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FM 1

Impact of high concentrations of sevoflurane on laryngeal reflex responses in children

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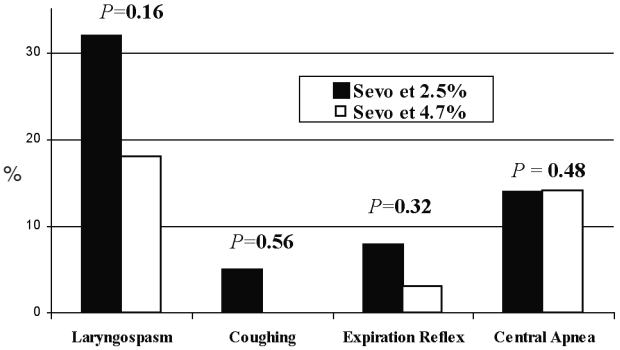
Introduction: Clinical impressions suggest that laryngeal reflex responses are less common under deeper levels of anesthesia. However, in contrast to other inhalational agents, this relationship was less obvious in children anesthetized with sevoflurane (sevo). Therefore, the purpose of the study was to evaluate the ability of a high concentration of sevo 4.7% [$ED_{95\ intubation}$] to depress laryneal reflex responses to laryngeal irrigation and we tested the hypothesis that laryngeal responsiveness is diminished at sevo 4.7%, compared with 2.5% (1 MAC).
Methods: After Ethics Committee approval and written parental informed consent re-cruitment of 40 children, aged 2–7 y. Premedication: midazolam 0.3 mg/kg. Induction: sevo 8%. Placement of a LMA. Maintenance (spontaneous breathing) with sevo 2.5 or 4.7%$_{et}$ (randomized order). Insertion of a fiberoptic bronchoscope *via* LMA (tip of placed above glottic opening). Registration of images with respiratory parameters (tidal gas flow and airway pressure). Stimulation of the laryngeal mucosa on each sevo level by spraying 0.25 ml distilled water. Evoked responses were classified by a blinded reviewer: A) laryngospasm (complete glottic closure >10 s), B) expiration reflex (forceful expiration), C) cough reflex, and D) central apnea (>10 s).
Results:



Discussion: Laryngospasm is the most frequent respiratory reflex response in children anesthetized with sevo. In contrast to our hypothesis, increasing the concentration of sevo did not result in significantly depressed respiratory reflex responses.

FM 2

Do paramedics and emergency physicians communicate effectively in simulated Emergency Medical Service scenarios?

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Background: Emergency Medical Service (EMS) providers are often exposed to stressful situations. Among other aspects of team performance, closed-loop communication may improve the effectiveness between physician and paramedic in such situations.
Method: Videotapes of 20 air rescue teams in 5 different training scenarios (1. paediatric near-drowning, 2. traumatic brain injury of a child, 3. postpartum haemorrhagic shock, 4. post-lightning resuscitation, and 5. preeclampsia during interhospital transfer) were analysed. All communication units between paramedic (PM) and emergency physician (EP) were recorded. Communication loops were defined, including initiation (information, question, command and drug application) and closing (action, affirmation, answer, explicit response and interpretative response); the respective items were rated specifically. Chi-square tests were used to compare communication patterns between PM and EP.
Results: Examination of 1479 communication units showed that type of initiation and closing of the loops differed between paramedic and emergency physician (p <0.01). 54.6% of the communication loops were initiated by the EP, 45.4% by the PM. They included information (EP 28.1%, PM 46.7%), question (EP 15.2%, PM 39.4%), command (EP 49.2%, PM 3.9%) and confirmation of drug application (EP 7.4%, PM 10.0%). Overall, 20.1% of the loops remained unclosed, showing no difference between PM and EP.
Conclusion: EP and PM initiated communication loops in critical emergency situation equally often. Overall, 20.1% of the communication loops remained unclosed. Open communications bear the risk of loss of information and/or withhold of treatment. Therefore, strategies for closing communications under stressful surroundings may have a potential for improved team performance.

