced with the patient already in the chosen position for the surgical procedure. Both groups were monitored with a non invasive standard monitoring, and after three minutes of preoxigenation, we started the anaesthetic induction with fentanil, propofol and rocuronium. After the confirmation of suitable neuromuscular blockade by means of the TOF, an expert anaesthesiologist inserted the i-gel. We assessed the number of attempts that are needed, as well as the time of the performance. The peak pressure in the airway and the tidal volume were recorded in both groups.
Results and Discussion: Data for 32 patients were analyzed and are presented in the table 1 (n=16 for each group). Continuous variables are presented as mean±SD. Failure for the i-gel insertion at the first attemp occurred in 1 patient of each group (6,5%) and the mean time for proper i-gel insertion was similar in both group.

	Supine position	Lateral position
Age	44±16,5	49,2±15
Male / Female	12/4	4/12†
ASA I / II	10/6	9/7
Insertion (sec.)	11,7±2,5	12,3±2,1
Success first attempt (%)	15/16 (93,75%)	15/16 (93,75%)
Vt ins	510,2±56	468,9±68
Paw peak	14,9±2,3	15,4±1,3

†p<0,05; t-students, $\chi 2$

Conclusion(s): The success rate of inserting the supraglottic device i-gel was similar in both groups. The insertion of i-gel in the lateral position is feasible and a reasonable option for the airway management in the lateral position.

19AP4-1

Inter- and intra-observer reliability of the Cormack-Lehane classification

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Background and Goal of Study: The Cormack-Lehane classification [1] is broadly used to describe laryngeal view during direct laryngoscopy. This classification, however, has been poorly validated and the limited studies report contradictive and inconclusive data concerning its reliability. This discrepancy between widespread use and limited evidence prompted us to investigate its intra- and inter-observer reliability.
Materials and Methods: Twenty anesthesiologists well familiar with the Cormack-Lehane classification received a standardized briefing in which the definition of all grades was recapitulated. Subsequently, each participant was asked to perform 5 laryngoscopies in a full-scale patient simulator and to announce the observed glottic visibility according to the Cormack-Lehane classification. The simulator allowed to reproducibly present four different, yet for each participant identical, intubating conditions in random order. These conditions were chosen to correspond to typical grade 1,2,3 and 4 view of the Cormack-Lehane classification. Grade 2 was shown twice to each participant. Kappa coefficients were calculated for inter-observer agreement between all 20 participants and for intra-observer agreement between the first and second evaluation of grade 2 of each participant.
Results and Discussion: In 56 of the in total 100 laryngoscopies, the observed grade conformed to preset grade, while no agreement was observed in 44 cases. 10 (50%) of the participants showed agreement between their first and second observation of the identical airway setting that was presented twice to each participant. Of the other 10 participants not showing agreement, 6 assigned a lower grade and 4 a higher grade at the second occasion. The multi-rater kappa coefficient for the overall agreement between all 20 participants was 0.35, indicating fair agreement between the participants [2]. Cohen's kappa coefficient for intra-observer agreement was 0.15, indicating poor intra-observer agreement [2].
Conclusion(s): Reproducibility of the Cormack-Lehane classification was found to be limited, with a poor intra-observer reliability and fair inter-observer reliability in anesthesiologists well familiar with this classification. These data question the usefulness of the Cormack-Lehane classification for routine documentation of intubating conditions.
References:
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19AP4-2

The accuracy of the Mallampati test in predicting a difficult airway

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Background and Goal of Study: The Mallampati test is used as a preoperative bed side test to predict difficult airway.
Materials and Methods: After IRB approval and written informed consent we studied 610 anaesthetised paralysed adults (ASA 1-3, age 15-87 yr, weight 38-147 kg, M/F: 406/204) undergoing thoracic procedures. Lung isolation (LI) was required in 233 of 610 patients. The preoperative airway assessment included the original Mallampati test with and without phonation. The efficiency of mask ventilation (MV) under general anaesthesia was evaluated by using a four-point scale to grade difficulty [2]. Difficult DL was defined as inability to visualize any part of the vocal cords. DLTI was ranked as (A) easy, (B) difficult or (C) failed as follows: A. excellent LI after one attempt, B. excellent LI after 2-3 attempts, C. ineffective LI, contralateral LI or inability to enter the trachea after three attempts.
Results and Discussion: Chi-square test Yates corrected: comparisons between classes *1 & 2 vs. 3, *1 vs. 2 & 3 sensitivity: $0.36^{1}/0.54^{2}/0.34^{3}$, specificity: $0.85^{1}/0.77^{2}/0.85^{3}$, positive predictive value: $0.22^{1,2,3}$
Conclusion(s): The Mallampati test with phonation predicts cases with difficult MV. With regard to the prediction of difficult DL, the phonation seems to increase the specificity, but decreases the sensitivity of the test.

Abstract 19AP4-2

Mallampati	1	2	3	1	2	3	P - value
MV n=610	Easy				Difficult		
Original*	279 (51.0)	124 (22.7)	144 (26.3)	30 (47.6)	15 (23.8)	18 (28.6)	NSS
Phonation 1 +	464 (84.8)	70 (12.8)	13 (2.7)	40 (63.5)	20 (31.7)	3 (4.8)	0.0005
Mallampati	1	2	3	1	2	3	
DL n=610	Easy				Difficult		
Original 2 *	292 (53.8)	125 (23.0)	126 (23.2)	17 (25.4)	14 (20.9)	36 (53.7)	<0,0001
Phonation3 +	460 (84.7)	75 (13.8)	8 (1.5)	44 (65.7)	15 (22.4)	8 (11.9)	<0,0001
Mallampati	1	2	3	1	2	3	
DLTI n=233	Easy				Difficult or Failed		
Original *	68 (43.0)	42 (26.6)	48 (30.4)	32 (42.7)	18 (24.0)	25 (33.3)	NSS
Phonation+	132 (83.5)	26 (16.5)	0 (0)	61 (81.3)	12 (16.0)	2 (2.7)	NSS

( ):%, D: difficult, F: failed.

References:
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2 Yildiz TS et al. J Anesth 2005; 19: 7-11.

19AP4-3

Qualitative risk factors associated with difficult mask ventilation: Preliminary data

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Background and Goal of Study: Mask ventilation (MV) is an essential component of airway management and the delivery of general anaesthesia [1]. Given the relatively limited data regarding difficult MV and the differences concerning its definition, we aimed to determine the incidence of difficult MV and to identify qualitative risk factors (RFs).
Materials and Methods: After IRB approval and written informed consent we studied 543 anaesthetised paralysed adults (ASA 1-3, age 15-85 yr, weight 42-141 kg, M/F: 376/167). Preoperative patient characteristics and detailed airway physical exam data were recorded. The efficiency of MV under general anaesthesia was evaluated by using a four-point scale to grade difficulty. As criteria of inadequate MV we defined the following: $SpO_2 \leq 92\%$, need to increase gas flow to >15 l/min, no perceptible chest movements or capnogram, need to perform a two-handed MV, change of operator required. Adequate (not difficult) MV without or with an oral airway was defined as grade (G) 1 or 2 respectively. According to the number of criteria of inadequate MV the cases were ranked as difficult (G3: two or three) or impossible (G4: four or more).
Results and Discussion: The incidence of difficult and impossible MV was 46 (8.5%) and 10 (1.8%) respectively. Table shows characteristics proved to have an aggravating impact in difficult and/or impossible MV. Neck extension and the original Mallampati test do not predict difficult MV.

	Not DMV, n=487	D/I MV, n= 56	P value*
Gender (M/F)	329 (67.6)/ 158 (32.4)	47 (83.9)/ 9 (16.1)	0.02
"Bull" neck	26 (5.3)	9 (16.1)	0.005
Full beard/ goatee/ moustache	11 (2.2)/ 19 (3.9)/ 46 (9.4)	4 (7.1)/ 0 (0) /15 (26.8)	0.00007
Lack of upper teeth (partial/complete)	77 (15.8)/ 94 (19.3)	15 (26.8)/ 18 (32.1)	0.004
Lack of lower teeth (partial/complete)	80 (16.5)/ 79 (16.2)	12 (21.4)/ 18 (32.1)	0.006
Chronic cough	133 (27.3)	26 (46.4)	0.005
Snoring	219 (45.0)	35 (62.5)	0.02
Sleep apnoea	17 (3.5)	7 (12.5)	0.006

( ): %, D/I MV: difficult or impossible MV, *Chi-square test

Conclusion(s): Beard, moustache, lack of teeth, short fat neck, history of chronic cough, diagnosed obstructive sleep apnoea, history of snoring and male sex were identified as potentially difficult MV qualitative RFs.
Reference:
1 Task force of ASA. Anesthesiology 2003; 98: 1269-77.

19AP4-4

Quantitative variables associated with difficult mask ventilation: Preliminary data

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Background and Goal of Study: Mask ventilation (MV) is an essential component of airway management and the delivery of general anaesthesia [1]. Given the differences regarding the definitions of difficult MV and the lack of anthropometrical data we aimed to identify quantitative variables of patients with difficult MV.
Materials and Methods: After IRB approval and written informed consent we studied 543 anaesthetised paralysed adults (ASA 1-3, age 15-85 yr, weight 42-141 kg, M/F: 376/167). Preoperative patient characteristics and detailed airway physical exam data were recorded. The efficiency of MV under general anaesthesia was evaluated by using a four-point scale to grade difficulty. As criteria of inadequate MV we defined the following: $SpO_2 \leq 92\%$, need to increase gas flow to >15 l/min, no perceptible chest movements or capnogram, need to perform a two-handed MV, change of operator required. Adequate (not difficult) MV without or with an oral airway was defined as grade (G) 1 or 2 respectively. According to the number of criteria of inadequate MV the cases were ranked as difficult (G3: two or three) or impossible (G4: four or more).
Results and Discussion: Table shows mean values +/- SD (range) of variables proved to have an aggravating impact in difficult and/or impossible MV. Limited mouth opening, thyromental and hyoidomental distance were not associated with difficult MV.

	Not DMV, n=487	D/I MV, n= 56	P value*
Age (yrs)	53.5 +/- 16.3 (15-85)	60.0 +/- 13.2 (16-80)	0.004
Body weight (kg)	76.2 +/- 14.8 (42-130)	87.2 +/- 16.1 (56-141)	<0,0001
BBMMII	26.2 +/- 4.5 (15.7-42.2)	29.3 +/- 5.1 (20.1-46.0)	<0,0001
NC (cm)	38.5 +/- 4.0 (18-51)	42.3 +/- 4.0 (34-56)	<0,0001
SMD (cm)	18.2 +/- 2.1 (10.5-24)	17.2 +/- 1.8 (13-21)	0.0007
NC : SMD	2.16 +/- 0.46 (1.4-8.0)	2.49 +/- 0.38 (1.8-3.6)	<0,0001
TMD (cm)	15.8 +/- 2.2 (10.5-19.5)	16.7 +/- 1.8 (13.0-20.5)	0.003

D/I MV: difficult or impossible MV, *Student t- test, BMI : body mass index, NC : neck circumference, SMD : sternomental distance, TMD : transverse mandibular distance

Conclusion(s): Advanced age, increased body weight, large BMI, wide neck circumference, short sternomental distance and high neck circumference/sternomental distance ratio were identified as variables potentially aggravating MV.
References:
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19AP4-5

Evaluation of the incidence of clinical parameters implying difficult mask ventilation

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Background and Goal of Study: Maintenance of airway patency and oxygenation are the main objectives of face-mask ventilation (MV). Given the differences regarding the definitions of difficult MV we aimed to identify the clinical parameters (CP) that characterise, either difficult or impossible MV, and their occurrence.
Materials and Methods: After IRB approval and written informed consent we studied 543 anaesthetised paralysed adults (ASA 1-3, age 15-85 yr, weight 42-141 kg, M/F: 376/167). We defined inadequate MV when more than one of the following CP were present: $SpO_2 \leq 92\%$, need to increase gas flow to >15 L/min, no perceptible chest movements or capnogram, need to perform a two-handed MV, change of operator required. The efficiency of MV under general anaesthesia was evaluated by using a four-point scale to grade difficulty. Adequate MV without or with an oral airway was defined as grade (G) 1 or 2 respectively. According to the number of CPs encountered, the cases were ranked as difficult (G3: two or three) or impossible (G4: four or more).
Results and Discussion: Although desaturation is used to define difficult MV, our findings suggest that it characterises impossible, rather than difficult MV. Absence of chest movements is always present during impossible MV. The incidence of the remaining CPs appears not to differ between the two subgroups of inadequate MV. Evaluation of desaturation alone, seems to underestimate the incidence of inadequate MV.

Mask ventilation (MV)	Easy	Difficult	Impossible	P value*
	n= 487	n= 46	n= 10	
SpO2< or = 92%	0 (0)	3 (6.5)	5 (50.0)	0.003**
Need to increase FGF > 15L/min	16 (3.3)	16 (34.8)	4 (40.0)	NSS
No perceptible capnogram	39 (8.0)	29 (63.0)	9 (90.0)	NSS
No perceptible chest movements	33 (6.8)	25 (54.3)	10 (100)	0.009
Need to perform a two-handed MV	12 (2.5)	39 (84.8)	9 (90.0)	NSS
Change of operator required	9 (1.8)	9 (19.6)	3 (30.0)	NSS
Cumulative frequency of PD/ pt	0.22	2.60	4.0	

FGF: fresh gas flow, * Fisher's exact test: paired comparisons between difficult MV and impossible MV, **OR= 14.3

Conclusion(s): Absence of chest movements is always present during impossible MV. Evaluation of desaturation alone, seems to underestimate the incidence of inadequate MV.

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1 Langeron O etal. Anesthesioloy 2000;92:1229-36.
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19AP4-6

The incidence of difficult laryngoscopy among patients with difficult mask ventilation

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Background and Goal of Study: The ability to maintain an adequate airway using bag and face mask in cases of difficult intubation is of critical importance. However there is evidence that difficult direct laryngoscopy (DL) occurs more frequently in patients with difficult mask ventilation (MV). The goal of this study was to determine the incidence of difficult DL among patients with difficult MV.

Materials and Methods: After IRB approval and written informed consent we studied 543 anaesthetised paralysed adults (ASA 1-3, age 15-85 yr, weight 42-141 kg, M/F: 376/167). The efficiency of MV under general anaesthesia was evaluated by using a four-point scale to grade difficulty. As criteria of inadequate MV we defined the following: $SpO_2 \leq 92\%$, need to increase gas flow to >15 L/min, no perceptible chest movements or capnogram, need to perform a two-handed MV, change of operator required. Adequate (not difficult) MV without or with an oral airway was defined as grade (G) 1 or 2 respectively. According to the number of criteria of inadequate MV the cases were ranked as difficult (G3: two or three) or impossible (G4: four or more).The DL findings (as defined by the modified five-grade Cormack & Lehane scoring system [1]) were recorded with the patient in optimum sniffing position, by using a Macintosh 3 or 4 blade and without applying any manipulation on the neck.

Results and Discussion: Chi-square test Yates corrected: comparisons between LV grades 1 and 2a and 2b vs. 3 and 4: P= 0.015, OR= 2.5

LV grades	No DMV n= 474	D/I MV n= 56	Total n= 543
1	287 (60.5)	27 (48.2)	314 (57.8)
2a	77 (16.2)	6 (10.7)	6 (10.7)
2b	64 (13.5)	11 (19.6)	75 (13.8)
3	39 (8.2)	10 (17.9)	49 (9.0)
4	7 (1.5)	2 (3.6)	9 (1.7)

( ):%, D/I: difficult or impossible

Conclusion(s): The inability to visualise the larynx during DL appears twice as frequent in patients with difficult MV, compared to the rest of the surgical population.

References:

1 Yentis SM, Lee DJ. Anaesthesia 1998; 53: 1041-4.

19AP4-7

Comparison of upper lip bite test with Mallampati test in prediction of difficult intubation in tertiary care hospital of a developing country

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Background and Goal of Study: Difficult or failed tracheal intubation has been identified as one of the most important cause of death or permanent brain damage during anesthesia. Many methods have been used to predict difficult intubation. Upper lip bite test (ULBT) and Mallampati test (MT) are two of them. MT is used to evaluate oropharyngeal structures while ULBT evaluates the ability of a patient to reach the upper lip with the lower incisors. To determine the accuracy of ULBT and MT in predicting difficult endotracheal intubation.

Materials and Methods: After institutional ethical committee approval and written informed consent, 324 patients were enrolled in this observational study requiring endotracheal intubation for elective surgical procedure. ULBT and MT were performed for the assessment of airway by specifically trained observer. Ease or difficulty of laryngoscopy after the patient is being fully anesthetized with standard technique and laryngoscopic view of first attempt was rated by another anesthetist who remained blinded to the result of initial assessment.

Results and Discussion: Of the 324 patients included in the analysis, 56 (17.3%) were classified as difficult to intubate. ULBT showed significantly higher accuracy, positive predictive valve and negative predictive valve than MT. Comparison of specificity however did not reveal any significant difference between these two tests. The discriminating power of ULBT was high 0.90 (95% confidence interval, 0.84-0.95) than MT 0.55 (95% confidence interval, 0.47-0.64) indicating that ULBT is a good predictor of difficult intubation.

Conclusion(s): ULBT is an acceptable option for prediction of difficult intubation as a simple, single test.

19AP4-8

Strategy to improve anaesthesiologists' airway assessment and management in Catalonia: QUAVA II

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Background and Goal of Study: QUAVA study demostrated that a deeper knowledge on Airway assessment(AA)and management(AM), continuous training on different AM techniques, as well as quick availability of AM devices is needed among Catalan anaesthesiologists(1). QUAVA II collaborative project is an study focused on the further improvement of AA and AM in Catalonia.

Materials and Methods: A prospective multicentre study is conducted in 38 hospitals. In order to plan a continuous educational program, a questionnaire was sent. AA and AM details of each department were recorded. Anesthesiologists were asked to anonymously rate their experience and availability of 8 AM techniques and their needs for continuous education.

Results and Discussion: Availability of different devices is shown in table 1. 76% hospitals have an AM cart. Preoperative AA is performed with a specific checklist in 74% hospitals. 74% anaesthesiologists answered to the survey. Degree of individual experience and availability of different AM techniques is shown in Table 1. AA is performed routinely (85%), only when difficulty is suspected (14%) or seldom (1%). Local or ASA guidelines are usually followed (90%). In 2009, 78% of anaesthesiologists received some information/training on AM but 94% of them demand training in invasive techniques (62%), fiberoscopy (49%), videolaryngoscopy (46%), airway rescue devices (41%).

Devices	Hospitals availability. n(%)	Experience*	Availability perception**
Bougies	35 (92%)	15-23-43-7-13	67-17-6-2-7
Extraglotic devices	37 (97%)	42-41-13-2-2	77-12-5-2-3
LMA fastrach	37 (97%)	18-26-43-8-5	56-33-7-1-4
Videolaryngoscopes	17 (45%)	5-8-49-20-17	20-15-10-13-43
Fiberscope	31 (82%)	12-24-43-11-9	35-32-19-10-4
Non invasive rescue Airway	14 (37%)	3-2-17-38-40	15-17-13-14-41
Cricotiroidotomy set	33 (87%)	2-1-15-39-44	26-24-23-16-10

*Percentage of anaesthesiologists'experience degree: 1=expert; 2=frequent user; 3=occasional user without help; 4=only in mannequins; 5=never used; **Percentage of perceived availability degree by anaesthesiologists: 1=immediate availability; 2=available<5min; 3=available<15 min; 4=difficult availability; 5=not available.

Conclusion(s): From this results, a training programme is being developed in Catalonia, starting with a Training of trainers course last Oct. A prospective study of several AM quality clinical indicators is being conducted to assess impact of a multifocal strategy focused in training developement.

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Acknowledgements: To all anesthesiologists participing in QUAVA study.

19AP4-9

Variability in the application of difficult airway predictor tests: Is it affected by anesthesiologist's experience?

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Background and Goal of Study: Multiple studies have attempted to identify patient characteristics predictive of difficult intubation and some of them are commonly accepted to be admissible predictors when used all together; but these characteristics are observer dependent. The goal of this study is to define the influence of the degree of experience of the anaesthesiologist on the variability of four defined predictors of difficult airway and on the global airway assessment.
Materials and Methods: Prior to study, an airway assessment protocol was designed, in wich a semiquantitative valuation (normal, limited or very limited) was defined for three predictors: mouth opening, thyromental distance and cervical mobility; as well as Samsoong-Young modification of Mallampati test. Once these tests were applied, a subjective difficult airway prediction was required (difficult, possible or not difficult). A total of 9684 patients were assessed by 9 anesthesiologists; 3 had less than 5 years of experience (they evaluated 2716 patients), 3 had between 5 and 10 (3053 patients), and 3 had more than 10 (who evaluated 3915). Intragroup variability was calculated, as well as intergroup variability by analysis of Variance and Bonferroni test for multiple comparisons, for each of the test and for the final assessment.
Results and Discussion: There was no statistically significant differences (p<0'05) between sex nor age of the patients in each group; and intragroup variability was discarded. There were statistically significant differences (p<0'01) between the 3 groups for mouth opening, thyromental distance and cervical mobility. No linearity was found; and the intermediate experience group was who gave the worst score. Analyzing Mallampati and final assessment, we found statistically significant differences (p<0'01) between the most experienced group and the other two (but noy between these two) with a marked linearity. It was the most experienced group who assessed a difficult intubation more frecuently.
Conclusion(s): Statistically significant variability exists when difficult airway predictive test are applied in a semiquantitative way. Anesthesiologist's experience affects variability and subjective prediction of difficult airway.