FM 3

Intraoperative cerebral perfusion in geriatric patients

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Background: It is unknown whether cerebral perfusion in geriatric and younger patients under general anaesthesia differs.
Methods: We compared 2 groups of patients undergoing elective major non-cardiac surgery under standardized general anaesthesia (thiopental, sevoflurane, fentanyl, atracurium). Group 1: 18–40 yrs (n = 20), Group 2: >65 yrs (n = 37). Cerebral perfusion was investigated with transcranial Doppler and near-infrared spectroscopy (NIRS). Arterial blood pressure was monitored continuously with a Finapres device. Mx, an index allowing continuous monitoring of cerebrovascular autoregulation based on the changes in mean arterial blood pressure (MAP) and cerebral blood flow velocity was calculated. Data are shown as mean ± SD.
Results: MAP (86 ± 9.6 *vs* 79 ± 10.9 mm Hg, p = 0.02), end-tidal concentration of sevoflurane (1.9 ± 0.3 *vs* 1.6 ± 0.3%, p <0.01), and the cerebral tissue oxygenation index measured by NIRS (72 ± 4 *vs* 68 ± 5%, p = 0.01), were significantly lower in Group 2. The end-tidal concentration of O_2 was significantly higher in Group 2 (46 ± 4 *vs* 48 ± 4% p = 0.04). There were no significant differences between Group 1 and 2 for cerebral blood flow velocity (41 ± 10 *vs* 43 ± 18 cm/s), end tidal CO_2 (4.7 ± 0.3 *vs* 4.6 ± 0.3 kPa) and cerebrovascular autoregulation (Mx 0.42 ± 0.2 *vs* 0.48 ± 0.2). In Group 1 35% and in Group 2 43% of the patients had an index of autoregulation suggesting disturbed cerebrovascular autoregulation (p = n.s.).
Conclusions: In elderly patients under general anaesthesia with sevoflurane the cerebral tissue oxygenation index was significantly lower than in younger patients despite higher end-tidal oxygen concentrations. Our data suggest subtle differences in cerebral perfusion between geriatric and younger patients. However, more patients need to be investigated to confirm and characterize these differences.
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FM 4

Intraoperative cerebral perfusion and postoperative cognitive dysfunction in geriatric patients

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Background: Inadequate intraoperative cerebral perfusion has been suggested as a possible cause of postoperative cognitive dysfunction (POCD).
Methods: We investigated 35 patients aged 65 or older undergoing elective major non-cardiac surgery under standardized general anaesthesia (thiopental, sevoflurane, fentanyl, atracurium). Intraoperative cerebral perfusion was monitored with transcranial Doppler, and near-infrared spectroscopy (NIRS). Arterial blood pressure was monitored continuously with a Finapres device. Mx, an index allowing continuous monitoring of cerebrovascular autoregulation based on the changes in mean arterial blood pressure (MAP) and cerebral blood flow velocity was calculated. Mx >0.5 was defined as disturbed cerebrovascular autoregulation. Cognitive function was measured preoperatively and 7 days postoperatively using the CERAD-NAB Plus test battery. A postoperative decline >1 z-score in at least two of the tested domains was defined as POCD. Data are shown as mean ± SD.
Results: Mean age was 75 ± 7 yrs. Sixteen patients (46%) developed POCD. These patients were older (77 ± 8 vs 73 ± 7 yrs), had lower MAP (77 ± 12 vs 81 ± 11 mm Hg), lower cerebral tissue oxygenation indices measured by NIRS (66.8 ± 6.0 vs 68.6 ± 4.3%) and less efficient cerebrovascular autoregulation (Mx 0.54 ± 0.17 and 0.44 ± 0.22) than patients without POCD. Disturbed intraoperative cerebrovascular autoregulation was found more often (56 vs 37%) in patients with POCD. However, none of these differences reached statistical significance.
Conclusions: Our data show a trend towards subtle changes in intraoperative cerebral perfusion in elderly patients who develop POCD. However, a cause effect relationship must not be assumed and a greater number of patients needs to be investigated.
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FM 5

Incidents occurring during anesthesia for total hip arthroplasty: a comparison of general versus regional anaesthesia

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Background: The type of anesthesia to be used for total hip arthroplasty (THA) is still a matter of debate. We compared the occurrence of per- and post-anesthesia incidents in patients receiving either general (GA) or regional anesthesia (RA).
Methods: We used data from 29 hospitals, routinely collected in the Anaesthesia Databank Switzerland register between January 2001 and December 2003. We used multi-level logistic regression models.
Results: There were more per- and post-anesthesia incidents under GA compared to RA (35.1% vs 32.7 %, n = 3191, and 23.1% vs 19.4%, n = 3258, respectively). In multi-level logistic regression analysis, RA was significantly associated with a lower incidence of per-anesthetic problems, especially hypertension, compared with GA. During the post-anesthetic period, RA was also less associated with pain. Conversely, RA was more associated with post-anesthetic hypotension, especially for epidural technique. In addition, age and ASA were more associated with incidents under GA compared to RA. Men were more associated with per-anesthetic problems under RA compared to GA. Whereas increased age (>67), gender (male), and ASA were linked with the choice of RA, we noticed that this choice depended also on hospital practices after we adjusted for the other variables.
Conclusions: Compared to RA, GA was associated with an increased proportion of per- and post-anesthesia incidents. Although this study is only observational, it is rooted in daily practice. Whereas RA might be routinely proposed, GA might be indicated because of contraindications to RA, patients' preferences or other surgical or anaesthesiology related reasons. Finally, the choice of a type of anesthesia seems to depend on local practices that may differ between hospitals.

FM 6

Postoperative thoracic epidural analgesia inhibits detrusor activity in male patients

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Background: There is no clear evidence concerning the need for an indwelling bladder catheter in patients with a thoracic epidural anesthesia (TEA) for postoperative pain management. We therefore hypothesized that after epidural analgesia within segments T4 to T11 bladder functions remain unchanged.
Methods: In a prospective, open, observational, follow up study, 10 male patients with no pre-existing lower urinary tract symptoms underwent urodynamic investigations the day before open kidney surgery (lumbotomy) and 2–3 days postoperatively under TEA. Primary outcome was the difference in post void residual before vs during TEA.
Results: The area of the sensory blockade elicited by TEA extended from the thoracic dermatome T4 to T11. No motor neural blockade was present. No patient dropped out because of inadequate epidural analgesia. No opioids and no sedatives were administrated postoperatively and no PONV was documented. TEA resulted in a significant increase in post void residual volume from a median of 48 ml [interquartile range: 9–81] to 435 ml [219–697], $P = 0.002$. Maximum detrusor pressure, detrusor pressure at maximum flow rate and maximum flow rate were significantly reduced under TEA (37 [31–44] to 26 cm H_2O [22–36], $P = 0.004$), (31 [27–33] to 20 cm H_2O [0–25], $P = 0.003$) and (16 ml/s [11–21] to 4 ml/s [0–11], $P = 0.001$), respectively. Bladder filling and sensation were not influenced by TEA.
Conclusions: Voiding function significantly deteriorated during TEA for postoperative pain management. Potential explanations for our unexpected finding are increased sympathetic activity in the unblocked regions, post-operative stress-induced sympathetic activation and/or inhibition of parasympathetic activity.

FM 7

A selective nociceptive block is not sufficient to prevent central changes after peripheral nerve injury

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Background: Providing analgesia without suppressing motor or sensory function is a challenge for regional anesthesia and postoperative pain management. Resiniferatoxin (RTX), an ultrapotent agonist for transient receptor potential subtype-1 (TRPV1) can produce this selective blockade, as TRPV1 is selectively expressed on nociceptors. Futhermore, after peripheral nerve injury, spontaneous ectopic activity arises from all types of nerve fibers that can affect spinal neurons and glial cells. The goal of the present experiment is to determine whether spontaneous activity generated in C-fibers or in both A&C-fibers is required for microglia activation.
Method: We applied RTX (0.01%) or bupivacaine microspheres to the sciatic nerve of rats to block the conduction of C-fibers or A&C-fibers, respectively, before spared nerve injury (SNI). Behavior was tested and all the rats were sacrificed 2 days later; immunohistochemistry was performed on their spinal cord for mitogen-activated protein kinase (MAPK) p38, bromodeoxyuridine (BrdU, marker of proliferation) and Iba1 (microglial marker).
Result: At day 2 after SNI robust mechanical allodynia and p38 activation in spinal microglia were documented. There was also a substantial cell proliferation in the spinal cord, all proliferating cells (BrdU+) being microglia (Iba1+). RTX blocked heat sensitivity and produced heat hypoalgesia without affecting mechanical allodynia and motor function. Microglial proliferation and p38 activation in the spinal cord were not affected by RTX ($p > 0.05$). In contrast, a complete sensory and motor blockade was seen with bupivacaine which also significantly inhibited p38 activation and microglial proliferation in the spinal cord ($p < 0.05$).
Conclusion: We conclude that (1) RTX can provide a selective nociceptive blockade but that (2) blocking only nociceptive fibers does not impair the development of mechanical allodynia and microglia activation. Therefore (3) if microglia activation is important for chronic pain development then specific nociceptive blockade won't be sufficient to prevent it.