19AP4-10

Preoperative evaluation of difficult laryngoscopy using predictive tests

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Background and Goal of Study: Unanticipated difficult intubation increases morbidity and mortality in patients undergoing general anesthesia. The aim of this study was to assess the usefulness of preoperative tests to predict difficult intubation.
Materials and Methods: After approval of ethics committee and patients' informed consent, 235 adults aged 18-68 years who required tracheal intubation as part of their anaesthetic were enrolled to study. The age, gender, weight, height and body mass index (BMI) of patients were recorded. The assessed tests were interincisor distance (IID), upper lip bite (ULB), Mallampati, thyromental distance (TMD), sternomental distance (SMD). Ratio of height to thyromental distance was also calculated. After induction of anaesthesia and neuromuscular blocking drug administration, laryngoscopy was performed after the loss of the forth twitch in the train-of-four. Glottic visualization was assessed according to Cormack-Lehane classification.
Results and Discussion: Laryngoscopy was difficult in 15 (6,38%) patients but there was no failed intubation. Incidence of difficult laryngoscopy was increased with the increase in age, BMI and weight. There was a negative correlation between difficult laryngoscopy and TMD, SMD, IID and a positive correlation between difficult laryngoscopy and and RHTMD, ULB test and Mallampati classification. ULB test was found as the most sensitive test with sensitivity of 86,67% in predicting difficult laryngoscopy. Area under curve (AUC) was largest for Mallampati classification.There was no statistically significant difference between the ROC curves of tests. Preoperative evaluation of anatomical landmarks and clinical factors help identify potentially difficult laryngoscopies. Several studies evaluated different tests, alone or in combination, to predict difficult intubation.

Table1. Accuracy of tests in predicting difficult laryngoscopy

Test	Sensitivity	Spesifisity	+PV	-PV	%95 CI	AUC
TMD	46,67	90,0	24,1	96,1	0,545-0,67	0,610
SMD	46,67	82,65	17,1	95,3	0,621-0,75	0,688
IID	66,67	65,10	13	96,2	0,601-0,73	0,670
RHTMD	46,67	91,36	26,9	96,2	0,574-0,70	0,639
ULB	86,67	43,64	9,5	98,0	0,627-0,74	0,690
Mallampati	73,33	95,45	54,2	98,1	0,780-0,87	0,834

PV: Predictive value

Conclusion(s): Our results suggested that ULB test and Mallampati classification could be useful bedside tests for preoperative prediction of difficult laryngoscopy.

19AP5-1

A comparison of three endotracheal tubes for blind intubation via LMA-FastrachTM disposable and the i-gel mask in an airway management manikin

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Background and Goal of Study: The study was split up in two parts: insertion of the I-Gel and LFD in a manikin followed by blind intubation with three different endotracheal tubes (ET) via both supraglottic airway devices(1).
Materials and Methods: 32 investigators (12 staff member, 10 anesthesia residents and 10 CRNA) with no previous experience in using neither the I-Gel nor the LFD volunteered to participate in this study. The number of insertion attempts, time to achieve an effective airway and the handling of insertion of both devices were recorded. Blind intubation via both devices was performed using either an ID 7.0 mm Portex silicones tube (PT), an ID 7.0 mm Mallinckrodt PVC tube (MT) or an ID 7.0 mm LMA FastrachTM tube (LFT). Failure rate, attempts and time for successful intubation were obtained.
Results and Discussion: The I-gel was inserted successfully with the first attempt by all investigators, whereas the insertion of the LFD was successful in 90% with the first attempt and in 10% with second attempt. Insertion time was significantly shorter in I-Gel group (p<0.0001). Intubation time via LFD was significantly shorter for LFT (12±3 sec) compared to PT (14±3; p=0.001) and to MT (14±6; p=0.043). Insertion time using LFT via I-gel was also significantly shorter compared with MT (12±3 vs. 16±8; p=0.0032) and with PT (12±3 vs. 19±10; p<0.001). There was no difference in the attempts needed for intubation using the different tubes in the both roup. Intubation time with PT was significantly shorter via LFD compared to I-Gel (p=0.02). The overall rate of successful intubation via LFD was significantly higher compared to I-Gel with PT, and similar between MT and LFT.

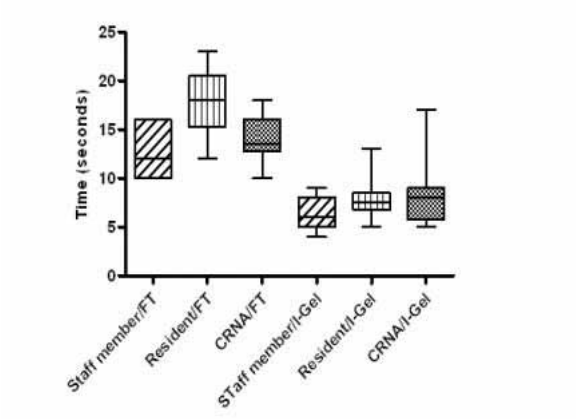

Figure 1. Insertion time to achieve an effective airway with I-Gel and LMA Fastrach™

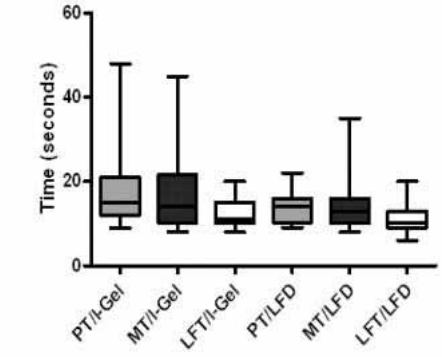

Figure 2. Intubation tiem via I-Gel and LMA fastrach™ with 3 Ets. PT, Portex tube; MT, Mallinckrodt tube; LFT, LMA fasttrach tube; LFD< LMA fastrach disposable.

Conclusion(s): Significantly shorter insertion times suggest that the I-Gelâ may be advantageous to ensure oxygenation. For blind intubation, however, the LMA FastrachTM proved to be superior.

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19AP5-2

Can we reduce airway management complications in children? Laryngeal mask vs. endotracheal tube

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Background and Goal of Study: Endotracheal tube is the gold standard of airway management in major abdominal surgery. However it causes a great number of airway complications in children (1). The laryngeal mask uses routinely in elective paediatric surgery, but experience of its using during major surgery in children is insufficient (2). The aim of study to estimate the safety of laryngeal mask airway in children underwent major elective abdominal surgery and reveal the amount of airway complications.
Materials and Methods: After Local Ethic Committee approval we studied 201 children underwent major elective abdominal surgery. Mean age of patients was 7.3±3 years, weight – 25.4±5.1 kg. Surgery duration – 195.8±91.3 min. In 107 children we used tracheal intubation (TI), in 94 patients laryngeal mask (LM) was applied. During surgery we studied gas exchange and haemodynamic. Gastric regurgitation during anaesthesia revealed with appearance of methylene blue in the throat, which patients had taken orally 20 minutes prior to anaesthesia. In the postoperative period we studied frequency of airway complications. Data were compared using t-test and chi-squares analysis.
Results and Discussion: There was no difference in gas exchange between two groups. The arterial O_2 tension was 203.6±57.3 mmHg (group TI) vs. 195.3±49.6 mmHg (group LM). CO_2 tension was 37.± 2.2 mmHg (group TI) vs. 38.2 ±1.7 mmHg (group LM). We observed much expressed hyperdynamic reaction in response to tracheal intubation/extubation in comparison with laryngeal mask insertion/removal Mean arterial pressure was 17.6% higher in TI group (p<0.05). None of the patients had gastric regurgitation. Comparison of postoperative airway complications revealed its greater amount in TI group – 25 cases vs. 3 cases in LM group (p<0.05).

Frequency and nature of airway complications

Complication	TI group (n=107)	LM group (n=94)
Sore throat	23,4%	3,2% *
Cough	14%	1,1% *
Laringospasm	1,9%	0
Airway infection	22,4%	1,1% *
Nausea	7,5%	1,1% *
Total	23,4%	3,2% *

* - p<0,05 vs. TI-group

Conclusion(s): Laryngeal mask airway during major and prolonged elective abdominal surgery in children allows safe and effective ventilation and reduces amount of airway complications up to 8,3 times.

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19AP5-3

Comparison of the combination of dexmedetomidine with either sevoflurane or propofol induction according to the success rate of classical LMA insertion

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Background and Goal of Study: Our aim was to investigate the effect of intravenous dexmedetomidine on success rate of laringeal mask (LMA) insertion during sevoflurane or propofol induction.
Materials and Methods: After the University ethics committee approval; 80 ASA I-II patients scheduled to undergo elective surgical procedures were enrolled the study. All patients were monitored for measuring systolic artery pressure (SAP), diastolic artery pressure (DAP), mean arterial pressure (MAP), hearth rate, peripheral oxygen saturation, end tidal CO2 and with Bispectral Index (BIS) monitor. Patients were randomized into the four groups by sealed envelope technique regarding the induction of general anesthesia: Group S (n=20); 8% sevoflurane, Group P (n =20); 3mg/kg intravenous propofol, Group DP (n=20); 1µg/kg intravenous dexmedetomidine plus 3 mg/kg intravenous propofol and Group DS (n=20); 1µg/kg intravenous dexmedetotimidine plus 8% sevoflurane. During LMA insertion, parameters such as jaw relaxation, cough, and patient movement were evaluated using the modified Muzi score to assess LMA insertion quality and were also recorded at the regular time points.
Results and Discussion: The modified Muzi scores which were measured during LMA insertion were significantly higher in Group S and Group P (6.15±1.03 and 7.05±1.35, respectively) than Group DP and Group DS (2.55±0.60 and 2.30±0.57, respectively) (for all,p<0.001). The success rate of LMA insertion at the first attempt was 17 (85%), 16 (80%), 20 (100%) and 20 (100%) in Groups S, P, DS and DP, respectively. In Group P and Group D, increased BIS values were determined immediately after the insertion of LMA. When compared with the baseline values, SAP, DAP and MAP measurements showed significantly decreases after the induction in Group P. However, there were no significantly differences among the groups according to hemodynamic parameters.
Conclusion(s): As a conclusion, the administration of 1 µg/kg intravenous dexmedetomidine before the induction of propofol and sevoflurane results in increased success rate of LMA insertion and improved the insertion quality without any alterations on hemodynamic parameters

19AP5-4

Comparison of two insertion techniques of ProSeal™ laryngeal mask airway in paralyzed, anesthetized patients: Standard versus 90-degree rotation

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Background and Goal of Study: Rotational insertion technique for size 3 of ProSeal™ laryngeal mask airway (PLMA) was reported to be more successful and produce less complication in non-paralyzed adult female patients. For the effective sealing, larger size is recommended during positive pressure ventilation. The aim of this study was to see the effectiveness of rotational technique with larger size of PLMA (size 4 in female, size 5 in male) in paralyzed, anesthetized patients.
Materials and Methods: A total of 94 male and female patients undergoing laparoscopic surgery were randomly allocated to the standard or rotational technique groups. In the standard technique group (n = 47), PLMA was inserted according to the manufacturer's instructions. In rotational technique group (n=47), PLMA was inserted into the mouth and rotated 90 degrees counterclockwise. PLMA was advanced and rotated back until the resistance of the hypopharynx was felt. Insertion success rates, sealing pressure, incidence of hypopharyngeal bleeding and postoperative sore throat were compared.
Results and Discussion: In rotational technique group, first-attempt insertion success rates were higher (100 vs. 81%, P = 0.003) and less time was required to achieve and effective airway (11 ± 3 vs. 19 ± 15 sec, P = 0.002). There was low incidence of postoperative sore throat (11 vs. 34%, P = 0.007) and blood stain on PLMA was less (9 vs. 40%, P < 0.001) for rotational technique. Sealing pressure was similar in both groups (26 cmH_2O, 25 cmH_2O).
Conclusion(s): The rotational technique is useful for large size of PLMA in paralyzed, anesthetized patients.

19AP5-5

Suction catheter guided insertion of the Proseal laryngeal mask: Trained vs non trained users

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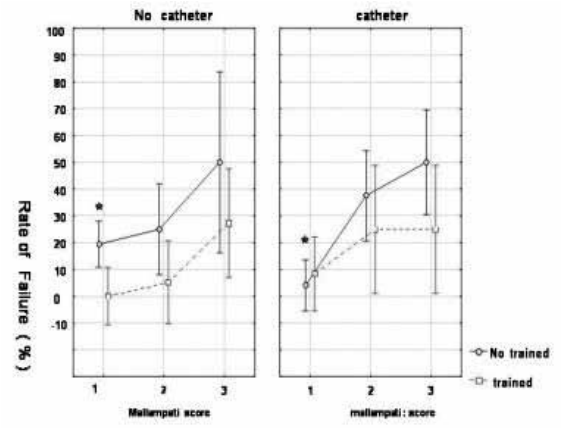
Background and Goal of Study: Previous studies demonstrated a higher rate of successfully insertion of LMA with a suction catheter than with the classical digital technique among expert anesthesiologists. The aim of this study was to verify the suction guided insertion technique (SC) among less experted users (less than 10 attempts).
Materials and Methods: After Ethical committee approval and written informed consent were obtained, one hundred and sixty patients (ASA physical status I-II, aged 18-70 years) undergoing planned proctological surgery in litothomic position, were randomly allocated in four groups according to the technique of insertion (SC or Digital) and the user's experience (trained or non trained) Patients were excluded if they were less than 18 years or more than 70 years and a body mass index (kg m^{-2}) > 35 kg/m2.A standard anesthesia protocol was followed, including Propofol (2 mg/kg) plus remifentanil (0.2-0.5 mcg/kg/min infusion rate) and Sevoflurane according to clinical needs. Neuromuscular blockades were not administered. The techniques of insertion were previously described and a well lubricated suction tube was inserted through the drainage tube of LMA Proseal. Sample size was selected to detect a projected difference of 10% in first attempt success rate between trained and nontrained groups.
Results and Discussion: The rate of successful placement at the first attempt is shown in fig.1 (p<0.05 *). Trained physicians achieve best results and the use of the suction catether does not improve their success rate. This

result is not in agreement with previous study probably because difficult airways were excluded from that series. On the contrary, non trained personnel achieved a significant improvement with the use of the catheter, even if only for easy airways (mallampati score =1). It is likely that this result may be due to the soft material of the suction catheter, that cannot be easily directed into the oesophagus.



Conclusion(s): Non trained anesthesiologists may improve their performance with the use of a suction catheter in easy airways.

References:

1 Roberto García-Aguado, MD PhD*, Juan Viñoles, MD, Joseph Brimacombe, MB CHB FRCA MD, Miguel Vivó, MD*, Rosario López-Estudillo, MD and Guillermo Ayala, PhD.

19AP5-6

One lung ventilation using an i-gel supraglottic device and a bronquial blocker

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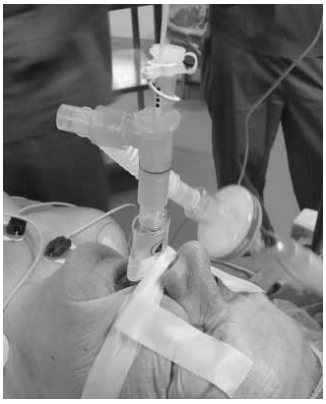
Background and Goal of Study: One lung ventilation is a compulsory practice for several thoracic surgical procedures. We describe an alternative tecnique for lung isolation using a bronquial blocker (Coopdech, Smiths Medical) and the I-Gel supraglottic device(Intersurgical), which has recently been introduced in the clinical practice.

Materials and Methods: We selected 22 ASA I-II patients (without predicted difficult airway management and with normal pulmonary function tests [FVC> 80% and FEV1 > 80% predicted]) undergoing different thoracic surgery procedures in which one lug ventilation was necessary. Lung isolation was achieved introducing the bronquial blocker through the I-GEL supraglottic device under direct flexible fibrobroncoscopic vision.

ASA	I (14), II (8)
gender	male (15); female (7)
age	20-40 (12); 40-60 (10)
weight, kg.	40-60 (5); 60-80 (14); >80 (3)
surgical procedure	segmentectomy via VATS (13); lung biopsy via VATS (7); segmentectomy via thoracotomy (2)

VATS, video-assisted thoracoscopy; (n), number of patients



Results and Discussion: Unipulmonar blockade was successful in every patient and airway pressure was always maintained under 25 cmH2O both in total lung and in one lung ventilation, just by modifying ventilation rate and tidal volume. Thanks to the new design of the mask i-gel, which allows sealed trustworthy and assurance of the airway, and to a suitable experience in the management of the optical flexible fibrobroncoscopic it was possible to carry out all of the procedures without remarkable incidents from the anesthesic and the surgical point of view as well.

Conclusion(s): The unstoppable development of the airway devices aiming to provide the most safety and the less invasive environment for the patient, offers a huge range of possibilities to the anesthesiologist in a high number of surgical procedures. The lung isolation obtained with a bronchial blocker introduced through the I-gel supraglottic device appears to be a safe and effective alternative for the management of certain patients and surgical thoracic procedures adequately selected.

19AP5-7

Use of the LMA Proseal™ in patients with predicted difficult airways in ambulatory surgery

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Background and Goal of Study: Awake tracheal intubation is recommended in patients with known or predicted difficult airways (DA). In ambulatory surgery, however, intubation is not always required. The LMA Proseal (PLMA) has been successfully used in patients with DA and for airway rescue after failed management. The aim of this prospective study is to evaluate the feasibility of PLMA use in ambulatory patients with DA.

Materials and Methods: Thirty five patients with different types of DA, scheduled for ambulatory procedures under general anesthesia not requiring tracheal intubation, were recruited. In patients with both, suspected severe difficult facemask ventilation and intubation, the PLMA was inserted maintaining spontaneous ventilation. Otherwise, anesthesia was induced and a laringoscopy was performed before the PLMA insertion of Airway assessment details, insertion and ventilation parameters, fiberscope view and complications were recorded.

Results and Discussion: Awake insertion was performed in four patients. Laringoscopy was impossible in two patients with limited mouth opening. Cormack-Lehane Grades II, III and IV were found in 9, 19 and 1 patient respectively. Insertion was successful in all patients at first attempt. Spontaneous ventilation was maintained in 7 patients. In the remaining patients, optimal ventilation was achieved initially (24) or after adjusting maneuvers or muscle relaxant administration (4). Mean airway and PLMA seal pressure were 20±3 and 33±6 cm HO respectively. Vocal cords were completely or partially seen in 28 patients, other findings were: only epiglottis (4), laryngeal polyp (1), lingual tonsil hyperplasia (1), no glottis structure (1). Main complications were: laryngospasm (2) hycupp (1) mild blood staining (6) and mild sorethroat (2). No epidosdes of hypoxia were registered.

Conclusion(s): The PLMA is suitable to manage predicted DA, either in awake or anesthetized patients. This approach could be an alternative to awake tracheal intubation in the ambulatory setting, after careful patient assessment and provide other DA management techniques are immediately available.

19AP5-8

Airway morbidity after use of the laryngeal mask airway: LMA ProSeal® vs. i-gel®

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Background and Goal of Study: Postoperative airway morbidity with the classic laryngeal mask (LMA) and the ProSeal (LMAP) is low. The emergence of new supraglottic devices made of other materials and without cuff could lead to a reduction of undesirable events on the airway. The incidence of postoperative sore throat with the I-Gel (LMIG) laryngeal mask has not been well studied. The aim of this study is to compare the incidence of sore throat, dysphagia and hoarseness after placement of the LMAP or LMIG during general anaesthesia.

Materials and Methods: After local ethics committee approval, written informed consent was obtained from 60 ASA I-III consecutive patients scheduled for surgery in supine position with an estimated duration of general anesthesia from 45-150 min. Exclusion criteria were the use of pneumoperitoneum-pneumothorax or difficult airway suspectec. Patients were randomly allocated to or of the two devices. No patient was premedicated. After induction, inser-

tion of the LMA was performed by an expert anesthesiologist. A hydrophilic lubricant without local anesthetic was used for lubrication of de LMA. The cuff of the LMAP was sealed following the manufacturer's instructions. Proper LMA insertion was verified by a leak test at 30 cm H2O, repositioning the mask to obtain a negative leak test. Anaesthesia mainteinance was free excep for the use of nitrous oxide (not allowed). One hour and 24 hours after surgery, every patient was asked for sore throat, dysphagia or hoarseness. Chi square test and Student's t test for independent data were used as appropiate. A p<0,05 was considered significant.

Results and Discussion: Demograhic data are shown in table 1. Patients and anesthetic time were similar in both groups. Two patients in the LMAP group were excluded (failure to placement of the device and more than three attempts required) and one patient in Group IGEL (excessive length of procedure). Results are shown in table 2. No patien presented sore throat, dysphagia or hoarseness at 24 hours.

Table 1

	Sex(M/F)	Age	Weight (kg)	Height (cm)	ASA (I/II/III)	Anesthesia time(min)
LMAP group	12/16	43,3(11,5)	73,1(10)	166,6(8,1)	17/10/1	80,8(17,3)
LMIG group	11/18	39,7(8,8)	73,8(9,6)	167,7(8,3)	21/8/1	81,2(18,9)

Data show number(SD).

Table 2

	Sore throat(*)	Dysphagia(*)	Hoarseness
LMAP group	8(28,6)	7(25)	3(10,7)
LMIG group	1(3,4)	1(3,4)	1(3,4)

Data show number(percentage).(*)p<0.05.

Conclusion(s): The use of LMAP produces more sore throat and dysphagia that the LMAIG. We recommend the use of the I-gel mask.

19AP6-1

Applied force during (GlideScope) video-laryngoscopy: A comparison of four airway training manikins

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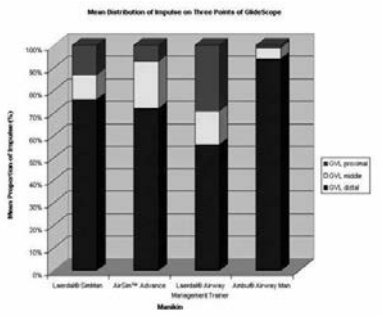
Background and Goal of Study: Airway training manikins have been commonly used to teach *direct* laryngoscopy and intubation, but their use in teaching *video*-laryngoscopy has not been studied. We hypothesized that a large variation in force is applied during video-laryngoscopy with the GlideScope® (GVL) in different manikins.

Materials and Methods: Anesthesiologists performed laryngoscopy with the GVL on 4 different manikins. 3 calibrated Flexiforce Sensors™ proximal, middle, and distal, were attached to the anterior surface of the blade. Peak force, impulse (area under the curve of the force/time graph), time to intubation and Cormack and Lehane (C-L) views were recorded and analyzed using the paired Wilcoxon test. Variability between the four manikins was measured with the Friedman rank sum test. P<0.05 was considered statistically significant.