FM 8

Effect of local anaesthetics on osteoblasts

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Background: Regional anesthesia with ropivacaine, bupivacaine and lidocaine is widely used to control intra- and postoperative pain. We investigated the effect of anesthetics on growing osteoblasts in an *in vitro* model focusing on cell viability and proliferation rate, simulating bone healing after fracture with or without surgery.
Methods: Growing human osteoblasts were exposed to 0.03%, 0.06%, 0.125% or 0.25% of ropivacaine, bupivacaine, and lidocaine for 2 days. Medium was then changed, followed by incubation with normal growth medium (group 1) or growth medium containing local anesthetics for another 1, 4 or 7 d (group 2). At each time point, proliferation rate (BrdU assay), cell viability (MTT assay) and cell count (Fluorescence DNA Quantitation, DNAQuant) were analyzed.
Results: Increasing anaesthetic concentration resulted in a clear dose dependent decrease of proliferation rate, cell viability and cell number for all three anaesthetics ($p < 0.001$). Proliferation rate and amount of DNA were stronger affected in group 2 than in group 1 ($p < 0.001$). Lidocaine showed the strongest effect of all anaesthetics, followed by bupivacaine and ropivacaine.
Conclusion: These data suggest that the use of ropivacaine, bupivacaine, and lidocaine may negatively affect bone healing. The difference between group 1 and group 2 show a partial recovery of osteoblasts after removing the drug. These results are consistent with recent studies from our group, demonstrating a negative effect of local anesthetics on cell viability of fibroblasts.

FM 9

Characterization of Nedd4-2 ubiquitin ligase expression in experimental neuropathic pain

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Background: Neuropathic pain is associated with altered expression of voltage-gated sodium channels (VGSCs). The ubiquitin ligase Nedd4-2 regulates sodium channels and we have previously demonstrated in expression systems that this protein decreases the Nav1.7 current. Nav1.7 is the most abundant VGSC in dorsal root ganglion (DRG) and is a major contributor to pain perception. We hypothesize that Nedd4-2 modulates Nav1.7 channel density at the neuronal cell membrane and the goal of this present experiment is to characterize Nav1.7 and Nedd4-2 expression in the context of neuropathic pain.
Methods: Biotinylation, Western Blot and Immunohistochemistry experiments for Nav1.7 and Nedd4-2 were performed in HEK transfected cells or in rodent DRGs 7 days after SNI surgery. We used antibodies against Nedd4-2 and Nav1.7 and several comarkers of DRG neurons (Peripherin for nociceptors, NF-200 for large myelinated

cells, ATF3 for injured neurons). Data are expressed in proportion of positive cells (%) and protein signal ratio ± SEM, n = 3–4 in each condition.
Results: In HEK293 cells, upon co-expression of Nedd4-2, a decrease of 50% of Nav1.7 signal at the membrane is demonstrated ($p \leq 0.005$). Immunofluorescence on DRGs neurons reveals a decreased number of positive Nedd4-2 cells in the SNI model (27.0 ± 1.2%) versus sham group (43.4 ± 3.5%) ($p < 0.005$). Nedd4-2 is mainly colocalized with markers of small neurons and almost absent in large neurons. In addition, Nedd4-2 is predominantly decreased in injured ATF3 positive cells.
Conclusion: Our results indicate that Nedd4-2 decreases Nav1.7 channels and currents at the cell membrane and that it is mainly expressed in nociceptors and downregulated after nerve injury. Taken together, our data suggest that the reduction of Nedd4-2, after nerve injury, modulates Nav1.7 activity and can contribute to neuropathic pain. We will further try to restore a normal level of Nedd4.2 via a gene therapy approach with viral vectors in order to soothe symptoms of neuropathic pain.