Results and Discussion: 16 anesthesiologists performed a total of 64 laryngoscopies. There was a significant variability in impulse, peak force, and time to intubation between the manikins.Median C-L view for all was grade 1 except the AirSim™ Advance which was grade 2. The largest proportion of the impulse was exerted on the most distal point of the blade.



Conclusion(s): A large variation in force is applied with the GVL depending on type of manikin. This finding has implications for the validity of manikins used to evaluate video laryngoscope devices and as surrogates for training. Further study will compare the current data with the forces exerted in humans to allowing a model to be chosen which best simulates video-laryngoscopy and intubation conditions. We will also evaluate consistency between different manikins of the same model.

19AP6-2

Variability of force during direct laryngoscopy: A comparison of four airway training manikins

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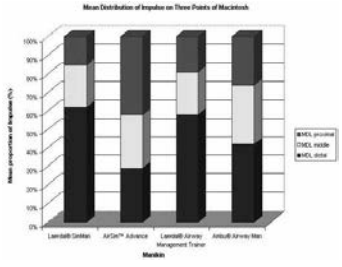
Background and Goal of Study: Airway training manikins are commonly used to teach direct laryngoscopy and intubation. The realism of manikins as simulators for learning this skill on patients has not been established. We hypothesized that a large variation in force is required during laryngoscopy with Macintosh direct laryngoscope (MDL) in different manufactures of manikins.

Materials and Methods: Anesthesiologists performed laryngoscopy with MDL on 4 different manikins. 3 calibrated Flexiforce Sensors™ proximal, middle, and distal, were attached to anterior surface of the blade. Peak force, impulse (area under the curve of the force/time graph), time to intubation and Cormack and Lehane (C-L) view were recorded and analyzed using paired Wilcoxon test. Variability between 4 manikins was measured with Friedman rank sum test. P<0.05 was considered significant. Manikins were ranked in order of closest approximation to human laryngoscopy.

Results and Discussion: 16 anesthesiologists performed a total of 64 laryngoscopies. There was significant variability in impulse and time to intubation between the manikins, but no difference in peak force. Median C-L view for all was grade 2. The impulse was distributed over the all three sensors. Laerdal® Airway Management Trainer was ranked as most (score 49/64), and AirSim™ Advance as least (score 18/64) close to resembling human intubation conditions.



Abstract 19AP6-1 – Impulse, Peak Force and Time to Intubation with GVL in Four Manikins

	Laerdal® SimMan	Trucorp AirSim™ Advance	Laerdal® Airway Management Trainer	Ambu® Airway Man	P-value
Impulse (N/s)	5.3 [3.4,8.1]	21.0 [12.8,47.7]	4.3 [3.0,5.6]	16.1 [8.5,23.6]	<0.0001
Peak (N)	2.8 [1.8,4.7]	4.3 [3.2,5.7]	3.2 [2.9,6.0]	6.6 [4.2,8.6]	<0.0001
Time (s)	11.5 [8.9,17.8]	27.6 [21.6,42.6]	12.0 [10.0,16.4]	14.9 [12.3,19.2]	<0.0001

Data expressed as median [IQR], N=Newton, s=second

Abstract 19AP6-2 – Impulse, Peak Force and Time to Inubation with Macintosh in Four Manikins

	Laerdal®SimMan	Trucorp AirSim™Advance	Laerdal®Airway Management Trainer	Ambu®Airway Man	P-Value
Impulse (N/Sec)	13.7 [7.7,36.5]	42.0 [25.5,62.2]	12.1 [5.3,25.9]	39.3 [22.5,49.4]	<0.0001
Peak (N)	11.4 [5.8,17.8]	8.9 [5.3,11.3]	6.8 [3.3,10.3]	11.4 [7.3,14.0]	0.063
Time (sec)	12.0 [9.8,15.7]	21.2 [15.8,27.5]	15.9 [10.0,17.8]	10.6 [8.5,14.3]	<0.0001

Conclusion(s): Large variation in force is exerted during laryngoscopy on different manikins. This finding has implications for validity of manikins used as surrogates for training in direct laryngoscopy.

19AP6-3

A novel training device for fibreoptic intubation

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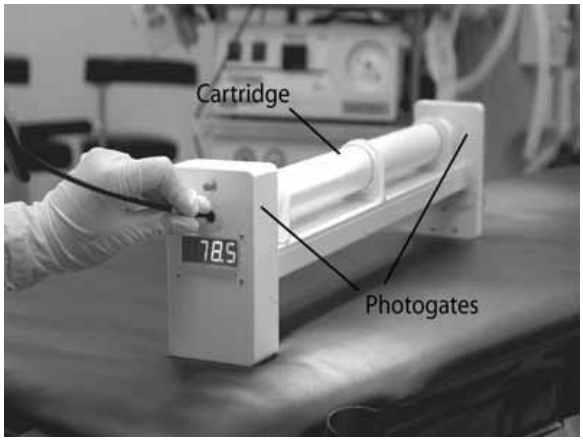
Background and Goal of Study: Fibreoptic intubation is an essential skill for difficult airway management[1]. We have developed a novel device to aid in the training and assessment of the psychomotor skills of scope manipulation.
Materials and Methods: Our device consists of a "maze" of baffles through which the participant must navigate the scope as rapidly as possible. The baffles are arranged to require the participant to move the scope in all axes and prevent progress due to random movement, and are contained in a removable cylindrical cartridge. As the participants' skills improve, this may be exchanged for another cartridge from a series with graded difficulty levels, to ensure that the task remains appropriately challenging. The device incorporates an automatic timer which starts to count up in units of 0.1 seconds when the scope enters the maze, and stops when the scope exits the maze. This provides immediate feedback on performance, and may be used to quantify the participants' level of competency.
Results and Discussion: The maze cartridges are constructed from polyurethane components within an ABS plastic shell. The timing device was designed using standard electronic components. Infrared photogates are used, modulated at 38KHz to prevent spurious triggering due to ambient light. APIC microcontroller performs the logic and timing functions. Elapsed time is shown on a four digit 7-segment LED display. If the preset maximum time for the task is exceeded (user definable; default 300s), the device "times out" and that attempt is terminated. The device is powered by a single 9v battery and optimises battery life by automatically shutting down the photogates after triggering, and entering "sleep" mode after a preset time interval. A single "reset" button aborts a timing period and wakes the device from sleep mode.



Conclusion(s): The device works well, and is very popular with participants, who strove to beat the fastest times. It has application in both training and competency-based assessment of this particular psychomotor skill. A randomised clinical trial is in progress to see if the skills learned on this device transfer effectively to clinical practice.

References:

1 Mason R. BJA 1998; 81: 305-7.

19AP6-4

Management of airway emergencies, beyond the national guidelines

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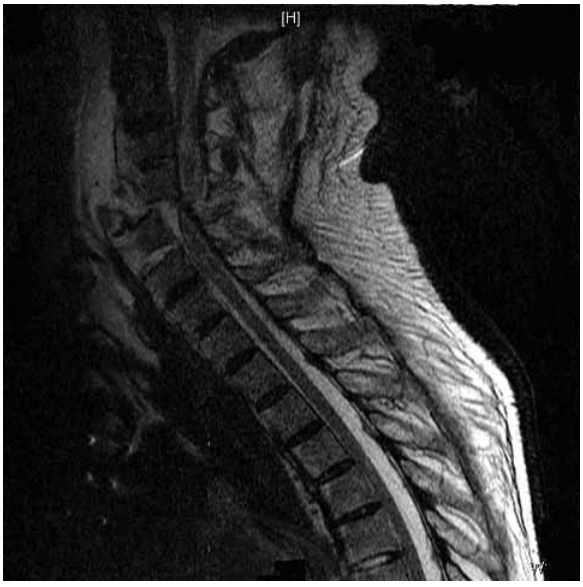
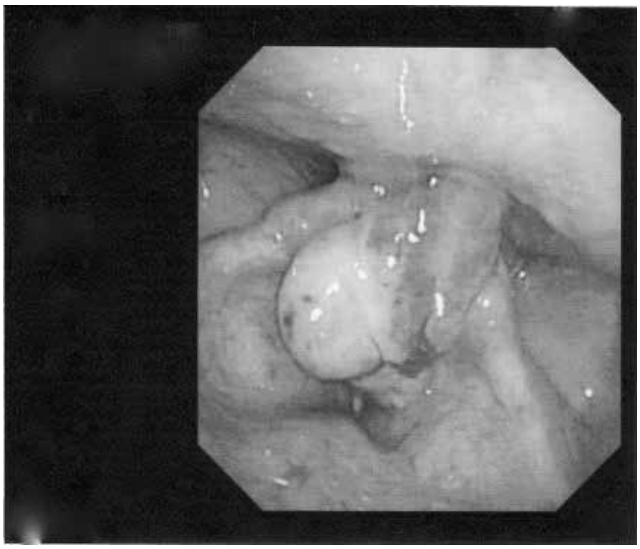
Background and Goal of Study: Airway management forms one of the generic skills for an anaesthetist. An airway strategy should be planned during the management of every patient as per the difficult airway society (DAS) guidance. We describe 3 cases of airway emergencies at different anatomical locations and the management options beyond the DAS guidelines.
Materials and Methods: 1) 75yrs male presented to the emergency department with respiratory compromise after a fall. 2) 82yrs male admitted to the hospital with history of haemoptysis and attempted bronchoscopy showed a large supra-glottic tumour causing ball wall effect during respiration. 3) 27yrs male scheduled for an elective tracheostomy with radiological evidence of a sub-glottic mass.
Results and Discussion: 1) Attempted direct laryngoscopy with head in-line immobilisation failed. Laryngeal mask airway was inserted to ensure ventilation and oxygenation. On fibreoptic examination of the larynx, the glottis was visible, however it was not possible to pass a tracheal tube beyond the glottis and an emergency tracheostomy had to performed. Further imaging with MRI scan showed fracture at the c3-4vertebrae with impingement on the posterior tracheal wall. 2) Multiple attempts at cricothyroid puncture failed. Direct laryngoscopy showed a large supra-glottic cyst and tracheal intubation was successful without any compromise. 3) An awake cricothyroid puncture was performed. Oxygenation was maintained by trans-tracheal jet ventilation and a tracheostomy was performed. Biopsy of the sub-glottic mass showed a benign amyloid mass.





Conclusion(s): Written guidelines should exist in each department to cover number of common or serious airway problems, however there are many situations where strict adherence to guidelines may not be possible. Airway evaluation is imperfect in predicting problems and an airway strategy should be drawn up before management of every patient.

19AP6-5

Evaluation of tip surface collisions as an outcome measure in two methods of fibreoptic intubation training

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Background and Goal of Study: Commonly used outcome measures of fibreoptic training (intubation time and success rates) give limited information on skill. Maintaining a clear view and avoiding collision and hence trauma may be more important than speed. A 'choose a hole' trainer has been used previously to evaluate fibreoptic handling skills[1]. The Oxford box (OB) (choose a hole trainer[2]) and the AirSim Multi manikin are designed for fibreoptic training. We used these training tools to evaluate tip collision count as a measure of fibreoptic manipulation skill.

Materials and Methods: We recruited 77 anaesthetists. Each completed a standardised task on the OB and a modified AirSim manikin in randomized order. Completion time for each task and a video of the fibreoptic view were recorded. Number of tip collisions was independently counted by two blinded instructors, three times each. Performance was subjectively scored on a five point Global Rating Scale (GRS). To-date fibreoptic experience was noted. Our primary aim was correlation of completion time with collision count for both tasks. Secondary aims were to correlate previous fibreoptic experience and GRS score with collision count. Spearman rank correlation was used for all.

Results and Discussion: Experience ranged from none to >50 awake fibreoptic intubations. Four did not complete the OB and one the manikin. The median [range] completion times (s) were 123 [35-451] and 86 [35-266] and collision counts were 8 [1-40] and 4 [0-11] for the OB and manikin respectively. Moderate correlation between collision count and both completion time and GRS score was found. Lack of recent fibreoptic use may explain why previous fibreoptic experience did not correlate with collision count. Correlation (p value) between the OB and manikin completion times was 0.4(<0.01) and collision counts was 0.5(<0.01), suggesting performance on both were related.

Collision count correlations

	Oxford Box	Manikin
Completion Time	0.7 (<0.01)	0.5 (<0.01)
GRS	-0.6 (<0.01)	-0.5 (<0.01)
Fibreoptic Experience	-0.02 (0.88)	-0.2 (0.08)

Values are ρρ (p value)

Conclusion(s): Our findings suggest that tip collisions correlate well with commonly used outcome measures of fibreoptic performance. Its use as an outcome measure in fibreoptic training may reduce airway trauma. Further evaluation in patients is required.

References:

1 Popat M, Benham SW, Kapila A et al. DAS Abstracts 1999:61-62.
2 Naik VN, Matsumoto ED, Houston PL et al. Anesthesiology 2001;95:343-8.

19AP6-6

Awake fiberoptic Intubations protocol in a tertiary hospital in Spain

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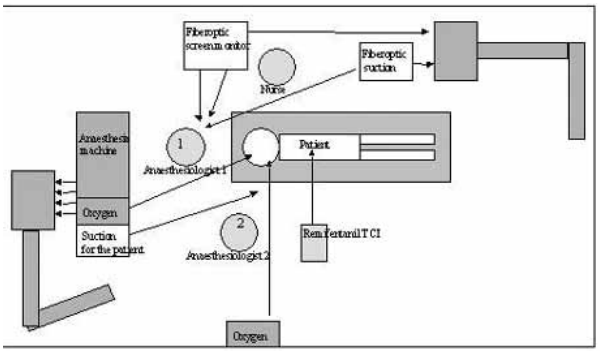
Background and Goal of Study: The difficulty in the clinical managing of the airway is the first reason of anaesthetic mortality and morbidity in adult patients[1,2]. Awake orotracheal intubation is an established method of securing a difficult airway included in the guides. Awake fiberoptic intubation's protocol, included the disposition of the operation theatre, is essential for the safety of the procedure, patient's safety and outcome. Aim of the study: To describe the safety of Awake Fiberoptic Incubation's protocol in a Tertiary Hospital.

Materials and Methods: Observational retrospective study. Awake fiberoptic intubations during 3 years. Protocol: Information in the preoperative visit. Personal: 2 anaesthesiologists, 1 nurse. Theatre's positioning (Fig.) O_2 through nasal cannula. Basic monitoring, capnography, Ramsay scale. Drugs: atropine, midazolam. Lidocaine spray for posterior pharynx. Remifentanil TCI (Ce: 3ng/ml), lidocaine 2% 1cc through the fiberoptic channel at 3 levels: epiglotis, glotis, inside the trachea. Data collected: demographic and comorbilities, complications, sedation drugs, vasopresors. Statistical analysed SPSS15.0. Results: Mean ± standard deviation.



Results and Discussion: 634 awake fiberoptic intubations. 38.17 % carried out in 2006, 35.96 % in 2007, 25.86 % in 2008. 473 patients (74.6 %) had at least 1 aspiration's risk factor (Diabetes Melitus, full stomach, urgency, obesity, and stomach cancer), 232 (36.5%) had cardiovascular comorbilities (isquemic cardiopaty, arterial hypertension, arrhythmia). In 100% of the cases the disposition of theatre was as one in the protocol. 99 % were on remifentanil for sedation (Ce: 2.9ng/ml± 0.63). 14.9 % of the patients did not receive relaxing neuromuscular. The mean dose of propofol needed for hypnosis after the procedure was of 0.8mg/kg± 0.3. Complications were not registered during the intubation neither in the postoperatory period.

Conclusion(s): 1. The protocol was followed in 99 % of the cases 2. No complications registered. 3. It is safe at 3 aspects: oxygenation of the patient, haemodinamic stability, and no aspiration in the risk patients.

References:

1 Caplan RA. Anesthesiology 1990 May;72(5):828-33.
2 Petrini F. Minerva Anestesiol 2005, 71: 617-657.

19AP6-7

Controversies in airway management

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Background and Goal of Study: Anaesthetic practice can differ from classic teaching provided to candidates preparing for exams⊃⊃1[/sup]. Despite its practical nature, airway management is frequently defined in exam answers. We sought to establish actual practice in a variety of potentially controversial areas of airway practice including consent for training.

Materials and Methods: We surveyed delegates attending the Annual Meeting of the Difficult Airway Society (Great Britain and Ireland) in November 2009. Data analysis used Microsoft Excel.

Results and Discussion: We collected 227 responses (59% of delegates). Eighteen percent (41) of respondents use propofol for all rapid sequence inductions (RSIs), 18% (40) never use it and 12% (26) teach practice different to their own. Nineteen percent (42) never draw up suxamethonium 'just in case' but 93% (203) favour an RSI over inhalational induction in the bleeding tonsil scenario. Only 37% (84) reverse non-depolarising muscle relaxants guided by a nerve stimulator. At induction, 27% (60) always and 31% (69) never preoxygenate patients to a target end tidal oxygen level. Extubating patients sitting-up was favoured by 53% (118) after an RSI, by 61% (135) in elective cases, and by 86% (189) in patients with a difficult airway. Although 35% (79) favoured left lateral extubation after RSI, only 22% (50) rehearsed left lateral airway skills. Twenty percent (45) performed awake fibre optic intubations (FOIs) for training, where 71% (32) sought consent. With asleep FOIs, only 22% (26) thought consent necessary. Thirty eight percent (84) sought consent when non-medical staff were learning to intubate but only 10% (22) did so for novice anaesthetists, although skill levels may be similar. Practice varies greatly within this group of airway enthusiasts and there is little evidence for best practice. Simple safety measures have yet to be uniformly adopted. Controversy remains in obtaining consent for teaching airway management despite guidance[2,3].

Conclusion(s): Although there is no consensus on best practice, the correct anaesthetic technique is a safe one and exam answers should reflect this. Anaesthetists involved in training should follow recognised guidelines regarding consent.

References:

1 Kinnear J. The 'exam answer'. Bulletin of the RCOA 2009;58: 24-25.
2 Consent: patients and doctors making decisions together. GMC guidance for doctors, June 2008.
3 Consent for Anaesthesia. The Association of Anaesthetists of Great Britain and Ireland, January 2006.

Acknowledgements: Difficult Airway Society and Edinburgh Anaesthesia Research and Education Fund.

19AP6-8

12 month retention of airway management skills in supraglottic devices

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Background and Goal of Study: Besides the "gold standard" endotracheal tube, supraglottic airway devices are alternatives for emergency airway management. Goal of the study was to compare airway devices that provide sufficient ventilation, even 12 months after training without further instruction, on manikins.

Materials and Methods: In 2008, 288 medical students were standardised theoretically and practically trained to use laryngeal mask airways: Unique, ProSeal, Supreme, I-Gel and bag mask-ventilation on manikins (Ambu). Students who were successful using all devices (randomised) on the first attempt (n=190) were included and tested one year later. Insertion time, number of attempts for first successful ventilation and tidal volume were assessed.

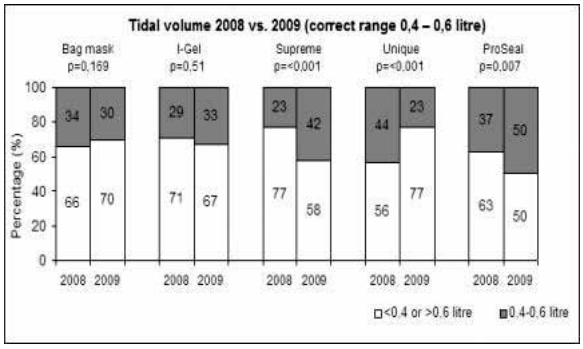
Results and Discussion: The time from insertion until first ventilation was in the same range as a year before. At the follow-up, students needed statistically more time for the I-Gel and the Unique. About 60% of the tidal volumes were insufficient with little, but significant improvement for the Supreme and ProSeal. The Supreme and the I-Gel showed the highest rates of successful ventilation on the first attempt in the follow-up trial. Non significant differences between: Bag-mask vs. I-Gel and Unique; I-Gel vs. Supreme; Unique vs. ProSeal.

Insertion time (seconds) to first successful ventilation (mean±SD)

	2008	2009	p
Bag mask	8,1±4,5	8,4±5,5	0,882
I-Gel	10,1±2,6	11,7±4,9	0,008
Supreme	14,9±3,6	15,5±4,6	0,147
Unique	16,5±3,7	18,2±5,6	<0,001
ProSeal	17,7±5.0	17,7±5,2	0,856

Success rate of ventilation after first insertion

n=190	%
Bag mask	80
I-Gel	87
Supreme	94
Unique	69
ProSeal	67



Conclusion(s): One year after initial training, time for successful ventilation for all devices was shorter than 25 seconds, which is clinically acceptable. Shorter intervals of training might be necessary due to insufficient tidal volumes. The high first attempt success rate for ventilation with the new supraglottic airway devices I-Gel and Supreme support their introduction into clinical use.

19AP6-9

Head position angles in anaesthetised adults to open the upper airway

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Background and Goal of Study: To assess in anaesthetised adults head positions to open the upper airway and define angles for the head positioned on a pillow (similarly to anaesthesia induction), or without a pillow (similarly to ventilation during a medical emergency).

Materials and Methods: After anaesthesia induction the patient was ventilated with pressure-controlled mode with a face mask. Respiratory variables were measured after neuromuscular block was achieved. Head position angles were measured with an electronic level prototype attached to the face mask. The head of a patient was placed in three different positions, namely neutral position, maximal extension and a third position deemed optimal for ventilation by the anaesthetist, which had to be at least 5° different from the other two head positions.

Results and Discussion: In the "head on a pillow" group (n=30), angles (neutral position: 2±5 vs. extension: 19±7 vs. anaesthetist's position: 11±7°; P<0.001), tidal volume (neutral position: 645±127 vs. head extension: 697±186 mL; P=0.025), expiratory airway resistance (neutral position: 8±5 vs. head extension: 6±2 cmH2O sec L-1; P<0.001) and incidence of stomach inflation differed significantly (neutral position: 10 vs. extension: 0 vs. anaesthetist's position: 0%, P=0.045). In the "head flat on the table" group (n=30), angles (neutral position: 9±7 vs. head extension: 29±7 vs. anaesthetist's position: 21±7°; P<0.001), tidal volume (neutral position: 305±201 vs. extension: 514±146mL vs. anaesthetist's position: 467±126 mL; P<0.01), dynamic compliance (neutral position: 44±28 vs. extension: 73±25 vs. anaesthetist's position: 75±29 mL cmH2O-1, P<0.001 for neutral position vs. extension and anaesthetist's position) and airway resistance differed significantly (20±12vs. 10±7 vs. 10±4 cmH2O sec L-1; P<0.001 for neutral position vs. extension and anaesthetist's position).