FM 10

Effect of sevoflurane on lung oedema in an ALI/ARDS model *in vivo* and *in vitro*

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Introduction: ARDS and ALI are accompanied by alveolar and interstitial oedema. Sevoflurane has shown anti-inflammatory effects in various pre- and postconditioning settings. We investigated the effect of sevoflurane on water and ion transport in a model of lipopolysaccharide (LPS)-induced injury *in vitro* and *in vivo*.
Methods: Alveolar epithelial cells (AEC) were stimulated with LPS and co-incubated with 1 MAC sevoflurane for 8 hours. mRNA and protein of the epithelial sodium channel (ENaC) and Na^+/K^+-ATPase were measured and activity determined by 22-sodium and 86-rubidium influx in four groups: PBS/air, PBS/sevoflurane, LPS/air and LPS/sevoflurane. Animals were divided into three groups: PBS/propofol, LPS/propofol and sevoflurane/LPS. mRNA of transporters and oxygenation levels were measured.
Results: *In vitro* α-ENaC mRNA was decreased upon exposure to sevoflurane and sevoflurane/LPS, γ-ENaC upon treatment with LPS, sevoflurane and sevoflurane/LPS. However, protein levels and sodium-influx remained unchanged. Sevoflurane decreased Na^+/K^+-ATPase mRNA, protein levels also remained unchanged. Rb-influx was increased in the sevoflurane, LPS and sevoflurane/LPS group (24%, 19% and 27%). *In vivo* PBS/propofol served as a control. We found decreased α-ENaC mRNA upon porpofol/LPS treatment, while it remained unchanged in the sevoflurane/LPS group. γ-ENaC was decreased in both the sevoflurane/LPS and propofol/LPS group. Sevoflurane/LPS increased expression of Na^+/K^+-ATPase mRNA. No changes were observed in all other groups. Oxygenation was significantly improved in sevoflurane/LPS treated animals compared to propofol/LPS.
Conclusion: Our study shows few influence of sevoflurane treatment on protein levels and pump activity *in vitro*. *In vivo*, however, oxygenation was improved and expression of ion channels was enhanced upon exposure to sevoflurane. Taken together this could give evidence, that not edema resolution but edema formation is positively influenced by sevoflurane.

FM 11

In vitro exposure of human fibroblasts and osteoblasts to diclofenac is cytotoxic at clinically used concentrations

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Background: Diclofenac is routinely used to control postoperative pain. However, sparse data exist focusing on the possible interaction of diclofenac with fibroblasts and osteoblasts despite their importance for wound and fracture healing. We investigated the effects of clinically used concentrations of diclofenac to assess viability of these cells.
Methods: Monolayers of human fibroblasts and osteoblasts were exposed to different concentrations of diclofenac (6.25 µg/ml, 12.5 µg/ml, 25 µg/ml, and 50 µg/ml) for 2d, followed by an incubation with normal medium for another 1d or 4d (group 1). Alternatively, cells were incubated with diclofenac for 3d and 6d (group 2). At each time point, live cells were counted using the DNA quantitative test, cell viability was assessed with the MTT assay.
Results: Fibroblasts in group 1 at low concentrations did not show a decrease of live cells after 3d and 6d of incubation except for at 50µg/ml, where living cells dropped to 60%, and 86%, respectively ($p < 0.05$). In group 2, the decrease of live cells with increasing concentrations of diclofenac was even clearer showing decrease of live cells to 51% and 31%, respectively. In osteoblasts group 1 showed a significant decrease of live cells after 3d and 6d of incubation at concentrations of 25 µg/ml (56%, 25%) and 50 µg/ml (3%, 0.5%). In group 2, the decrease of live cells with increasing concentrations of diclofenac was comparable with results from group 1 ($p < 0.05$).
Conclusions: Our study shows a concentration-, time- and cell-dependent cytotoxic effect of diclofenac on fibroblasts and osteoblasts *in vitro*. Fibroblasts after a short incubation time with diclofenac seem to undergo regeneration at lower concentrations compared with cells permanently exposed at lower and higher concentrations. Osteoblasts do not show any regeneration characteristics. Further studies are warranted to evaluate the clinical impact of these results.