Conclusion(s): Ventilation parameters differed less in the "head on a pillow" when compared to the "head flat on the table" group. Thus, for less skilled rescuers an acceptable ventilation quality may be easier to achieve in the "head on a pillow position" with a head position angle of 2-19°. If the head is positioned flat on a table a head position angle of 21-29° may be optimal to open the upper airway. These findings may help to improve ventilation of a patient in a medical emergency for a less skilled rescuer.

19AP6-10

Twenty four (is) no more

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Background and Goal of Study: Intraoperative dislodgement of the endotracheal tube is a potentially life threatening complication. In current practice, it is generally advised to advance the endotracheal tube no more than 24 cm. In addition, it is suggested to place the tip of the tube at least 4 cm above the carina. However, in patients with an airway length of more than 28 cm, this practice provides conflicting recommendations. We earlier found that with the increase of body length in the Dutch population there is a concomitant increase in airway length. We therefore hypothesized that a significant number of Dutch people admitted for anesthesia will be at risk for intraoperative endotracheal tube dislodgement, as their airways are longer than 28 cm. In this study we measured airway length to determine the percentage of patients in which the guidelines cannot be adhered to because of an airway length of more than 28 cm.

Materials and Methods: For this prospective, observational single centre study, the airway length was determined by tracheascopy in orally intubated patients under general anesthesia. Airway length was defined as the distance between the teeth and carina. Values are represented as mean ± SD and data were analyzed by Pearson correlation or a Student's T-test. P<0.05 was considered to be statistically significant.

Results and Discussion: The 88 included patients (29 male/59 females) aged 49±15 years had an average body length of 173±9 cm with a mean airway length of 25.4 ± 3.2 cm. Fifteen patients (17%) showed an airway length longer than 28 cm. In this group the mean body length was longer in comparison with the group of an airway length shorter than 28 cm (179 ± 8 cm vs. 172±9 cm for airway length longer or shorter than 28 cm, respectively; P=0.005).

Conclusion(s): Our data show that 17% of the surgical population has an airway length exceeding 28 cm. This implicates that in a substantial part of patients the current practice recommendation on tube depth cannot be adhered to. Our data suggest that retraction of the endotracheal tube based on the 'twenty four, no more' rule should be carefully reconsidered in tall patients to prevent inadvertent dislocation of the endotracheal tube.

19AP7-1

Pentax airway scope facilitates easier intubation with less haemodynamic changes than intubation using Macintosh laryngoscope

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Background and Goal of Study: Airway Scope (AWS; Pentax, Tokyo, Japan) is a video-laryngoscope, by which glottis can be visualized indirectly. Intubation using AWS requires less cervical spine extension compared with intubation by Macintosh laryngoscope (Mac). Whether this leads to less haemodynamic responses during intubation is yet unclear. Our aim was to compare cardiovascular changes during tracheal intubation using either AWS or Mac in patients undergoing thyroid surgery.
Materials and Methods: Eighty patients scheduled for thyroid surgery had general anaesthesia. All patients were euthyroid preoperatively. Remifentanil infusion 0.1 µg/kg/min was commenced, followed by fentanyl 1.5 µg/kg, propofol 1 mg/kg and rocuronium. Patients were randomly divided into two groups and their tracheas were intubated using AWS or Mac. Non-invasive blood pressure (BP) and heart rate (HR) were measured every one minute during induction. Minimum values of BP and HR before intubation and maximum values of those during three minutes after intubation were compared. Intubation time, defined as the time from discontinuation of mask ventilation to re-connecting tracheal tube to anaesthetic circuit, was measured. Laryngoscopy grades were also noted. Mann-Whitney U-test, paired t-test and Fisher's exact test were used as appropriate.
Results and Discussion: Laryngoscopy grades were significantly different (Grade 1/2, n; 36/4 in AWS, 19/21 in Mac) and gum elastic bougie (GEB) was used more often in patients in Mac group (GEB/no GEB, n; 4/36 in AWS, 24/16 in Mac). In both groups, BP and HR increased after intubation. BP and HR differences between pre- and post-intubation values were smaller in AWS group. Intubation time was not different between two groups.

Intubation time and haemodynamic changes

group	Pentax Airway Scope	Macintosh laryngoscope	p value
number of patients	40	40	
intubation time; seconds	19 [10,57]	25 [11,60]	0.39
haemodynamics			
Δ systolic BP; mmHg	9 [-52,87]	49 [-26,128]	<0.001
Δ diastolic BP; mmHg	13 [-17,55]	29 [-25,79]	0.003
Δ HR; bpm	20 [-7,53]	27 [-3,56]	0.024
Data are numbers or median [range]. Haemodynamics data are differences between values before and after intubation.			

Conclusion(s): Laryngoscopy and intubation using AWS was easier and caused less haemodynamic changes compared to intubation using Mac. AWS could be a good alternative to Macintosh laryngoscope not only in patients with difficult airways but also in patients in whom cardiovascularly stable induction is desirable.

19AP7-2

Double lumen tube placement with Airtraq in unanticipated difficult airway cases

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Background and Goal of Study: The absence of any single factor that reliably predicts the existence of a difficult airway means that many difficult intubations are not recognised until induction of anaesthesia. The incidence of difficult airway has been estimated as 3% in thoracic surgery due to the use of double lumen tubes (DLT) and single lung ventilation (SLV). The Airtraq brings a good view of the glottis without alignment of the three axes making easier tracheal intubation in difficult airway cases. We evaluated this device in cases of unanticipated difficult airway in thoracic surgery with DLT placement.
Materials and Methods: Twelve Asa II-III patients were included. After anesthethic induction and under adequate hypnosis and muscle relaxation we made two attempts to intubate with direct laryncoscopy and DLT. The Cormack Lehane classification was III and IV in all cases. After failed intubation with direct laryngoscopy, we used Airtraq. In all cases an Eschmann guide was inserted through the bronchial lumen of the DLT. After obtaining a good glotic vision with Airtraq, we placed the Eschmann in the vocal cords and through it we advanced the DLT until the bronchial cuff passed through the vocal cords under direct vision. The Eschmann was withdrawn and after the DLT was advanced completely. We checked the DLT position with capnography, auscultation, and fiberscopy. The endpoints were the number of intubation attempts, duration of the intubation attempt, and the rate of successful placement of the DLT. Additional endpoints included number of optimisation manoeuvres required and presence of dental trauma.
Results and Discussion: On pre-operative assessment, the mean thryromental distance was 5.6 cm (range 5-5.5), the mean interincisor distance was 3.9 cm (range 3.5-4.5 cm) and 10 patients were classified as Mallampati II and two as Mallampati III. Intubation with airtraq was successful in the first attempt in 11 of 12 cases. In one case 3 attempts were necessary. The mean time of intubation was 21±5 seg. Optic fiberscope was necessary for the correct placement of the DLT in one case. No dental lesions were registered.
Conclusion(s): Airtraq is a valid alternative for unanticipated difficult airway, when we require single lung ventilation.
References:
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19AP7-3

GlideScope® requires less force compared to Macintosh during laryngoscopy: A manikin study

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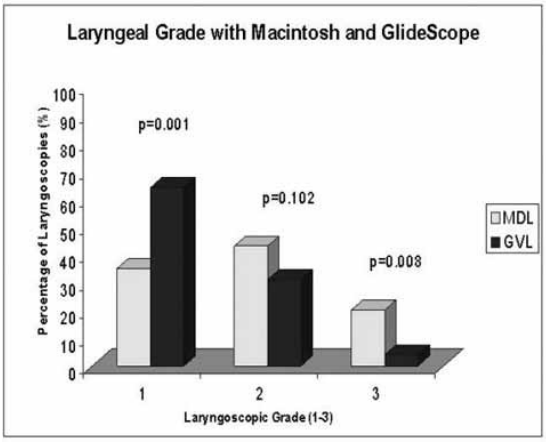
Background and Goal of Study: Force exerted on upper airway during direct laryngoscopy generates marked physiological response in humans. Video-laryngoscopes do not require direct line of vision and may be associated with less force. We hypothesized that GlideScope® (GVL) video-laryngoscope requires less applied force compared to Macintosh (MDL) direct laryngoscope whilst providing similar or superior laryngeal exposure.
Materials and Methods: Anesthesiologists experienced with GVL and MDL performed 2 laryngoscopies with each device on 4 manikins. Calibrated Flexiforce Sensors™ were attached to the anterior surface of each blade. Peak force, impulse (area under the curve of the force/time graph) and time to intubation were recorded and analyzed using the paired Wilcoxon test. Cormack-Lehane (C-L) view was analyzed with Chi-Square test. P<0.05 was considered statistically significant.
Results and Discussion: 16 anesthesiologists performed a total of 128 laryngoscopies. Use of MDL resulted in increased peak force and impulse during laryngoscopy compared to GVL. There was no difference in time to intubation between MDL and GVL. C-L Grade 1 view was obtained more often, and C-L Grade 3 less often with GVL compared to MDL.

Impulse and Peak Force with MDL and GVL

Manikin Type		MDL	GVL	P-value
A	Impulse	13.7 [7.7,36.5]	5.30 [3.4,8.1]	<0.0001
A	Peak	11.4 [5.8,17.8]	2.8 [1.8,4.7]	<0.0001
B	Impulse	42.0 [25.5,62.2]	21.0 [12.8,47.7]	0.375
B	Peak	8.9 [5.3,11.3]	4.3 [3.2,5.7]	0.003
C	Impulse	12.1 [5.3,25.9]	4.3 [3.0,5.6]	0.006
C	Peak	6.8 [3.3,10.3]	3.2 [2.0,6.0]	0.093
D	Impulse	39.3 [22.5,49.4]	16.1 [8.5,23.6]	0.013
D	Peak	11.4 [7.2, 14.0]	6.6 [4.1,8.6]	0.025

Data expressed as median [IQR]. Impulse (Newtons/second). Peak Force (Newtons). A=Laerdal®SimMan, B=Trucorp AirSim™™Advance, C=Laerdal®Airway Management Trainer, D=Ambu®Airway Man.



Conclusion(s): GVL requires less force during laryngoscopy than MDL whilst obtaining superior laryngeal exposure in manikins. If similar differences in forces

exist in humans, the GVL may have positive benefits by reducing physiological stimulation during laryngoscopy.

19AP7-4

Intubation of obstructive sleep apnea patient: Comparative study between conventional laryngoscopy and Airtraq®

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Background and Goal of Study: The syndrome of obstructive sleep apnea (OSA) is a proven factor of difficult intubation(1) and it affects a 1-9% of the surgical population. The use of Airtraq has proved a useful tool in controlling obese patients' airways with macroglossia or snorer, both features presented in OSA patients (2)(3). That fact makes us think that, althouth there is no previous research about, Airtraq can be useful for patients with OSA.
Materials and Methods: We conducted a cross-overt and prospective clinical study making a comparison between tracheal intubation with conventional laryngoscope (CL) and traqueal intubation with Airtraq. We selected 12 patients undergoing elective surgery who had clinical criteria or OSA diagnostic by polisomnography. We compare the glottis view grades (using the Cormack-Lehane scale) with both intubation methods. We also analyzed demographic (Age, sex, body mass index), ASA, associated pathology and airway data (Mallampati, bite test, cervical mobility, mouth opening, thyromental distance, neck circumference). Values of $p<0.05$ were considered as statistically significant.
Results and Discussion: All analyzed patients were male, with a mean age of 57.50 years and mean BMI of 30.8. The anesthetic risk was a 75% ASA III and 25% ASA II. The most frequently associated pathologies that could be risk factors of difficult intubation include obesity and diabetes (41,7%). Regarding examination features, a 80% of these patients had a Mallampati II-III, 54,5% were grade I and 27,3% grade II on the bite test. Neck circumference was greater than 42 cm also in most patients (66,6%). The improvement of Cormack-Lehane grade using Airtraq device compared to CL was statistically significant (p 0.016): 58,3% of the patients in our study showed Cormack > I with CL, while using Airtraq, Cormack grade was I in 100% of these patients.
Conclusion(s): Airtraq allows better glottis visualization in OSA patients in comparison with CL. Nevertheless, we think that it will be necessary to carry out more studies which corroborate these results.

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3 Ndoko S. Tracheal intubation of morbidly obese patients: a randomized trial comparing performance of Macintosh and Airtraq laryngoscopes. Br J Anaesth 2008; 100(2): 263-8.

19AP7-5

Use of Airtraq laryngoscope for out-of-theatre cardiopulmonary resuscitation

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Background and Goal of Study: The AirtraqTM optical laryngoscope (AL) is a new disposable indirect laryngoscope developed to facilitate tracheal intubation in patients with normal or difficult airways. It is designed to provide a view of the glottis without alignment of the oral, pharyngeal and tracheal axes. We tested the feasibility of using the AirtraqTM optical laryngoscope (AL) for tracheal intubation for out-of-theatre (Emergency department and wards) cardiopulmonary resuscitation.
Materials and Methods: After completion of a training programme, a single experienced trainee anaesthesist used the AL for patients after spontaneous cardiac arrest in emergency department and wards, requiring out-of-theatre tracheal intubation, over a 4-month period. We tested both adult sizes of AL. The larger size (AL-L) utilizing tube sizes 7.0-8.5 mm internal diameter and the smaller size (AL-S) utilizing tube sizes 6.0-7.5 mm internal diameter according to the manufacturer's instructions.
Results and Discussion: From September 2009 until December 2009, 27 patients with cardiac arrest, requiring out-of-theatre tracheal intubation, were recorded (Table). The AL was successfully inserted at the first attempt in all patients. Circulation was successfully restored in 11/27 (40.7%) patients.

		P-value Chi-square test
M/F	17/10	
AL size S/L	16/11	
View 1a/ 2b	21/27 (77.7%) / 6/27 (22.3%)	0.009
Attempts 1st/ 2nd	23/27 (85.2%) / 4/27 (14.8%)	0.007
Maneuvers 0/1	20/27 (74%) / 7/27 (26%)	0.01

Conclusion(s): The AL seems to be an easy to use device and may provide a trustworthy alternative for patients requiring out-of-theatre tracheal intubation during cardiopulmonary resuscitation.

19AP7-6

Use of GEB to rescue failed tracheal intubation through Airtraq laryngoscope, when using straight wire-reinforced tracheal tubes. A prospective, randomised comparative study

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Background and Goal of Study: We evaluated the rescue success rate of gum elastic bougie (GEB), when used as a rescue device in failed tracheal intubation through the Airtaq Laryngoscope (AL) using straight reinforced tracheal tubes in anesthetised patients.
Materials and Methods: 270 adult patients were randomly allocated to be intubated either with wire-reinforced tracheal tube (n=146) or the silicone wire-reinforced tube (n=124). In failed cases, a GEB was used, either through the tracheal tube with its straight tip first or without the tracheal tube and its angled tip first. The possible influence of the angle that the GEB exits the AL guiding channel and of AL size, on intubation rescue success rate was examined.
Results and Discussion: Intubation failure rate in both groups was 61/270 (22.6%). No statistical difference in intubation failure was found between groups (P = 0.77). When the GEB was passed through the tracheal tube with its straight tip first resulted in no improvement, compared with its use without the tracheal tube and its angled tip first, where the rescue success rate was improved (0% vs 19.7%, P = 0.004). A five degrees increase in GEB angle increased the odds of failure 9.33 times (95% c.i. 5.03 – 18.53). The rescue success rate was higher when the GEB was used in the smaller AL adult size, compared to the larger size (12% vs 54.3%, P= 0.005).
Conclusion(s): The use of GEB is not effective to rescue failed tracheal intubation through AL, when using straight wire-reinforced tracheal tubes. The smaller Airtraq size resulted in increased, but not clinically acceptable, GEB rescue success rate.

19AP7-7

Comparison of C-MAC Videolaryngoscope, GlideScope Ranger and conventional laryngoscopy for tracheal intubation in patients with a predicted difficult airway – A randomized controlled trial

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Background and Goal of Study: Airway management is still one of the most important challenges to anaesthetists. Recently, videolaryngoscopes have gained increasing interest especially for the management of the difficult laryngoscopy. In our study we investigated whether the use of the C-MAC videolaryngoscope or the GlideScope Ranger may improve the laryngoscopic view and the rate of successful endotracheal intubations compared to conventional direct laryngoscopy with a Macintosh blade in patients with predicted difficult airways.
Materials and Methods: After Institutional Review Board approval and written informed patient consent we enrolled 105 patients undergoing elective minor surgery requiring general anesthesia and endotracheal intubation in our study. Each of them presented at least one predictor for a difficult airway (Mallampati score ≥2, reduced mobility of the atlantooccipital joint (≤15°), mouth opening (≤38mm) and thyromental distance (≤65mm). Repeated laryngoscopy was performed using a Macintosh blade (MB, n=35), C-MAC videolaryngoscope (C-MAC, n=35) and GlideScope Ranger (GS, n=35) in a randomized sequence before patients were intubated.
Results and Discussion: Both video laryngoscopes allowed significantly better laryngoscopic view according to Cormack and Lehane classification as modified by Yentis and Lee (C&L) than MB. Laryngoscopic view C&L ≥ III was obtained in 19% of patients when using a Macintosh blade versus 10% (0%) when using the C-MAC videolaryngoscope (GlideScope Ranger) ($P<0.001$). Using the GlideScope Ranger the laryngoscopic view was significantly better than using the Macintosh blade ($P<0.0001$) or the C-MAC videolaryngoscope ($P<0.005$). Clinically relevant improvement in the 20 patients with insufficient direct view (C&L ≥ III) could be achieved significantly more often with the GlideScope Ranger (100%) than with the C-MAC videolaryngoscope (50%; $P<0.01$). The time from touching the device until obtaining laryngoscopic view did not differ between devices (median [range]; MB: 10 [7 – 15]; C-MAC 11 [8 – 17]; GS 10 [7 – 15] s). There were no significant differences between con-

ventional and videoassisted devices regarding the interval between touching the device and successful tracheal intubation (MB: 18 [14 – 24]; C-MAC: 19 [16 – 30]; GS: 24 [17 – 32] s.).
Conclusion(s): We conclude that the C-MAC video laryngoscope and GlideScope Ranger may be useful devices both for management of the predicted difficult airway and for teaching the skills of endotracheal intubation.

19AP7-8

Does video laryngoscopy improve the laryngoscopic view during cricoid pressure?

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Background and Goal of Study: Cricoid pressure is an integral component of a rapid sequence anaesthetic technique. However, cricoid pressure has been shown to worsen laryngoscopic view. The primary aim of the study is to establish whether video laryngoscopy improves laryngoscopic view during cricoid pressure as compared with conventional cricoid pressure. The secondary aim is to study the impact of cricoid pressure on glottic deviation and compression.
Materials and Methods: After approval by the local research ethics committee, ASA 1 to 3 elective patients were recruited. After induction of anaesthesia and muscle relaxation, the Storz C-MAC video laryngoscope was inserted and 3 consecutive images were recorded. View A was the initial laryngoscopic image, view B after application of conventional cricoid pressure, and view C after video-assisted application of cricoid pressure. All videoscopic views were graded from 1 to 4, based on the Cormack and Lehane classification for direct laryngoscopy. The presence of laryngeal deviation and glottic compression were noted for views B and C. The Pearson's chi-square test was used to analyse the results.
Results and Discussion: Forty-five patients were recruited for the study. The initial view A was grade 1 in 35 (77.8%) patients and grade 2 in the rest. Application of 'blind' cricoid pressure resulted in the view (B) improving in 7 patients and worsening in 5 patients ($p = 0.252$). Comparison of view C to view B showed that video-aided cricoid pressure resulted in improvement of the view in 5 patients and worsening in 4 patients, with borderline statistical significance ($p = 0.59$). Rightward glottic deviation was noted in 8 patients (17.7%) with significant improvement ($p < 0.0001$) in 3 out of the 8 patients on re-application of video-aided cricoid pressure. Glottic compression was noted in 7 out of 45 patients with 'blind' cricoid pressure which persisted in 6 patients despite video-aided cricoid pressure ($p<0.0001$). Successful tracheal intubation was achieved in all patients.
Conclusion(s): Video laryngoscopy may not lead to an improvement in glottic view when video-aided cricoid pressure is applied. 'Blind' cricoid pressure resulted in substantial glottic deviation which improved with video-aided pressure. This suggests a possible role for video laryngoscopy for effective external laryngeal manipulation. Despite video-assisted cricoid pressure, there was glottic compression, but tracheal intubation was successful in all patients.

19AP7-9

A randomised, crossover comparison of the C-MAC videolaryngoscope with direct laryngoscopy in 100 patients

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Background and Goal of Study: The recently introduced C-MAC® videolaryngoscope is a portable videolaryngoscope based on a modified original Macintosh blade (1). The aim of the present study was to compare the C-MAC®® videolaryngoscope with a size 3 blade (Karl Storz, Tuttlingen, Germany) with conventional direct laryngoscopy in 100 patients during routine induction of anaesthesia.
Materials and Methods: After approval of the institutional review board and written informed consent, 100 patients (ASA I-III) of either gender (38 male) scheduled for routine surgery under general anaesthesia, in whom tracheal intubation was mandatory (mean±SD [range] age 52±15 [20-82], weight 81±17 [54-179]), were randomly assigned in a crossover design to direct laryngoscopy with a Macintosh blade (DL group), or to videolaryngoscopy with the C-MAC (size 3 blade; C-MAC group). Patients were excluded if they had any pathology of the upper respiratory or upper alimentary tract, if they were not fasted with subsequent increased risk of pulmonary aspiration of gastric contents (rapid sequence induction), or if a difficult airway mandatory of fiberoptic intubation was previously known.
Results and Discussion: With DL and C-MAC, a Cormack-Lehane class (C/L) 1 view of the glottis was seen in 83 and 81 patients, class 2a view in 12 and 13, class 2b in 3 and 4, and class 3 in 1 and 2 patients, respectively. One patient of the DL group had a class 4 view. Tracheal intubation in the DL (n=59) and C-MAC (n=41) groups was successful in 59/59 and 41/41 patients, respectively. In those patients with impeded intubation conditions (C/L>1; n=17), C/L view from DL to C-MAC improved by one class in 7 patients, three classes in one patient, or remained unchanged in 9 patients. The median time taken for tracheal intubation in the DL and C-MAC groups was 8 sec (range, 1–94 sec) and 8 sec (range, 1–60 sec), respectively.
Conclusion(s): Overall, the C-MAC size 3 blade showed comparable intubation conditions compared to conventional laryngoscopy; however, in patients with impeded glottic view, the C-MAC videolaryngoscope may improve C/L class and therefore facilitate intubation.
References:
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19AP7-10

Comparison of awake endotracheal intubation with GlideScope videolaryngoscope and fibreoptic bronchoscope in patients with difficult airway

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Background and Goal of Study: Intubation by fibreoptic bronchoscope (FB) is safe technique for awake intubation due to control under direct vision. Advancement of the endotracheal tube (ETT) is a blind maneuver frequently complicated by blockade of the ETT, laryngeal trauma and failed intubation. Other wise, GlideScope videolaryngoscope (GS) allows visualisation of the vocal cords and passing the ETT through them into the trachea, facilitating easier intubation. But during laryngoscopy, the maximal force transmitted by laryngoscope blade on to the base of tongue and can cause significant stress response. The goal of study was to compare this devices with respect to intubation time (IT) and stress response in predicted difficult airways cases.
Materials and Methods: Following ethics committee approval, 17 patients with ASA 1-2, mean age 36±14 years, with physical features suggesting a difficult airway, with mouth opening 30-35 mm were scheduled for elective surgery and randomly assigned to be oral intubated with two devices: GS group – 9 patients and FB group – 8 patients. Awake intubations were perfomed under mild sedation with fentanil and midasolam, and topical anaesthesia using 10% lidocaine spray. General anaesthesia was induced after insertion of ETT into the trachea. Blood pressure(BP) and heart rate(HR) were recorded before and 5 min after intubation with interval 20 sec. Norepinephrine(NE) in plasma and salivary alpha-amylase(sAA) were recorded before and one minute after intubation at the same time points. IT also was recorded. Wilcoxon test and t-test were used as appropriate.
Results and Discussion: Intubation was successful for all patients. Mean IT was sinificantly longer in FB group (64±21 sec) versus GS group (23±7 sec) ($p<0.05$). Oxygen saturation was maintained above 95%. After intubation: MAP and HR maximally increase at intubation in both groups, but in FB group MAP was sinificantly higher comparing to GS group ($p<0.05$). Significant difference in HR between the groups was not found. Salivary AA level after intubation increase was higher in FB group(median of 104Ku/ml) comparing to GS group(median of 87 Ku/ml)($p<0.05$). NE after intubation increased in both groups, but significant difference between the groups was not shown.
Conclusion(s): In our study awake intubation using mild sedation with fentanil and midasolam by GS showed shorter IT and lesser stress response. However, study is required in future investigations.
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19AP8-1

The Glasgow rescue airway trolley: A whole systems approach to the provision of emergency airway equipment across a health board

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Background and Goal of Study: Error reporting systems are useful in identifying system vulnerabilities for certain types of frequently occuring events such as emergency airway management. Across Glasgow, a health board with 9 hospitals, anaesthetists work in numerous different theatre environments. Emergency equipment was stored on airway trolleys but varied in content and layout within and between hospital sites. This may impair non technical skills and impact on patient safety by limiting effective use in time limited safety critical situations. In response to audit data, the aim was to deliver standardised, well equipped rescue airway trolleys at all sites, to improve ease of use, and address organisational issues in clinical practice.
Materials and Methods: The following areas were examined:-[br]•trolley content, particularly with regard to simplification and standardisation[br]•equipment layout, with the aim of improving identification[br]•anaesthetic teamwork and ease of use[br]••procedures to check content present and working

Results and Discussion: Content and layout were standardised. A Minimal Acceptable Content (MAC) was agreed taking into account DAS(1) and ASA(2) recommendations. Local preferences were also given consideration(3). To make identification of the Rescue Trolley easier, unique blue coloured trolleys were purchased. Equipment was allocated to each of the 5 drawers in a logical manner. For example, items likely to be used at the same time were stored together. External labelling was used to identify drawer contents. Within each drawer, individual items were labelled or highlighted to make identification quicker and easier. Fluorescent yellow or black marker pen was used to highlight sizes, particularly where this information was difficult to find. The importance of not obscuring manufacturer's printed information is emphasised. Laryngoscope handles were labelled to identify blade types. Following this process, the effects were audited for ease of use and user satisfaction and minor adjustments made. An inventory of existing equipment was compiled, missing equipment purchased and inappropriate equipment discarded. Procedures to check content were revised to include use of photographs and checklists.

Conclusion(s): Standardising rescue airway trolley content within and across hospitals in Glasgow is described. This may improve ease of use and reduce system vulnerabilities in airway management.

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19AP8-2

Endotracheal flexo-metallic tube insertion using different techniques in anesthetized patients: A prospective, observational study

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Background and Goal of Study: A prospective-observational study design was used to evaluate different techniques of oral intubation with a flexo-metallic tube. Correct placement of flexo-metallic tubes is often difficult. Many anesthesiologists chose to add alternative airway devices, such as introducers, despite evidence of increased tissue trauma during placement. This study aims to compare characteristics and outcomes of the different intubation techniques using this kind of tube in our hospital.

Materials and Methods: 564 flexo-metallic tube intubations were analyzed during a series of neuro- and oromaxillofacial surgical interventions. Following the anesthesiologist´s criteria either direct attempt, single-used introducer or Frova single-use tracheal tube introducer were used. Number of intubation attempts glottic grades, patient difficult airway predictors (DAP), use of external laryngeal manipulation, duration of insertion procedure and any other complications were documented. Self-reported reasons for failed attempts by performing intubators were also noted.

Results and Discussion: In 496 patients out of 564, initial oral intubation was performed with a flexo-metallic tube and no additional device. Out of the 428 intubations that were successful on first attempt, 16 met the criteria for DAP, but only 4 actually had a Cormarck Grade higher than III. 68 required a second attempt, 24 of which were intubated with the single-use introducer and 44 with the Frova single-use tracheal tube introducer, with success rates of 100% in both groups. In the single-use introducer group, 4 patients had DAP and 8 presented Cormark Grade equal or higher than III. Out of the 44 patients intubated with Frova introducer, 8 had DAP and 28 presented Cormack Grade equal or higher than III. Intubation with single-used introducer was done in 68 of 564 patients. 16 of which had DAP, but all had low glottic grades. No complications were reported.

Conclusion(s): Orotracheal intubation with flexo-metallic tubes in patients with easy airways does not seem to be more difficult than with standard tubes, therefore no additional devices should be used. In cases were airways are expected or known to be difficult, success rate may be increased with single-used introducers or Frova tracheal tube introducers. The two devices can likely be used interchangeably, and although further research is needed, the current tendencies include use of atraumatic guides instead of the classic one.

19AP8-3

Poly-urethane cuffed ET tube prevents tracheo-bronchial infections after cardiac surgery in long-term ventilated patients

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Background and Goal of Study: Tracheo-bronchial and pulmonary infections (TBPI) due to microaspiration are a major cause of prolonged ICU stay after cardiac surgery. Several measures have been proposed to decrease the TBPI rate. We postulated that polyurethane cuffed (PU) ET tubes could have impact on TBPI frequency and therefore on duration of ventilation.

Materials and Methods: Reviewing data from a previous series [1], we re-analyzed in view of the duration of postoperative ventilation in 135 scheduled, urgent and emergent cardiac surgical patients, randomly intubated after induction of anaesthesia with a PVC ET versus PU ET tube. Investigators were blinded to this randomization. Excluded were patients with infectious endocarditis and those treated preoperatively with antibiotics. Cuff pressure was kept between 20-26 cmH2O. Postoperative sedation with propofol (0.5 – 2.5 mg.kg.h) was continued until stable haemodynamics, chest tube drainage < 1 ml/kg.h during more than 2 consecutive h, paO2 > 70 mmHg with FIO2 <.6, peak inspiratory pressures < 20 cmH2O and compos mentis. Continuous variables were assessed with ANOVA. Categorical variables were analyzed with a $\chi\chi^2$-test. Backward logistic regression analysis was performed to elucidate interfering factor for long term ventilation and TBPI, including only variables related to TBPI in univariate analysis (p <.20).

Results and Discussion: Patients with TBPI were ventilated significantly longer without impact on mortality. A multivariate logistic backward regression analysis included age, cuff material, preoperative creatinine, ejection fraction, Euroscore and Tu-score [2]. The table shows cuff type and creatinine were predictors influencing TBPI rate and duration of ventilation.

Multivariable backward stepwise regression analysis

predictor	regression coefficient	standard error	p value
preop. creatinine	0.870	0.443	0.049
cuff material	2.141	0.705	0.002

Conclusion(s): Use of a PU ET tube during and after cardiac surgery could reduce TBPI rate and could influence duration of ventilation support in the early postoperative phase.

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19AP8-4

Tracheal tube introducers – Efficacy in Africa

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Background and Goal of Study: The tracheal tube introducer plays an important role in the management of a difficult airway. Low cost and ease of use make them an ideal tool for the anaesthetist working in an environment with limited resources. However, the tracheal tube introducer could be more difficult to place in the trachea when ambient temperature is high[1]. This study investigated the efficacy of the Frova, BreatheSafe and Eschmann introducers in Liberia.

Materials and Methods: Thirty-four anaesthetists (two performed the study twice) in Liberia were recruited for this randomised cross-over study. Ten samples of Frova and BreatheSafe, and four samples of the Eschmann introducer were transported to Liberia. After standardised training, the anaesthetists placed each introducer into the trachea of a manikin set to simulate a difficult airway. Outcomes recorded were: single attempt success rates, time to placement, the peak forces exerted at the tip of the introducer and ease of use using visual analogue score (VAS): 0 mm extremely easy, 100 mm extremely difficult and temperatures in transit and during the trial. Continuous data were analysed using ANOVA, Cochran Q and Friedman tests were used to analyse categorical data.

Results and Discussion: The temperature range was -2.2°C to 70°C in transit and 26.2°C to 32.4°C during the trial.

Evaluation of the three tracheal tube introducers. Values are number (%) and mean (SD). *n* = 36.

	Frova	Breathesafe	Eschmann	p-value
Success	32(89%)	31(86%)	16(44%)	=0.00001
Time to placement(s)	12(4)	11(3)	14(4)	=0.019
VAS(mm)	15(7)	14(9)	71(24)	<0.001
ΔForce (N)*	0.6(0.4)	0.23(0.3)	0.25(0.2)	=0.08

*=peak force before – peak force after trial

Conclusion(s): The Eschmann introducer had a lower success rate, longer time to placement and was perceived to be more difficult to use than the Frova and BreatheSafe introducers. The Eschmann introducer is considered a gold

standard in the UK[2]. However, our findings suggest that it is the least suitable introducer for use in a hot African climate. The Breathesafe and Frova introducers had comparably high success rates. The BreatheSafe, however, could be the more suitable introducer as it may have a lower potential for airway trauma[3]. The introducers were not significantly affected by the repeated use as the change in peak force was minimal (p = 0.08).

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19AP8-5

An audit of airway device optimization including cuff pressures, sizing and ventilation modes in a university teaching hospital

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Background and Goal of Study: Two years after a previous audit on airway device optimization, we felt that practice in our institution was still not in line with evidence-based recommendations. We decided to re-audit cuff inflation pressures for laryngeal mask airways (LMA) and endotracheal tubes (ETT), choice of sizes for both ETTs and LMAs and ventilation practice with LMAs.

Materials and Methods: 69 randomly selected cases were audited which included 36 females and 33 males undergoing both elective and emergency surgery. The LMA and ETT size for male and female patients, cuff pressure, ventilation mode, peak airway pressure and presence of an audible leak were recorded. Pressure measurements were performed with a manometer which is in use as a standard in ICU but not normally available in the operating theatres.

Results and Discussion: A supraglottic device was used in 61% of cases(49% LMA and 12% I-gel). In 39% a cuffed ETT was used. A size 3 LMA was inserted for 76% of females and a size 4 for 24%, while a size 4 was inserted for 53% of males and a size 5 for 47%. The cuff inflation pressure exceeded 115 cm H_2O in all LMAs and was above the scale of the manometer in 97% of cases. Patients were ventilated on LMAs in 65% of cases (35% were breathing spontaneously). There was no audible leak on the LMA in 94% of cases and peak airway pressures were between 10 and 20 cm H_2O in 95% of LMA-ventilated patients, and above in 5%. Size 7.5 ETT was used in 84% of females and size 8.5 in 76% of males. In 19% of patients ETT cuff pressure was below 20 cm H_2O, in 34% of patients was in the range 20-30 cm H_2O and in 47% was higher, including 7% with pressure above the scale of the manometer (120 cm H_2O). In our opinion the reasons for suboptimal use of airway devices include lack of availability of manometers in theatre, undersizing LMAs (size 3 for female and 4 for male as a standard), inserting LMAs pre-inflated, lack of good communication between anaesthetist and anaesthetic nurses and lack of staff awareness of the existence of a problem.

Conclusion(s): Our post-audit recommendations include the purchase of a manometer for every theatre, a cuff pressure check more than once per case to ensure 10-30 cm H_2O for ETT and 10-60 cm H_2O for LMA, and the choice of a LMA size 5 or ETT size 8 for males and LMA size 4 or ETT size 7 for females as a standard. An oral presentation to the department briefed both anaesthetists and anaesthetic nurses of these issues. A re-audit is planned in March 2010 to confirm implementation of our recommendations.

19AP8-6

Evaluation of intubation techniques using a laryngoscope handle with embedded 3-axis accelerometers and Bluetooth telemetry

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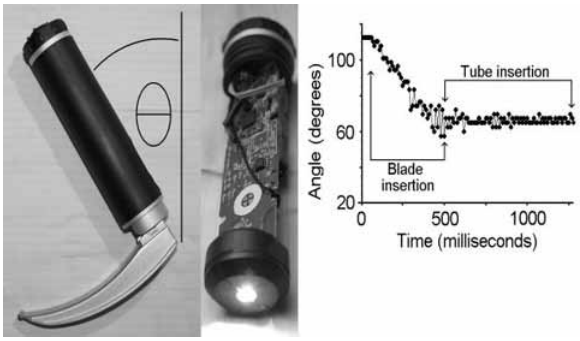
Background and Goal of Study: To achieve the best view for laryngoscopy and tracheal intubation, users should elevate the laryngoscope blade tip by lifting the laryngoscope along its long axis. Users should not attempt to elevate the blade tip by rotating or levering the handle backwards. This action may cause the posterior edge of the blade to contact and damage the patient's teeth, resulting in potential litigation and foreign body aspiration. The objective of this study was to evaluate the degree of handle rotation during intubation of a mannequin (AN3699, Adam,Rouilly Ltd, UK), in a group of anaesthetists with a wide range of ability and experience.

Materials and Methods: Rotation was evaluated by means of a modified laryngoscope handle, which contained a 3 axis accelerometer to measure the orientation of the handle in space and a short-range Bluetooth™ radio transmitter to transmit the data at 10ms intervals to a computer. Angle θ relative to the vertical axis described rotation of the laryngoscope handle. Large changes in θ whilst the blade tip was in the vallecula were considered to indicate poor technique. Eleven volunteers intubated the mannequin three times giving 33 data sets.



Results and Discussion: From a horizontal starting position, the laryngoscope was rotated (reducing θ) at a near-constant rate as the blade entered the mouth, after which it was held at a steady angle during insertion of the tracheal tube. There was considerable variation in the initial rate of rotation while there was much less variation in the steady angle maintained during tube insertion. Years of experience had no effect on either the mean, max or min angle (θ) during tube insertion. However there was a small non-significant tendency for more experienced users to hold the handle at a larger angle to the vertical axis.

Rate of rotation into position (°/sec)	Steady angle (θθ) during intubation
Mean (n=33) 44	Mean (n=33) 66
Maximum 142	Maximum 74
Minimum 15	Minimum 58

Conclusion(s): Technically the device worked well. There was no evidence of laryngoscope rotation during tube insertion. We intend to investigate the potential of this system as an intubation training aid with automated assessment and scoring of the technique being used.

19AP8-7

Effect of temperature on success rate for tracheal placement of Frova and BreatheSafe tracheal introducers

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Background and Goal of Study: Tracheal tube introducers are frequently used in cases of unanticipated difficult intubation. The Frova is considered to be the gold standard single use introducer [1]. The BreatheSafe was introduced into clinical practice in 2007. We could find no evidence on the effect of temperature on their tracheal insertion success rates. We therefore decided to evaluate the effectiveness of the Frova and BreatheSafe introducers at three different temperatures.

Materials and Methods: Seventy-two anaesthetists took part in this randomised cross-over manikin study. A grade 3 laryngeal view was simulated. Each of the 72 anaesthetists was asked to place one sample of each introducer (Frova and BreatheSafe) at each temperature (0oC, ~ 20oC and 40oC) in the trachea of the manikin (six insertions for each introducer). We recorded introducer placement, time to placement and volunteer introducer preference.

Results and Discussion: Median [range] number of years of anaesthetic experience was 9 [1-38] years. Fifty of the 72 (69%) anaesthetists chose Frova as their preferred introducer.There was no significant difference in time to placement between the Frova and BreatheSafe introducers at 0oC (p = 0.24), 20oC (p = 0.05) and 40oC (p = 0.14).

Success rates for tracheal placement at three temperatures. Values are number (%). *n = 72.*

	Frova	BreatheSafe	Diff (95% CI)	p =
0oC	64 (89%)	50 (69%)	19%(8 to 31)	0.003
≅20oC	61 (85%)	55 (76%)	8%(-1 to 18)	0.15
40oC	64 (89%)	47 (65%)	24%(10 to 36)	0.001
p* =	0.607	0.206		

p* - effect of temperature on success rate

Conclusion(s): Temperature does not have a significant effect on the success rate of the Frova or BreatheSafe introducers. However, the success rate of the Frova introducer was significantly higher than the BreatheSafe at 0oC and 40oC.

The Frova appears to be a more suitable introducer to use at the extremes of environmental temperatures. However as the Frova introducer is stiffer, it has noteworthy potential for airway trauma over a range of temperatures[2]. There was no difference in the success rates between the two introducers at room temperature. BreatheSafe may be a suitable alternative to the Frova introducer at room temperature (~~ 20oC) as it has similar success rate and lesser potential for airway trauma[2]. Further clinical evaluation of the BreatheSafe is needed.

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19AP8-8

Leakage of fluid through an endotracheal tube cuff during spontaneous and intermittent positive pressure ventilation: An in vitro comparison

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Background and Goal of Study: Escape of fluid from around an endotracheal tube (ETT) cuff into the lower airways can cause ventilator-associated pneumonia. Although much has been written about leakage around the cuff of various types of ETTs, there is little information on the relationship between the rate of leakage and the mode of mechanical ventilation. Therefore, we compared the rate of leakage between 2 ventilatory modes: intermittent positive pressure ventilation (IPPV) and spontaneous breathing.

Materials and Methods: The model trachea was connected to a 2-chamber lung model, (Dual Adult TTL; Michigan Instruments Inc). To simulate spontaneous breathing, the first driving chamber of the TTL was ventilated with 500 ml tidal volume (TV) at a rate of 10 times/min; the second chamber was connected to the distal end of the model trachea. The 2 chambers were mechanically linked, and therefore, the second chamber generated inspiratory flow in-sync with the ventilation via the first driving chamber. For measurements under IPPV, the 2 chambers were disconnected. An ETT with an 8 mm internal diameter (Safety Clear Soft,; Rüsch) was inserted from the proximal end of the model trachea and connected to a ventilator, (Evita 4; Dräger Medical). The cuff pressure of the ETT was manually set at 25 cmH_2O. Subsequently, the amount of leakage around the ETT cuff was measured under 2 conditions: zero end-expiratory pressure (ZEEP; spontaneous breathing) and IPPV (TV, 500 ml,; respiratory rate, 10 times/min,; PEEP, 0 cmH_2O). After the airway pressure had stabilized, 10 ml of colored water was instilled in the space above the cuff. A single investigator measured the leakage of the water through the ETT cuff in 5 minutes. These measurements were repeated 10 times. Unpaired *t*- 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 was observed during the ZEEP ($p = 0.003$). The mean leakage volume during ZEEP and IPPV was 5.3 ml and 1.1 ml, respectively. These results, which were obtained with minimal experimental settings, suggest that spontaneous breathing during weaning from mechanical ventilation may contribute to leakage of contaminated secretions, thus causing micro aspiration. Even in patients under general anesthesia, attention should be paid on leakage of secretions before extubation.

Conclusion(s): The amounts of leakage around the ETT cuff is significantly high during spontaneous breathing than during IPPV.

19AP8-9

First experiences with the single-use Ambu® aScope™ for fibreoptical monitoring in percutaneous dilatation tracheostomy

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Background and Goal of Study: In times of increasing rates of infections with multiresistant microorganisms in the intensive care unit (ICU), single-use devices play a growing role in daily clinical practice, especially regarding pitfalls in reprocessing of reusable endoscopes[1,2,3]. A single-use fibrescope would allow to prevent cross contamination given sufficient picture quality to carry out invasive procedures. The new Ambu® (Ambu A/S, Ballerup, DK) aScope™, a flexible single-use fibrescope underwent preliminary evaluation for monitoring percutaneous dilatation tracheostomy (PDT) in long-term ventilated patients in the ICU.

Materials and Methods: The Ambu aScope™ was used in four patients planned for PDT consented by their legally appointed guardians. Reasons for long-term ventilation and invasive airway management were urosepsis, chronic obstructive lung disease and recovery from cardiac arrest with one patient tested positive for methicillin resistant staphylococcus aureus (MRSA). Evaluation focussed on handling, quality of view and the question whether the maximum operation time of 30 minutes is sufficient to safely perform PDT. Endotracheal suctioning was performed prior to the procedures and an oxygen line with a flow of 1 l/min was connected to the aScope.

Results and Discussion: Handling and positioning of the aScope through the orally placed tubes (ID 7-8 mm) was easy and good view with identification of relevant structures could be obtained in all patients within 30 seconds. In all cases PDT could be accomplished smoothly with good endoscopic view on monitoring puncturing of the trachea, guide wire insertion, dilatation and positioning of the tracheostomy tube. Total mean endoscopy time was 18 minutes (additional 12 minutes remaining), no cleaning of the aScope was required which makes the use in one patient with MRSA exemplary for the advantages of single-use devices.

Conclusion(s): According to our experience, the new aScope™ seems to be a suitable alternative to reusable fibrescopes during PDT in ICU-patients offering clear view of relevant structures while minimizing the risk of cross-infections.

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19AP8-10

First evaluation of a new cricothyrotomy set. Comparison of Melker, Minitrach II S, Quicktrach end Easycric in a mannequin

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Background and Goal of Study: Cricothyrotomy is an emergency life-saving procedure requiring skill and rapidity. Aim of this study was to evaluate the Easycric set ("EC", Teleflex Medical), a new Seldinger cricothyrotomy technique with 5 mm Inner Diameter and 7 mm Outer Diameter, comparing it with the available commercial sets Melker ("M", Cook), Minitrach II S ("MT", Smiths-Portex) and Quicktrach ("QT", VBM).

Materials and Methods: The study was performed on a head-neck commercial mannequin (Bill, Teleflex Medical) by 3 right handed operators without specific experience, randomly performing 5 procedures with every kit (total=60). The cricoid was fixed and punctured with standard technique (chronometer start) and a 3 mm skin incision was made. "Lung" expansion was chosen for chronometer stop and duration was recorded. Endoscopic view was obtained with Airtraq videolaryngoscope (Teleflex Medical) and recorded, to be analyzed by a not informed operator searching for impingement against posterior wall or carena. After each procedure, operators were requested for their opinion on feasibility and handling (easy, moderately difficult, very difficult). Major (breaking of a device component) and minor defects (kinked guide, difficulties with guide, difficult tube insertion) were recorded

Results and Discussion: Of the 60 procedures, none was interrupted because of major inconveniences, while minor problems were common (21/52). Duration of procedure was significantly shorter ($p<0.01$, one way ANOVA) with QT (15.36+/2.4 sec, range 11-20) than with Seldinger's techniques (M=39.81+/3.1 sec, range 34-49, MT=39.18+/5.1 sec, range 30-53, EC=33.93+/3.7 sec, range 28-50). Feasibility opinions were "very easy" for EC (15) followed by M (13), MT and QT (12); 8 cases were "moderately difficult" for MT and QT (in 3/8 cases for QT only, video showed impingement against the posterior wall; the carena was touched by MT only) and no cases of "very difficult" were observed.

Conclusion(s): In our experience Seldinger procedures were safer than non-Seldinger, the new kit being easy and relatively rapid to use, promising a suitable and safe alternative to other devices.

19AP9-1

Prediction of optimal endotracheal tube cuff volume from tracheal diameter, height and age

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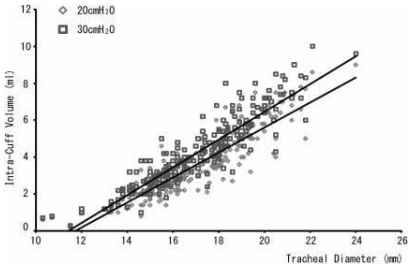
Background and Goal of Study: Pressure within an endotracheal tube cuff should be maintained between 20-30 cmH2O to prevent damage to the tracheal wall. However, cuff pressures are rarely measured, although clinicians poorly estimated cuff pressure. Our goal was thus to predict cuff volume that

would produce optimal cuff pressure from tracheal diameter (as determined from chest radiography) or from patient height and age.

Materials and Methods: In the development phase, initial cuff pressure and cuff volume were measured in 244 patients. Optimal cuff volume was determined in each, defined as the volume half-way between those required to produce cuff pressures of 20 and 30 cm H2O. We calculated regression equations between optimal cuff volume and tracheal diameter, and between optimal cuff volume and the combination of height and age. Our primary outcome was the proportion of patients who had cuff pressure 20-30 cm H2O when cuff volume was selected by each regression formula.

Results and Discussion: There was a good correlation between optimal cuff volume and tracheal diameter on chest X-ray (R2 = 0.83), and a moderate correlation between optimal ICV and both height and age (R2 = 0.44). Predicted cuff volume was more likely to give optimal cuff pressure when based on tracheal diameter (65% of patients) and when based on both height and age (45%) compared with in the development phase (28%) (P<0.05).



Conclusion(s): Optimal cuff volume can be better estimated from tracheal diameter, as determined radiographically, than by patient height and age. However, even the formula based on tracheal diameter proved inadequate in 35% of patients. Existing formulae cannot substitute for manometry.

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19AP9-2

Comparison of Trachway® intubating stylet and Macintosh laryngoscope in tracheal intubation: A manikin study

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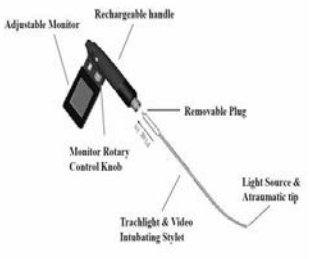
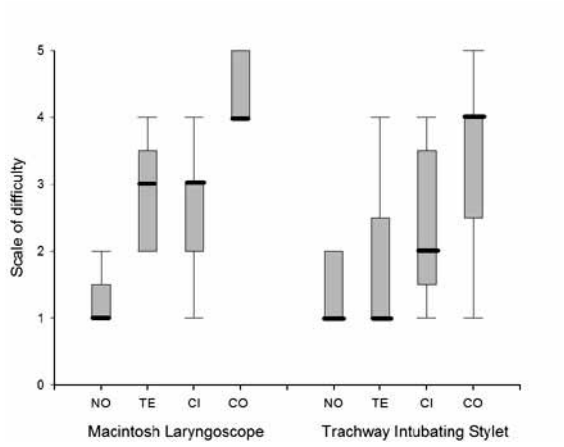
Background and Goal of Study: We attempted to evaluate the use of a new intubating stylet in tracheal intubation compared with the Macintosh laryngoscope in a manikin airway of various difficulties.

Materials and Methods: 10 experienced anesthesiologists intubated the manikin's trachea with the newly commercially available Trachway® intubating stylet and the Macintosh Laryngoscope in four airway scenarios: normal, tongue edema, cervical spine immobilization and tongue edema combined with cervical spine immobilization. Time of tracheal intubation, successful rate and perceived difficulty of intubation for each scenario were compared and analyzed.



Results and Discussion: Time of tracheal intubation with the Trachway® intubating stylet was significantly shorter in tongue edema scenario and the combined scenario compared with the Macintosh laryngoscope. (21.6 (1.45) s vs 24.07 (1.58) s, 23.73 (2.05) s vs 26.6 (2.77) s, respectively; p<0.05) Successful rate were 100% for both devices. Difficulty of intubation was significantly higher in tongue edema scenario and combined scenario with the Macintosh laryngoscope compared to the Trachway® intubating stylet by subjective difficulty score.



Conclusion(s): The Trachway® intubating stylet has a shorter intubation time comparable to the Macintosh laryngoscope in different airway scenarios, thus may act as an alternative intubation device.

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19AP9-3

Double lumen size selection: A model based on audit of successful and failed double lumen tube placement

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Background and Goal of Study: Double lumen tube (DLT) size selection is most often based on a 'best guess'. Radiological indices have been proposed as a predictive tool but studies have been confined to Broncho-cath tubes (Mallinckrodt, Tyco Healthcare, UK) [1]. In our unit we prefer to use Robertshaw tubes (Phoenix Medical Ltd, Preston, UK) but because of their relative greater diameter the size of the laryngeal inlet is the most common cause of a failed intubation by the first choice DLT.

Materials and Methods: We postulated that a predictive model could be generated from successful and unsuccessful tube placement correlated with patient data and therefore collected data from 202 intubations with DLTs selected without systematic criteria according to anaesthetist preference. Sex, height and weight were recorded together with the first choice DLT, success or failure of insertion and second and subsequent choices of DLT if required. This data was tabulated and repeated models were trialled against the data in order to determine the rules which would most often predict the size of final successful DLT. Both Robertshaw (68%) and Broncho-cath (32%) DLTs were used to generate the model.

Results and Discussion: The failure rate for the first choice DLT was 13.4%. Of these, 3% failed for reasons other than being to large to pass the laryngeal inlet. We found that weight had little predictive value; sex and height were the main determinants. The following model predicted an overall 5.5 % failure rate:

MALE	
≥ 182 cm	LARGE
160 – 181 cm	MEDIUM
≤ 159 cm	SMALL

FEMALE	
≥ 173 cm	MEDIUM
≤ 172 cm	SMALL

Conclusion(s): Traditional teaching is to use the 'largest tube that will negotiate the larynx' [2] but this approach will lead to unnecessary trials of introducing a DLT. Most studies of DLT placement do not report a failure rate related to passage of the DLT into the trachea. Additionally, reducing DLT wastage from 13.4 to 5.5% represents a saving of approximately £500 per 100 intubation attempts (based on a unit price of £70 per DLT). A simple formula for predicting an appropriate diameter of DLT is likely to reduce the need for repeated intubation attempts and laryngeal trauma and reduce cost.

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19AP9-4

Sequential lung isolation for bilateral VATS Mini-Maze using the EZ-blocker®, a novel Y-shaped bronchial blocker

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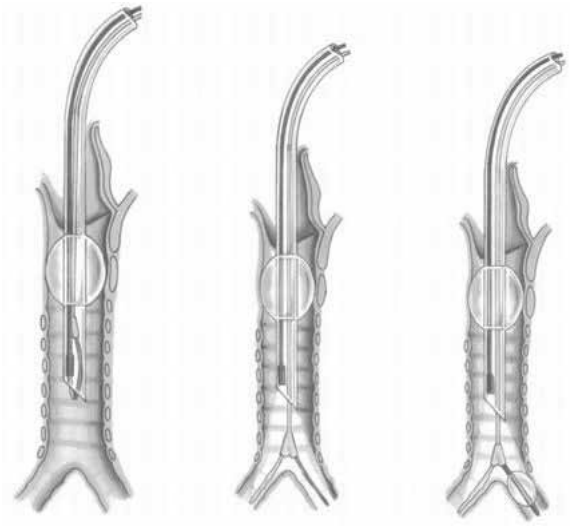
Background and Goal of Study: Reliable lung isolation with good lung collapse and thus optimal exposure of the thoracic cavity is essential for video assisted thoracoscopic surgery (VATS). VATS ablation for atrial fibrillation (1) is performed bilaterally, thus necessitating sequential lung isolation. We tested the feasibility of a novel technique for sequential lung isolation using a new Y-shaped bronchial blocker (2) in patients undergoing bilateral VATS Mini-Maze.
Materials and Methods: After patients' informed consent and an IRB waiver, the EZ-blocker (AnaesthetIQ, Rotterdam, NL) was used in 16 consecutive patients scheduled for bilateral VATS lung vein isolation. The EZ-blocker is a symmetrically designed Y shaped polyurethane catheter with two cuffed extensions. After endotracheal intubation the EZ-blocker was positioned under bronchoscopic control (fig1) with the extensions in the left and right main stem bronchi. First the right-sided cuff was inflated to isolate the right lung and surgery was performed, while the left lung was ventilated. This procedure was repeated on the left side. Time to placement (mean ± SD), frequency of dislocation and quality of lung collapse were recorded.



Results and Discussion: In all patients the EZ-Blocker could be positioned easily (time: 82 ± 47 sec.), did not dislocate and the quality of lung collapse was good. In two cases the EZ blocker had to be partially deflated, slightly moved backward and re-inflated, because of a partial inflation of the right upper lobe (RUL), due to an early RUL bronchus. We did not record device related complications. This is the first report to demonstrate the feasibility of a novel Y-shaped bronchial blocker to achieve sequential lung isolation for bilateral VATS Mini-Maze procedures.
Conclusion(s): Sequential lung isolation for bilateral VATS procedures could be achieved easily and reliably using the novel EZ-blocker.

References:
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19AP9-5

Intraoperative fibrobronchoscopic assessment of fluid leakage around a cuffed endotracheal: A comparison between a polyvinyl cuffed endotracheal tube and a polyurethane cuffed endotracheal tube. A preliminary report

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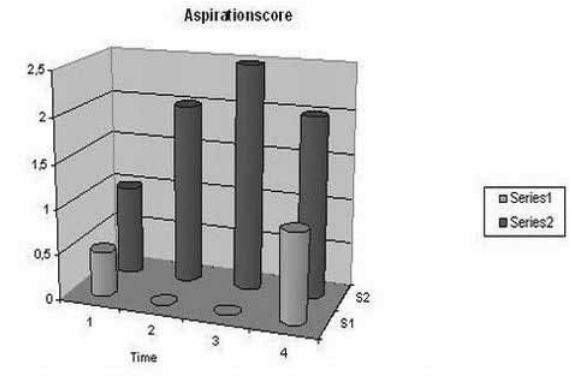
Background and Goal of Study: Micro aspiration of contaminated upper airway secretions along defects of the seal of a cuff is assumed to play a major role in the perioperative development of intubation related pneumonia. We compared a short-term assessment of aspiration of fluid with two different cuffed tubes: a *polyvinyl cuffed ET* tube (PV-ETT) and *a polyurethane cuffed ET* tube (PU-ETT).
Materials and Methods: After informed consent and ethical committee approval, patients were enrolled in the study. A standard general anaesthetic technique was used. Patients were scheduled for low back surgery and were placed in the prone position. Cuff pressure was held at 25 cm H_2O with an electronic pressure device. After intubation, methylthioniniumchloride (0.2 % 5 cc) was instilled around the laryngeal part of the cuff. The degree of tracheal aspiration of coloured fluid was observed by looking through the wall of the ETT using a fibro-optic endoscope which was done by an blinded pneumologist. Evaluation of aspiration was performed 10 min after instillation in the dorsal decubitus position and after 30, 60, and 90 min in the ventral decubitus position. Aspiration was quantified by a 5 point scale (0: no aspiration, 1: upper third part of the cuff, 2: midle part, 3: distal third part, 4: aspiration under the tracheal cuff). Statistical analysis was performed with the Mann-Whitney U test. Data are expressed as mean ± SD.
Results and Discussion: Seventeen patients were enrolled in the study (11 PV-ETT group and 6 PU-ETT group). The demographic data are shown in table 1, no statistical difference between both groups was observed. All the patients in PU-ETT group had lower aspiration score than in the PV group (Fig 1). At 30 and 60 min the difference was significant.

Table 1. Demographic data (Mean ± SD)

	Polyvinyl cuff (PV-ETT)	Polyurethane cuff (PU-ETT)
Weight (kg)	74 ± 16	83 ± 23
Lenght (cm)	175 ± 10	172 ±13
Age (year)	56 ± 17	56 ± 9
Duration ventilation (min)	105 ± 24	143 ± 55
Duration surgery (min)	64 ± 20	95 ± 43



Conclusion(s): Our first results indicate that passive pulmonary aspiration of fluid during surgery is signifantly reduced when using an ETT with a polyurethane cuff.

19AP9-6

Prediction of endotracheal tube cuff volume on the basis of radiological measurements of the trachea

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Background and Goal of Study: Increased endotracheal tube (ET) cuff pressure causes mucosal ischaemia; therefore, an appropriate cuff volume should be employed to maintain lower cuff pressure. However, it is difficult to predetermine the optimal size and cuff volume of ET on the basis of the measurements of tracheal diameter obtained using plain posteroanterior chest radiographs (PCXPs), because of the various cross-sectional shapes of the trachea. Therefore, in this study, we aimed to compare the cross-sectional area (CSA) and coronal diameter (CD) of the trachea as a predictor of ET cuff volume.
Materials and Methods: Twenty-nine surgical patients (15 men, 14 women; age, 29–91 years) who had received general endotracheal anaesthesia and whose preoperative chest computed tomography (CT) scans and PCXPs were available were identified from the electronic medical record system.

After obtaining approval from the institutional review board, we retrospectively reviewed the medical records. In all patients, the internal diameter of the tracheal air column was measured 2 cm above the projected top of the aortic arch on PCXP to obtain the CD of the trachea. The CSA was also measured at the same level on the preoperative chest CT slice. A single blinded investigator performed all the measurements, while another investigator who was unaware of the CT data recorded the age, height, weight, gender, and cuff volume of each patient from the anaesthesia records. In this study population, the ET size was 8 mm (internal diameter) in men and 7 mm in women. Simple linear regression analyses were used to determine the relationship of the cuff volume to the CSA and CD of the trachea according to the gender.

Results and Discussion: In male patients, there was a stronger correlation between the cuff volume and the CSA (correlation coefficient (r) = 0.88; $p < 0.001$) than between the cuff volume and CD (r = 0.59; p = 0.019). In female patients, the CSA showed a significant correlation with the cuff volume (r = 0.68; p = 0.007); however, there was a nonsignificant correlation (r = 0.02, p = 0.937) between the cuff volume and the CD. Although the CD was obtained in a greater number of patients who underwent routine preoperative tests, it might not be a significant independent predictor of the cuff volume. Therefore, further studies are required to develop the best-fit multiple regression model based on the CD in order to increase the explanatory power.

Conclusion(s): The CSA of the trachea is a better predictor of the ET cuff volume.

19AP9-7

Does just seal cuff inflation technique reduce the damage to the tracheal mucosa? A scanning electron microscopy study in neonatal pigs

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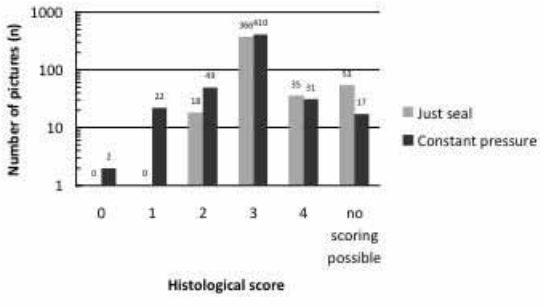
Background and Goal of Study: The aim of the study was to determine if inflating the cuff of the endotracheal tube (ETT) with the just seal technique (self-sealing mechanism (1)) reduces the damage to the tracheal mucosa compared to constant cuff pressure of 20 cmH2O.

Materials and Methods: The tracheas of 18 neonatal pigs (4.6 kg – 5.4 kg, median 5.2 kg) were intubated with a 4.0 mm internal diameter (ID) high-volume low pressure cuffed tracheal tube (Microcuff PET, Kimberly Clark, Atlanta, USA). Animals were randomly allocated to two groups: just seal cuff pressure group (n=9) and constant cuff pressure group (n=9). The pigs were artificially ventilated with a pressure controlled ventilator (Pmax 20 cmH20, PEEP 5 cmH20) and a respiratory rate to achieve an end tidal carbon dioxide of 4.7 kPa. Cuffs were inflated with air to either just seal (Group J) or to a constant pressure of 20 cmH2O (Group C). Cuff pressure was controlled and held constant with a manometer during the following 4-hour study period. Afterwards the pigs were euthanized. The cuff position was marked in situ, the whole trachea was resected and prepared for scanning electron microscopy (SEM) examination. Pictures from SEM were histologically graded (2) and percentage of intact mucosal area were assessed by a blinded observer.

Results and Discussion: Maximal cuff pressure in the just seal group ranged from 12 to 18 cmH2O (median: 14 cmH2O). A total of 492 (group J) and 508 (group C) pictures were analysed. In the just seal group histological grades were significantly higher (Figure 1) ($p < 0.01$) and a lower percentage of normal appearance was seen (7 ± 20 % (mean ± SD)) than in the constant pressure group (18 ± 30 %) ($p < 0.01$). Figure 1: Frequencies of histological scores in SEM pictures of pig trachea in contact with the cuff. Y-axis is logarithmical.



Conclusion(s): Just seal cuff inflation technique does not reduce damage to the tracheal mucosa compared to constant cuff pressure in this short-term bench-top animal trial.

References:
1 Guyton D et al. Chest 1991.
2 Abud TM et al. Can J Anaesth 2005.

19AP9-8

Fluid aspiration past tracheal tube cuff using three different cuff pressure controllers

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Background and Goal of Study: Rapid pressure compensation by automated cuff pressure controllers has shown to worsen air sealing in tracheal tubes (1). Aim of the study was to compare fluid aspiration past the tracheal tube cuff using three different cuff pressure controllers in intubated and ventilated neonatal pigs.

Materials and Methods: Eighteen neonatal pigs (4.1-5.7 kg median 5 kg) were endotracheally intubated with a 4.0 mm internal diameter (ID) high volume – low pressure polyurethane endotracheal tube (Microcuff PET, Kimberly Clark, Atlanta, USA). The cuff was inflated to "just seal" under pressure controlled ventilation (PIP of 20 cmH2O and a PEEP of 5 cmH2O) randomly using a manual (M), VBM- (V) or Tracoe- (T) cuff pressure controller. Methylenblue coloured water was administered above the inflated cuff via central venous catheter previously attached to the endotracheal tube. During the following 4 hours an infusion of 10 ml/h methylenblue was administered through the catheter. Fiberoptic control for leakage was performed at –5, 0, 5, 60, 120, 180, 240 minutes and after release of the cuff pressure (positive control). Endoscopic findings were video-taped and graded later on by a blinded observer with the following score: 0 = no leakage, 1 = blue dye solution along the cuff, 2 = blue dye solution below the lower cuff border.

Results and Discussion: Intracuff pressures were significantly higher in group T (median 14.5 cmH2O, range 12-17) than in group M (11 cmH2O, 9-16) (p=0.026) and V (11 cmH2O, 9-12) (p=0.002). In group V and T one pig showed grade 1 only after 4 h and in group M 1 pig showed grade 1 after 3 h and 3 pigs grade 1 after 4 h. All pigs had a positive control after release of the cuff pressure. None of the cuff pressure methods led to complete fluid aspiration past the tube cuff.

Conclusion(s): Unlike with air leak, fluid aspiration past the tracheal tube cuff has not been influenced by the nature of the cuff pressure controller. Positive end-expiratory pressure and respiratory secretions may have prevented fluid leakage.

References:
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19AP10-1

Negative pressure pulmonary oedema following biting on laryngeal mask airway: A case report

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Background and Goal of Study: Negative pressure pulmonary oedema (NPPE) is an uncommon, medical emergency, arising as a consequence of upper airway obstruction. The principal pathophysiological mechanism involved is the generation of markedly negative intrathoracic pressure causing disruption of the alveolar-capillary membrane. We report a case of severe postoperative negative pressure pulmonary oedema involving a young patient who underwent an elective procedure under general anaesthesia using an LMA.

Materials and Methods: A 21 year old male, ASA 1 patient, underwent Knee arthroscopy as a day case procedure. He was induced with Propofol and Fentanyl and a size 5 LMA was inserted. Anaesthesia was maintained with Oxygen, Nitrous oxide and Sevoflurane with patient breathing spontaneously. During recovery from anaesthesia the patient got agitated, bit down hard on laryngeal mask and made forceful inspiratory efforts. Patient became tachycardic, cyanosed and his spo2 dropped to 60%. When finally the LMA was removed, patient started to cough out pink frothy sputum. As the patient was not improving with 100% oxygen via a face mask, he was intubated following administration of Propofol and Suxamethonium. He was transferred to intensive care unit, was ventilated overnight. Patient was much improved by the morning and was extubated.

Results and Discussion: Negative-pressure pulmonary oedema is a potentially dangerous condition with a multifactorial pathogenesis. The central mechanism is a large inspiratory force generated against an obstructed upper

airway. The resultant decreased intrathoracic pressure leads to increased venous return to the right side of the heart and increased hydrostatic pulmonary capillary pressure. The negative intrathoracic pressure also results in an increased after load imposed on the left ventricle, causing a further decrease in left ventricular stroke volume. Hypoxia induces a massive sympathetic discharge, which produces pulmonary vasoconstriction and increases pulmonary capillary wedge pressure. The combination of increased venous return and increased pulmonary capillary wedge pressure favours the shift of fluid into the pulmonary interstitium.

Conclusion(s): Biting on endotracheal tube during emergence of anaesthesia and development of NPPE is a well documented complication. There is a potential for development of NPPE even with the use of LMA as a result of complete occlusion. NPPE is a potentially fatal complication but when it is promptly diagnosed and treated it resolves quickly.

19AP10-2

Unilateral pulmonary edema from nasal endotracheal tube: Study of two manufactures

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Background and Goal of Study: Nasal RAE (Ring-Adair-Elwyn) endotracheal tubes are typically used for surgeries of the mouth, such as, dental restorations. Nasal RAE endotracheal tubes have a natural plastic "memory" with a bend located where the nasal RAE endotracheal tube runs up to the forehead off the nostril. The position of the curvature is precisely located so that the tip of the nasal RAE endotracheal tube in theory is located in mid-trachea. Nasal endotracheal tubes are made by several companies (RAE by Mallinckrodt, Inc., St. Louis, MO and Preformed AGT by Rüsch Teleflex Medical, Bannockburn, IL). Recently, we presented the comparison of two company tubes of the same size [with complications of desaturation and unilateral negative pressure pulmonary edema (UNPPE)] which stimulated the research on the of depth/position of NETT placement.

Materials and Methods: After IRB approval, patients were randomized to intubation using cuff or uncuff RAE endotracheal tubes made by Mallinckrodt or Preformed Nasal endotracheal tube AGT manufactured by Rüsch. Capnography readings, tube size, position of nasal endotracheal tube, centimeters above/below carina, age, weight and height of the patients were recorded. We compared the groups accordingly.

Results and Discussion: In recruitment (N=23), the mean distance (location, in cm, between carina and tip of NETT tube) does not differ between manufacturers (p=0.90), as evidenced by an independent t-test that assumed equal variances (p=0.66). However, clinically in one patient, the cuffed NETT was in the bronchus.

Conclusion(s): We previously presented two complications, desaturations and UNPPE, from nasal AGT endotracheal tube from different manufactures.[1] Our study shows that lengths of nasal endotracheal tubes from different manufactures (Mallinckrodt and Rüsch) vary and are situated at different length from the carina, even if they are the same size, and caution that may cause one lung ventilation and UNPPE.

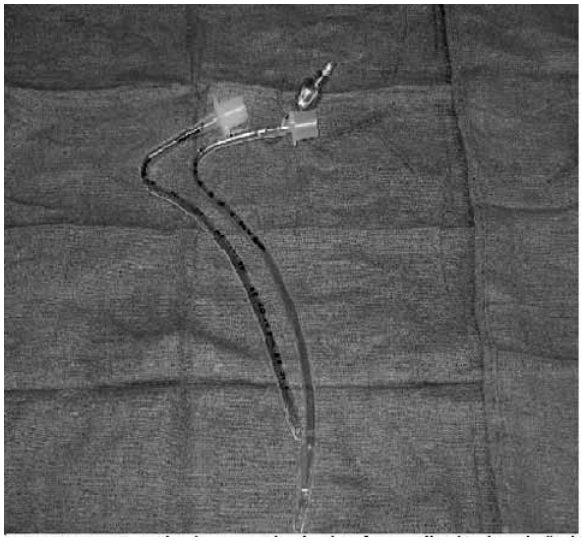

Figure 1. Same Size (5.5) Nasotracheal Tubes from Mallinckrodt and Rüsch

References:

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19AP10-3

Laryngoscopy and endotracheal intubation induced changes in human salivary alpha amylase activity – Associations with adrenergic activity

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Background and Goal of Study: Laryngoscopy and endotracheal intubation activate of the sympathetic nervous system due stimulation nociceptive efferents of the pharyngx and laryngx, and result in cardiovascular stimulation. Salivary alpha amylase (sAA) is main salivary enzyme in human and it is produced by salivary glands in response to stimulation of the sympathetic nervous system. The goal of this study was to determine whether sAA levels were altered by laryngoscopy and endotracheal intubation.

Materials and Methods: Forty six adult patients (ASA 1-2) with median age 54± 16, scheduled for elective abdominal surgery under general anaesthesia requiring orotracheal intubation, were included in this prospective study. After a standard intravenous induction of anaesthesia, conventional orotracheal intubation was performed. sAA and cortisol in saliva, as well as norepinephrine and cortisol in plasma were determined in two time points: immediately before laryngoscopy (point A) and one minute after intubation (point B). Heart rate (HR) and mean arterial blood pressure (MAP) were recorded in corresponding times to reveal if any correlation existed between hemodynamic parameters and neuroendocrine response. Wilcoxon matched pairs and Spearman rank order correlations tests were used as appropriate.

Results and Discussion: Results are expressed in the table. MAP significantly increased one minute after intubation (point B) comparing to MAP immediately before laryngoscopy (point A)($p<0.05$). HR did not show significant increase in point B compared to point A ($p=0.3$). One minute after intubation sAA level significantly increased comparing to point A ($p<0.05$) and correlated with the MAP changes ($rs=0.328$, $p<0.05$). Norepinephrine levels in plasma significantly increased in point B compared to point A ($p<0.05$) and correlated with the changes of sAA ($rs=0.456$, $p<0.01$) and the MAP changes ($rs=0.469$, $p<0.01$). Cortisol levels in saliva and in plasma did not show any significant changes.

Stress response: comparison of parameters before and after intubation

Parameter	Saliva alpha, amylase, (U/mL), median	Median arterial pressure, mmHg, mean ± stdev	Norepinephrine, pg/ml, median
Point A	4209	62 ± 17	12
Point B	9987	76 ± 17	19

Conclusion(s): Level of sAA increased in response to laryngoscopy and endotracheal intubation related stress in pattern resembles that of changes of norepinephrine in plasma and MAP.

Acknowledgements: This study was supported in part by European Social Foundation (ESF).

19AP10-4

Our experience with the Airtraq as secondary tracheal intubation plan in unanticipated difficult airway

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Background and Goal of Study: The Airtraq is an anatomically shaped laryngoscope with two separate channels. The aim of the study was to describe our experience with the Airtraq as secondary tracheal intubation plan in unanticipated difficult-to-intubate patients (scored 3 and 4 according to the Cormack and Lehane grading system (C&L) using Macintosh laryngoscope).

Materials and Methods: Following local institutional review board approval, those patients who required tracheal intubation for their procedure were approached for inclusion in the study when the initial direct laryngoscopy using the Macintosh laryngoscope was scored 3 and 4 according C&L. Information was collected preopertively identifying the operator, patient demographics and airway measurements. All the patients were connected to standard monitoring devices and they received intravenous induction agents including midazolam 0.01–0.02 μg kg^{-1}, fentanyl 2–3 μg kg^{-1} and propofol 1–2 mg kg^{-1}. Neuromuscular blockade was achieved using succinylcholine 1 -1,5 mg kg^{-1} or rocuronium 0.6 mg kg^{-1}.The patients were placed in the 'sniffing' position with their head on a pillow. Following initial direct laryngoscopy the trachea was intubated using the Airtraq and given a second laryngoscopy score. The

time to intubate (TTI) was measured from the time the instrument entered the patient's mouth until end-tidal carbon dioxide was detected. Data are expresed as mean ± SD. Statistical analysis was performed using a statistical software program SPSS 15.0 for windows (SPSS Inc.). A *P* value <0.05 was considered statistically significant.

Results and Discussion: Forty nine patients were included. The Airtraq provided a laryngoscopic view better than that of direct laryngoscopy in all the patients. The mean TTI related with C&L grade 3 and 4 were 22.5 (9.9) and 28 (17.2) seconds respectively and 13 and 40 % respectively required more than one attempt to intubate.

		C&L Airtraq		Total
		I	II	
C&L Macintosh	III	35	9	44
	IV	2	3	5
Total		37	12	49

Conclusion(s): The Airtraq provided a laryngoscopic view better than that of direct laryngoscopy. The Airtraq offers an alternate approach to securing the unanticipated difficult airway where attempts to do so by conventional direct laryngoscopy have failed.

19AP10-5

Deep neck infections: Are clinical signs good predictors of difficult airway and/or a possible worse outcome?

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Background and Goal of Study: Patients with deep neck infections (DNI) usually display neck pain, odynophagia, dysphagia or dyspnea. Individuals with swollen neck or respiratory difficulties are at high risk for complications. Our aim was to evaluate whether signs, symptoms or location of the infections were determinant to the occurrence of difficult airway or worse outcome in surgical drainage of deep neck infections (SDDNI).

Materials and Methods: Retrospective study of patients admitted for drainage of DNI between 01/2006 and 05/2009. Evaluated aspects: preoperative signs/symptoms, anaesthesia and difficult airway management (DAM), complications and length of stay in the hospital. DAM was defined as either: intubation performed with difficulty (three or more tries), necessity of auxiliary equipment (such as an Airtraq optical laryngoscope, a fast-track laryngeal mask airway or a fibre optic bronchoscope) for intubation or the need of a surgical airway. Intra operative complications, ICU admission, length of stay in the hospital greater than 15 days, need of surgical re-intervention and post-operative complications (need for tracheotomy, occurrence of mediastinitis and death) were considered to be a complicated outcome (CO) after SDDNI. Associations between DAM and other factors were determined by Chi-square or Fisher's exact test and logistic regression analyses was used to determine the variables studied that were associated with DAM and CO.

Results and Discussion: Out of 184 patients, 117 met the inclusion criteria. DAM was reported in 40%. Signs and symptoms studied: neck swelling (89%), dyspnea (22%), odynophagia/dysphagia (36%), trismus (46%) and torticollis (1%). The involved locations were: parapharyngeal (27%), retropharyngeal (10%) and peritonsillar (78%). Complicated outcome occurred in 48% of patients. In the univariate analysis the determinants of DAM were: intraoperative tracheotomy or nasotracheal tube for airway management (p<0.001), inhalational anaesthesia or sedation (p<0.001), use of endotracheal tube smaller than size 7 (p<0.001), induction of anaesthesia for longer than 15 minutes (p<0.001), avoidance of muscle relaxants (p<0.001). After surgery DAM was associate with CO (p=0.001). Signs, symptoms and abscess location were not related to DAM. Dyspnea (p=0.003) and retropharyngeal localization (p=0.002) were risk factors for CO.

Conclusion(s): Difficult intubation can't be predicted using signs, symptoms or abscess location. Patients with dyspnea or retropharyngeal abscess are more likely to suffer from CO.

19AP10-6

Deep neck infections: Review of 107 cases

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Background and Goal of Study: Deep neck infection (DNI) is a life-threatening condition with various serious complications. Patients with DNI need skillful airway management. There is currently no universal agreement on the ideal method of airway control for surgical procedure. This study reviews our experience with DNI.

Materials and Methods: Retrospective study of patients admitted for drainage of deep cervical infection between January 2006 and May 2009. Evaluated factors include patient preoperative characteristics, intraoperative anesthesia management and outcome. Descriptive statistics were used to present data.

Results and Discussion: Out of 184 patients, 117 met the inclusion criteria and were reviewed. Mean age was 41.6 years and 87% were classified as ASA physical status I or II. Tracheal intubation using laryngoscopy (76%), fibroscopy (18%) or supraglottic devices (3%) was successful in 113 patients. 3% needed tracheotomy for intubation. 67% of the patients were intubated in the first try. General anaesthesia was induced in 80%, inhalational anaesthesia in 3%, and sedation/analgesia in 16%. In 73% of the patients the intubation was performed after administration of neuromuscular blocking agents (56% were depolarizing agents). The average time of induction was 12.1 minutes and 74% of the patients required no more than 15 minutes. After surgery, the admission rate in ICU was 27%. Studied signs/symptoms included neck tumefaction (89%), dyspnea (22%), odynophagia/dysphagia (36%), trismus (46%) and torticollis (1%). Abscess locations included parapharyngeal (27%), retropharyngeal (10%) and peritonsillar (78%). 33% were submitted to more than one surgical intervention (mean: 1.3). Length of stay in the hospital was 13 days on average and 23% stayed longer than 15 days. Intra-operative complications occurred in 5.1% of the cases, specifically cardiac arrest (2%), emergency tracheotomy (3%) reintubation (3%). Tracheotomy was performed in 10%, mediastinitis occurred in 3% and the global mortality was 2%.

Conclusion(s): Although most of the intubation in patients with deep neck infection can be performed through the use of laryngoscopy, fibroscopy or supraglottic devices, tracheotomy should be promptly available. Life threatening complications may occur and postoperative care in ICU may be needed.

References:

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19AP10-7

Deep neck infections: Difficult intubation means worst outcome

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Background and Goal of Study: The frequency and severity of deep neck infections (DNI) has reduced dramatically since the introduction of antibiotics and improved dental care. Maintenance of a safe and secure airway remains the most important immediate therapeutic goal in the surgical management of DNI. This study was designed to evaluate determinant factors of complications after airway management and tracheal intubation for surgical drainage of deep neck infections (SDDNI).

Materials and Methods: Retrospective study of patients admitted for drainage of DNI between 01/2006 and 05/2009. Evaluated aspects include preoperative signs and symptoms, anaesthesia management, difficult airway management (DAM), complications, outcome, and length of stay in the hospital. DAM was defined as either: intubation performed with difficulty (three or more tries), necessity of auxiliary equipment (such as an Airtraq optical laryngoscope, a fast-track laryngeal mask airway or a fibre optic bronchoscope) for intubation or the need of a surgical airway. Intra operative complications, ICU admission, length of stay in the hospital greater than 15 days, need of surgical re-intervention and post-operative complications (such as the need for tracheotomy, occurrence of mediastinitis and death) were considered to be a complicated outcome (CO) after SDDNI. Statistic associations between CO and difficult intubation and other variables were evaluated using simple binary logistic regression analysis.

Results and Discussion: A total of 184 patients were retrospectively reviewed, of which 117 met the inclusion criteria. DAM was reported in 75 patients (40%). Tracheal intubation through the use of laryngoscopy occurred in 76%, fibre optic bronchoscopy in 18% and supraglottic devices in 3%. The intubation was successful in 113 patients and 3% needed a surgical airway. CO occurred in 48% of patients. In the univariate analysis, the determinant factors of CO were: DAM (p=0.001), ASA physical status (for ASA III and IV patients, p=0.007), use of tracheal canulla for airway management (p=0.047), inhalational anaesthesia (p=0.043), avoidance of muscle relaxants (p=0.012), airway management taking longer than 15 minutes (p<0.001) and use of endotracheal tube smaller than size 7 (p=0.002).

Conclusion(s): We found that DAM, ASA III or IV, use of tracheal canulla, smaller tube size, inhalational anaesthesia type, avoidance of muscular relaxant drugs and longer induction time were predictors of complicated outcome in patients submitted to surgical drainage of cervical abscesses.

19AP10-8

Endotracheal tube cuff pressures: How good is our guess?

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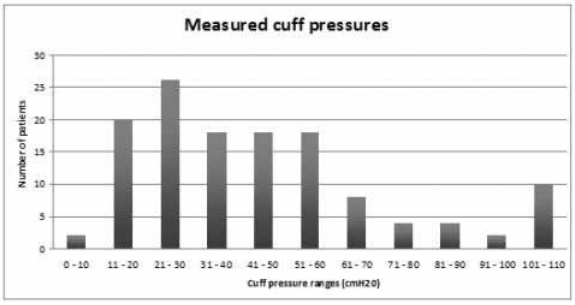
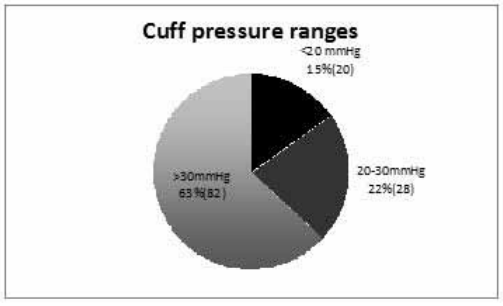
Background and Goal of Study: A critical function of endotracheal tube(ETT) cuffs is to seal the airway, thus preventing aspiration of oro-pharyngeal contents and any leaks. However either over-inflation or under-inflation of the tracheal tube cuff can have adverse effects. Adequacy of the cuff pressure has been conventionally done by palpation of the external balloon rather than measurement with a manometer which is unreliable. The goal of the present observational study was to determine if cuff pressures were within the recommended range of 20-30 cmH2O.
Materials and Methods: We used the Tracoe cuff pressure manometer to measure the ETT cuff pressures in 130 patients having surgery. Measurements of cuff pressures (cmH2O) were taken, 10 minutes after the induction of anaesthesia. Other factors like patient's gender & age, tube size and type, anaesthetist's estimation of tracheal cuff pressure were also recorded.
Results and Discussion: Our results are consistent with previous studies showing that the majority of ETT cuffs are over-inflated. All the cuffs had been inflated by the anaesthetic nurse/ODP to the point of no air leak +/- adjustments being made on palpation of the pilot balloon. We found that only in 28 patients(22%), the cuff pressures fell in the recommended range of 20-30 cm of water. There did not seem to be any correlation between any recorded factors with cuff pressures. A worrying number of cuffs were inflated to very high pressures.





Conclusion(s): Generally the estimations of cuff pressures were inaccurate with the majority being substantially underestimated as found in other studies as well. Based on our findings, we recommend that 100% of patients should have tracheal cuffs inflated in the recommended range and manometers should be widely available and used since there is substantial evidence showing the inadequacy of estimating cuff pressures by palpation/ auscultation of leaks.

19AP10-9

Tracheal rupture after endotracheal intubation: A retrospective audit from 2003-2009

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Background and Goal of Study: Tracheal perforation is a rare, but serious complication after tracheal intubation (TI). Subcutaneous emphysema and respiratory insufficiency are not specific but highly suggestive, however, diagnostic confirmation is made by bronchoscopy. There is no consensus about the treatment modalities but there is a trend to conservative treatment. We reviewed the causes, diagnosis and treatment of these lesions.
Materials and Methods: We report 7 cases of tracheal rupture related to TI treated at a tertiary hospital. Analysed data included the demographic characteristics of the patients (age and sex), characteristics of the TI (emergency/ elective), type of tube (single/double lumen), intubation difficulty, pressure cuff control, interval between intubation and rupture diagnosis, rupture length and site, treatment (surgical/conservative) and outcome.
Results and Discussion: There was a female predominance (4/3), mean age 66.42(39-83) years. 3 cases for elective procedure and 4 for emergency. All orotracheal intubations, 6 single lumen tube and 1 double lumen. 3 cases intubated by resident,1 by an experienced anaesthesiologist and 3 by emergency physicians. One Cormack 4 and three Cormack 1-2; in 3 patients Cormack was unregistered. No pressure cuff control was measured. Time interval until diagnosis of tracheal rupture was varied. Only 1 patient was diagnosed immediately during thoracic surgery. The diagnose interval reached up to168 hours. Rupture length varied from 0.5cm-4cm. The posterior membranous wall was perforated in 4 patients, anterior cartilaginous tracheal wall in 2 cases and bronchious in 1 case. Treatment was surgical in just one case and conservative in the other 6. The overall mortality was 28.6%.[br] **Discussion:** Elderly, female sex, multiple forced attempts at intubation, inexperience of the physician and overinflation of the cuff are relevant. Anterior lesions were related to multiple attemps of intubation. Posterior ruptures were related to overinflated cuffs. Consensus has not yet been reached on the management of tracheal rupture but there is a trend to conservative treatment.
Conclusion(s): Elderly women, emergency intubation and inexperienced intubators are risk factors. Difficult airway guideline application, airway management training and pressure cuff control would reduce the incidence of iatrogenic tracheal rupture.

19AP11-1

Awake intubation with double lumen tube in a patient with anticipated difficult airway

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Background and Goal of Study: Patients who require single lung ventilation (SLV) have an incidence of difficult airway of 2-3%.(Double lumen tubes (DLT) are an additional problem, due to their size and stiffness). The Airtraq laryncoscope is a useful device for management of predicted difficult airway cases in thoracic surgery.
Materials and Methods: Four cases of DLT placement with Airtraq in awake patients with clinical signs of difficult airway. All patients were scheduled for lung resection surgery and had history of head and neck surgery, with radiotherapy. In all cases the physical examination revealed signs of difficult airway. After consent, the patients were administered lidocaine 4% nebulizers and oral lidocaine 10%. The cricothyroid membrane was infiltrated with lidocaine 2%. An Eschmann guide was introduced through the bronchial lumen of the DLT. After a good glotic vision was obtained with Airtraq, the Eschmann guide was advanced through the vocal cords. Through the Eschmann the DLT was advanced until the bronchial cuff passed the cords under direct vision. Then the guide was withdrawn and we advanced the DLT completely. After the correct position of the DLT was checked with capnography and auscultation, we performed anesthethic induction. Later with optic fiberscopy we checked again the DLT position.
Results and Discussion: Intubation was successful in 100% cases in the first attempt, without repositioning of the DLT with fiberscopy. All patients had a good tolerance to the technique, hemodynamic stability, spontaneous ventilation and good pulsioximetry. They didn´t remember the experience as an unpleasant event afterwards. The difficult airway management algorythms recommend fiberscopy and bronchial blockers in case of SLV, but these require experience for their use. Bronchial blockers sometimes need repositioning. Airtraq is easy to use and it allows us to place a DLT without constant checking. It could be included in the management guidelines of these kind of patients.
Conclusion(s): Airtraq laryngoscope could be a valid alternative for intubation with DLT of awake patients with difficult airway when single lung ventilation is required.
References:
1 A. Suzuki, Y. Toyama, H. Iwasaki, J. Henderson. Airtraq_ for awake tracheal intubation. Anaesthesia, 2007, 62, pages 744–755.

19AP11-2

Massive aspiration past the tracheal tube cuff caused by closed tracheal suction system

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Background and Goal of Study: Negative tracheal pressure has been reported during suction with closed tracheal suction system (CTSS) catheter (1,2). This may increase aspiration across the tracheal tube cuff and play an important role in the development of ventilator-associated pneumonia. We investigated the effect of CTSS on fluid aspiration past the tracheal tube cuff in an *in vitro* benchtop lung model.

Materials and Methods: High-volume low pressure polyvinylchloride cuffs of 7.5mm internal diameter (ID) were placed in a 22mm ID artificial trachea connected to a test lung. Positive pressure ventilation (PPV) with 15cmH_2O peak inspiratory pressure and 5cmH_2O positive end expiratory pressure (PEEP) was used. Tracheal suction was performed through a 14Fr CTSS catheter for 5, 10, 15 or 20sec under 200 or 300cmH_2O negative suction pressures. Fluid aspiration during different suction conditions was compared using Kruskal Wallis and Mann Whitney test (Bonferroni correction (a =0.01)).

Results and Discussion: Airway pressure dropped (-8 to -13cmH_2O) from the preset level when suction pressure was applied through the CTSS catheter (p<0.001). Tracheal tubes did not show any leakage during constant PPV+PEEP but always leaked when negative suction pressure was applied (0% leak versus 100% leak). Higher suction pressure (-300cmH_2O) resulted into much more fluid leakage (6.28-6.29ml) than -200cmH_2O negative pressure (2.28-2.56ml) at the end of 20sec suction time (p <0.001). At all applied suction pressures aspiration of fluid increased as the duration of suction time was increased. At -300cmH_2O applied suction pressure fluid aspiration at 5, 10, 15 and 20sec suction time was 1.36, 2.66, 4.44 and 6.28ml (p<0.001) respectively. CTSS not only counter eliminates the protective effect offered by positive pressure through PEEP but considerably facilitates the leakage of fluid from the upper airway past the tracheal tube into the lower airway. While the main intention of using the CTSS is to remove respiratory secretions from the lower airway, paradoxically however, it actually facilitates the aspiration of the same from the subglottic space into the lower airway.

Conclusion(s): Massive aspiration of fluid occurs along the tracheal tube cuff during suction with the closed tracheal suction system.

References:

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19AP11-3

Closed tracheal suction and fluid aspiration past the tracheal tube – Impact of tube cuff and airway pressure

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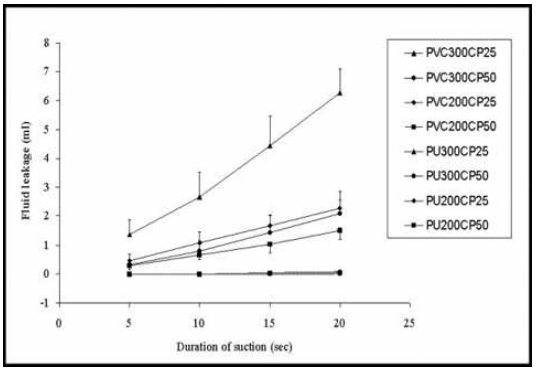
Background and Goal of Study: It is well known that the application of negative pressure during suction with closed tracheal suction system (CTSS) catheter leads to profound negative tracheal pressures (1) and this might facilitate fluid aspiration past the tracheal tube cuff. We investigated the effect of different tube cuff types and airway pressures on fluid leakage past the tracheal tube cuff during suction with CTSS.

Materials and Methods: High volume – low pressure cuffs made from polyvinylchloride (PVC) and polyurethane (PU) of tracheal tubes size 7.5mm internal diameter (ID) were placed in a 22mm ID artificial trachea connected to a test lung and inflated to 25 or 50cmH_2O cuff pressure. Peak inspiratory pressure (PIP) of 15, 20, 25cmH_2O and positive end expiratory pressure (PEEP) of 5 and 10cmH_2O were used. A 14 Fr CTSS catheter was used for 5, 10, 15 or 20sec under 200 and 300mbar negative suction pressures. Fluid leakage across the tube cuff and airway pressure at the end of the suction procedure was measured. Fluid leakage during different suction conditions was compared using Kruskal Wallis and Mann Whitney test (p<0.05)

Results and Discussion: Airway pressure drop from the preset level when suction force was applied through the CTSS catheter was similar for both the tube cuffs. Airway pressure dropped to -13.3cmH_2O with -300mbar suction pressure as compared to -10.6cmH_2O with 200mbar suction pressure for both the tube cuff types. PU tube cuff resulted into significantly less fluid leakage than the PVC tube cuff (p<0.001) (Fig 1). For PVC tube cuff fluid leakage at transiently increased cuff pressure was significantly less (p<0.01). Varying PEEP and PIP did not change the results. Fig 1: Fluid aspiration past the tracheal tube cuff during suction with the CTSS. Data in mean (SD). 300 and 200 in the legend represent the suction pressure (mbar) applied. CP: cuff pressure in cmH_2O.



Conclusion(s): The use of PU tube cuffs and transient increase in cuff pressure during suction can effectively reduce fluid leakage past the tracheal tube during suction with the CTSS in a benchtop setting.

References:

1 Stenqvist O et al. Warning! Suctioning. A lung model evaluation of closed suctioning systems. Acta anaesth Scand 2001; 45: 167-72.

19AP11-4

Malposition of reinforced endotracheal tube in submentaly intubated patient during Laforte III surgery

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Background and Goal of Study: Review of literature shows that reinforced endotracheal tube has been associated with several issues ranging from inability to detach the connector, obstruction, partial dissection and even intraoral separation of the tube. We describe an unreported issue with the reinforced endotracheal tube in submentaly intubated patient during a La Forte III surgey in a patient with Crouzon's syndrome.

Materials and Methods: 17 year old patient with Crouzon's syndrome was scheduled for La forte III surgery for correction of midface hypoplasia. Airway examinatinon was significant for vey short neck of the patient After Intravenous induction of anesthesia, intubation was performed by reinforced endotracheal tube (Mallinckrodt Med., St. Louis, Mo). Tube was exited from intraoral cavity to submental area through submental incision. Two hours into surgery, increased PAP, Desaturation have been noticed. Trouble shooting the issue revealed that the tube was endobronchially migrated, trial to pull out the tube resulted in leakage due to herniation of the cuff through the vocal cords.

Results and Discussion: Examination of the Reinforced ETT shows that the size of the cuff is double the size of regular ETT, the distance from the tip of the tube to the end of the cuff is 6 cm. Trachea is composed of cartilagenous rings and soft connective tissues, therefore its lenghth can be variable especially in our case as patient has very short neck. ETT can be displaced by neck extension, flexion and head rotation causing accidental endobronchial intubation. This led to a very narrow margin of safety between the tip of the tube and the carina. Also The steep angle of insertion imposed by submental approach, flexibility and softness of the tube make the cuff herniate during inflation.

Conclusion(s): Attention should be paid to the size and location of the cuff in Reinforced endobronchial tube especially in submentally intubated patients during extensive craniofacial construction surgeries as La forte III. Confirming the position of ETT after Submental intubation by FOB and making sure that there is a reasonable margin of saftey(2-3 cm) between the tip of the tube and the carina is highly recommended. Also Repeating FOB during extension and flexion of the neck as the surgery involves extensive manipulation. Direct laryngoscopy after submental intubation to Rule out cuff herniation especially in patients with significant airway abnormalities.

19AP11-5

Difficult airway management in patients with sleep apnea syndrome: A prospective study

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Background and Goal of Study: Undiagnosed OSA (Obstructive Sleep Apnea) is a wellknown perioperative risk, nevertheless its prevalence among surgical patients is unknown (1).OSA is often associated with increased risk of difficult intubation (2).

Materials and Methods: The prospective observational study was a consequence of the Airway Assessment evaluation performed by the physicians of the University of Chieti-Pescara (3).All the pts classified to be at high risk to be OSA by STOP Questionnaire were enrolled consecutively, excluding those with a previous diagnosis. For each patient age, sex, BMI, Mallampati Score (without and with phonation), thyromental distance, mouth opening (MO), neck shortness and large and reduction for cervical range of motion (ROM) were detected; furthermore intraoperatively an Intubation Difficulty Score (IDS) and a BMV Score were recorded, accordingly to the SIAARTI Airway Management Guidelines (4).

Results and Discussion: 728 consecutive patients, 477 men and 251 women, were enrolled into the study as undiagnosed OSA; the prevalence of DI was 9% and the prevalence of difficult BMV was 2.6%. In 13 patients (1,7%) both DI and difficult BMV were difficult and treated with endoscopic combined technique. No CVCI was reported. The only variables associated with DI and difficult BMV were Mallampati score and cervical ROM.

Conclusion(s): The study confirms that the prevalence of difficult airway management, first of all of intubation, is high in OSA patients. Difficult BMV is reported as higher than in other studies, but the preoperative evaluation of combined indexes confirms its value. The Mallampati Score and the cervical ROM seem to predict quite exactly the severity of airway difficulties in these subjects.

References:

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4 Minerva Anestesiol. 2005 Nov;71(11):617-57.

19AP11-6

Risk factors associated with difficult or failed double-lumen endotracheal tube (DLT) insertion

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Background and Goal of Study: Difficult DLT insertion is related either to difficult laryngoscopy or to anatomical features of the tracheobronchial tree and anthropometrics. We aimed to evaluate risk factors (RFs) associated with difficult or failed DLT insertion under direct laryngoscopy (DL).

Materials and Methods: After IRB approval and written informed consent we studied 233 anaesthetised paralysed adults ASA 1-3 undergoing thoracic procedures for which lung isolation (LI) was required. Preoperative patient characteristics and detailed airway assessment were recorded. Additionally, the efficiency of mask ventilation (MV) under general anaesthesia was evaluated by using a four-point scale to grade difficulty [1]. Left-sided DLTs were introduced into the glottis via DL with a Macintosh blade and correct placement was verified using clinical criteria, since access to fiberoscopy was limited. DLT insertion was ranked as (A) easy, (B) difficult or (C) failed as follows: A. excellent LI after one attempt, B. excellent LI after 2-3 attempts, C. ineffective, contralateral LI or inability to enter the trachea after three attempts. The results were analysed using X^2 test and ANOVA.

Results and Discussion: The table shows variables aggravating or ameliorating DLT insertion.

DLT insertion	Easy, n= 158	Difficult, n= 40	Failed, n= 35	P-value
Female sex	28 (17.7)	11 (27.5)	13 (37.2)	0.03
Micrognathia*	22 (13.9)/ 2 (1.3)	11 (27.5)/ 1 (2.5)	7 (20.0)/ 1 (2.9)	0.0001
BMI	25.6 +/- 4.5	26.2 +/- 4.8	27.8 +/- 4.9	0.04
SMD (cm)	18.1 +/- 2.1	17.6 +/- 1.9	17.2 +/- 1.8	0.04
History of rhinorrhea	13 (8.2)	3 (7.5)	8 (22.9)	0.03
Not easy MV	33 (21.0)	35 (87.5)	8 (22.9)	<0.0001
"Buck" teeth	9 (5.7)	4 (10.0)	6 (17.1)	0.07
Age (yr)	60.1 +/- 13.3	57.0 +/- 13.5	58.1 +/- 13.0	0.04
Lack of upper teeth	56 (35.7)	7 (17.5)	3 (8.9)	0.009
Lack of lower teeth	39 (24.9)	9 (22.5)	4 (11.4)	0.02

( ):%, BMI: body mass index, *moderately/ severely, SMD: sternomental distance

Conclusion(s): Characteristics associated with difficult and/or failed DLT insertion are female sex and micrognathia. Awkward and/or difficult MV is a significant RF for difficult DLT insertion. RFs associated only with failure are BMI, low SMD and history of rhinorrhea. Protruding upper teeth represent a marginal RF. Protruding upper teeth represent a marginal RF.

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1 Yildiz TS et al. J Anesth 2005; 19: 7-11.

19AP11-7

Incidence of difficulties encountered during double-lumen endotracheal tube (DLT) insertion

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Background and Goal of Study: Correct DLT insertion for lung isolation (LI) is related either to the sufficiency of the laryngeal view (LV) during direct laryngoscopy (DL) or to anatomical features and the dimensions of the tracheobronchial tree. Our aim was to evaluate the incidence of difficulties encountered during DLT insertion under DL.

Materials and Methods: After IRB approval and written informed consent we studied 233 anaesthetised paralysed patients (ASA 1-3, age 17-85 yr, weight 38-143 kg, M/F: 181/52) undergoing thoracic procedures for which LI was required. Left-sided DLTs were used and their size was determined by measuring the width of the trachea from the preoperative chest radiograph [1]. The DLT was introduced into the glottis via DL with a Macintosh blade and correct placement was verified using clinical criteria, since access to fiberoscopy was limited. The DL findings (as defined by the modified five-grade Cormack & Lehane scoring system [2]) were recorded and the DLT insertion was ranked as (A) easy, (B) difficult or (C) failed as follows: A. excellent LI after one attempt, B. excellent LI after 2-3 attempts, C. ineffective, contralateral LI or inability to enter the trachea after three attempts. According to DL view, the insertion would be performed by using smaller or bigger size of DLT and/or bending the tube with the stylet to resemble a hockey stick.

Abstract 19AP11-5 – Patients characteristics (continuous variables) stratified by IDS

Variable	Easy intubation N=502(69%)	Moderate intubation N=163(22%)	Difficult intubation N=63(9%)	P
Age (yr)	58±16	60±32	59±24	NS
BMI (kg/m2)	27±5	28±5	32±13	NS
TM (cm)	7±3	7±6	7±2	NS
MO (cm)	4±1	4±1	4±1	NS

Abstract 19Ap11-5 – Patients characteristics (categorical variables) stratified by IDS

Variable	Category	Easy intubation	Moderate intubation	Difficult intubation	P
sex	Male	318	111	48	NS
	Female	184	52	15	
Mallampati score	1	109	18	1	<0.001
	2	228	64	13	
	3	149	74	39	
	4	16	7	10	
Cervical ROM	normal	332	81	19	<0.001
	reduced	164	81	36	
	absent	6	1	8	

Results and Discussion: The DLT insertion failure group included: ineffective lung isolation (n= 15), inability to enter the trachea (n= 12), contralateral lung isolation (n= 8).

DLT insertion	Easy+	Difficult* +	Failed* +
	(n= 158)	(n= 40)	(n= 35)
LV grades			
Whole larynx	120 (75.9)	18 (45.0)	16 (45.7)
Partial VC view	34 (21.5)	13 (32.5)	11 (31.4)
Arytenoids only	3 (1.9)	8 (20.0)	2 (5.7)
Epiglottis only	1(0.6)	1 (2.5)	6 (17.2)
>1 DLT used/ pt	0 (0)	31 (77.5)	25 (71.4)
Hockey stick DLT	13 (8.2)	22 (55.0)	21 (60.0)

( ):%, VC: vocal cords. Comparisons between LV grades 1 & 2a vs. 2b & 3: *Fisher's exact test, P= 1.0 (NSS); +Chi-square test, P< 0,0001.

Conclusion(s): The DLT insertion appears easier whenever vocal cords are visible. However, the majority of difficulties were not solely associated with poor laryngeal view, but were probably combined with other features.

References:

1 Brodsky JD et al. Anesth Analg 1996; 82: 861-4.
2 Yentis SM, Lee DJ. Anaesthesia 1998; 53: 1041-4.

19AP11-8

Back-up-right-pressure (BURP) on the neck: How much does it optimise the laryngoscopic view?

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Background and Goal of Study: The displacement of the larynx posteriorly, superiorly as possible, and slightly laterally to the right (the BURP maneuver), improves the visualisation of the larynx [1]. We aimed to determine the efficacy of the BURP maneuver according to the degree of difficulty of direct laryngoscopy (DL).

Materials and Methods: After IRB approval and written informed consent we studied 610 anaesthetised paralysed adults (ASA 1-3, age 15-87 yr, weight 38-147 kg, M/F: 406/204). DL was performed using a Macintosh 3 or 4 blade. The DL findings (as defined by the modified six-grade Cormack & Lehane scoring system [2]) were recorded before and after the BURP maneuver. Difficulty in DL was ranked as (A) moderate or (B) major according as follows: A. laryngeal view (LV) grades 2b (arytenoids visible only) and 3a (epiglottis visible only, but not lying near the posterior pharyngeal wall) and B. LV grades 3b (epiglottis visible only, but lying near the posterior pharyngeal wall) and 4 (no part of larynx visible).

Results and Discussion: After the application of BURP in 57 patients the LV grade improved from 2b to 2a and in 18 from 2b to 1; in 25 from 3a to 2b, in eight from 3a to 2a and in three from 3a to 1; in two from 3b to 3a; in two from 4 to 2b and in one from 4 to 3b.

LV grades	Pre-BURP	Post-BURP	LV improved*	LV not improved*
2b	86	38	75 (87.2)	11 (12.8)
3a	47	13	36 (76.6)	11 (23.4)
3b	14	13	2 (14.3)	12 (85.7)
4a	6	3	3 (50.0)	3 (50.0)
Total	153	67	116 (75.8)	37 (24.2)

( ):% *comparison between LV grades 2b and 3a vs. 3b and 4: Chi-square test, P Value < 0,0001, OR= 15.1

Conclusion(s): The BURP maneuver does improve the degree of visualisation of the larynx, but unfortunately it more often optimises the moderate difficulties in DL.

References:

1 Takahata O etal. Anesth Analg 1997; 84: 419-21.
2 Rutter JM etal. Anaesthesia 1997; 52: 927.

19AP11-9

Challenges & outcomes: Airway management in ultra obese patients (high BMI> 70kg/m² or weight more than 200 kgs)

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Background and Goal of Study: A two centre retrospective analysis was conducted to assess airway management techniques in morbidly obese patients undergoing elective surgery. We examined and analyzed intubating techniques and methods and the number of cannot intubate cannot ventilate (CICV) situations as well as their postoperative course.

Materials and Methods: We evaluated 81 patients from 2 institutions, one from Asia and one from America. All these patients were of BMI greater than 70 kg/m^2 or absolute weight more than 200 kgs, ultra obese. All of these patients required general anesthesia and endotracheal intubation for elective surgery. We evaluated methods of intubation, devices used and changes in saturations as well as CICV scenarios. We also evaluated rescue devices used and postoperative course and management.

Results and Discussion: The 81 patients from 2 centers were found to have a BMI of 72 ± 5.69 kg/m^2 and mean weight of 198.8± 29.42 kgs. In this data set 5 patients were difficult to intubate. In any of these patients, we did not have any CICV situations. There was no increase in the number of in hospital days due to obesity, than the anticipated duration of stay with their surgical procedures. The common comorbidities were hypertension (56%), diabetes (35%), obstructive sleep apnea (74%), asthma (19%) and congestive heart failure (3%). We used the Baileys maneuver for 4 patients for extubation. Six patients were kept in the SICU for 24 hours after extubation. BiPAP was required on 64 patients post operatively.

Conclusion(s): At both centers ultra obesity is associated with a higher rate of difficult intubation; however none of the patients in this series experienced significant perioperative complications related to airway management. No patient had a CICV scenario. In the Indian data subset, all patients were intubated with a video laryngoscope but 2 required ILMA as a rescue device; while in the American group 47 patients had DL, while 7 had fiberoptic intubations. Further studies of a similar nature will help develop optimal airway management techniques for the ultra obese.

19AP11-10

Difficult intubation with double-lumen tubes

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Background and Goal of Study: Single-lung ventilation is the most appropriate technique for thoracic surgeons to perform intrathoracic procedures. Double-lumen tubes (DLTs) are the most commonly used ones, but the insertion of this kind of tubes might be very difficult at times in some patients. Our study goal is to determine all laryngoscopic factors and airway-related findings that can difficult the intubation with a DLT and to also find similarities with those found with single-lumen tubes (SLTs).

Materials and Methods: We conducted a prospective observational study in which we included one-hundred and ten patients undergoing intrathoracic surgery. A DLT was placed in all those patients. We analyzed data such as inter-incisor gap and thyromental distance, length of the horizontal branch of the jaw, cervical diameter, Mallampati and Cormarck-Lehane grades (CL) and degree of cervical mobility). Other subjective data were also analyzed.

Results and Discussion: Out of the one-hundred and ten patients enrolled in the study, 12.5% presented difficulties in the intubation process with DLTs. Out of all Cormack-Lehane grade II patients, 27% were difficult to intubate with DLTs ($p < 0.05$), respect CL-I. 18% of all of the "difficult to intubate" patients presented maxillary-mandibular dental protrusion. Applying a univariant analysis, there were no main differences related with predictive factors of difficult intubation with DLTs between patients enrolled in this study and those reported in any other studies. Intubation of patients with DLTs has a greater chance to be difficult (12.5% of patients in this study) than intubation of patients with SLTs. When compared airway-related findings between "difficult to intubate" patients with DLTs and "difficult to intubate patients" with SLTs, we found no differences based on data from previous studies. However, we also found in this study that Cormack-Lehane grade II patients are more difficult to intubate with DLTs than with SLTs.

Conclusion(s): In our study we found that the two most important factors predictors for dificultéis in the intubation with DLTs are the Cormack-Lehane grade II and the maxillary-mandibular dental protrusion.

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