FM 12

ICAM-1 independent anti-inflammatory effect of ropivacaine in the double-hit mouse model of acute inflammation

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Background: Local anesthetics are known to attenuate the host inflammatory response. In a previous study ropivacaine (R) was shown to prevent acute lung injury by blocking lipopolysaccharide (LPS)-induced increase in Intra-Cellular Adhesion Molecule 1 (ICAM-1) mRNA level, suggesting a beneficial effect of R through regulation of ICAM-1 expression.
Methods: ICAM-$1^{-/-}$ mice exposed to nebulized LPS or normal saline (NS) for 1 h, received 2 h after LPS challenge NS or 1 µM R i.v. and were thereafter connected to a ventilator for high tidal (28 cc/kg) volume-controlled ventilation (VC) for 2 h to further induce acute lung inflammation ("double hit" model). Thereafter, lungs were homogenized for measurement of total lung PMN infiltration (MPO-activity) or a broncho-alveolar lavage (BAL) was performed for PNM counts.
Results: Lung MPO-activity and PNM counts after BAL were increased in ICAM-$1^{-/-}$ lungs exposed to LPS and 2h of high tidal VC. LPS exposure stimulated lung inflammation (MPO activity and BAL PNM counts) whereas ropivacaine after LPS challenge significantly decreased PMN infiltration in the BAL.
Conclusions: PNM transmigration into ICAM-$1^{-/-}$ mouse lungs in response to LPS and high tidal VC was attenuated by R. There was no effect of R on BAL neutrophil counts or MPO activity in mice ventilated at high tidal volume without prior LPS challenge. Therefore, ICAM-1 independent anti-inflammatory effect of i.v. R seems to be specific to endotoxin-induced PMN transmigration. R-mediated attenuation of LPS-induced PMN migration seem also mediated by ICAM-1-independent mechanisms, suggesting that R may be a useful anti-inflammatory agent through direct actions on circulating neutrophils.

FM 13

Ultrasound guided, selective block of the ilioinguinal and iliohypogastric nerves: a volunteer study

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Background: Diagnostic or therapeutic block of the ilioinguinal (il) and iliohypogastric (ih) nerve is widely used in pain medicine. We tested the hypothesis that these two nerves can be blocked selectively using our previously developed ultrasound guided approach and injecting 2 x the ED_{95} dose of 1% mepivacaine in relation to the cross sectional area of the nerve (0.11 ml/mm^2).
Methods: 16 volunteers were studied. After scanning and measuring the nerves we blocked either the il or ih nerve on each side, the side for each nerve being selected randomly. The block was performed under ultrasound guidance injecting 0.22 ml/mm^2 of mepivacaine. The same procedure was repeated one week later blocking the respective other nerves. 20 min. after injection the anaesthetized skin area was determined and graphically marked using pinprick testing. The testing physician and the volunteers were blinded in regard to the blocked nerves. All marked skin areas were photographed and transformed in a normalized coordinate system. The overlap of the anaesthetized areas of the il and ih nerves was assessed. The acceptance criterion for selective block was defined as a maximum overlap of 25%.
Results: The mean volume injected to block a single nerve was 0.8 ml (SD 0.3). Mean overlap of the anaesthetized skin areas of the selectively blocked right il and ih nerves were 55.4% (34.5) and 59.9% (28.4) left.
Conclusions: It was not possible to selectively block these two nerves even by injecting such small amounts of local anaesthetic.

FM 14

Continuous interscalene analgesia with ropivacaine 0.2% versus ropivacaine 0.3% following open rotator cuff repair: effects on postoperative analgesia and motor function

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Background: Interscalene analgesia is the established standard for the management of postoperative pain after major shoulder surgery. The most efficient local anesthetic concentration in this setting is still controversial. The aim of this study was to compare the benefits and side-effects of a continuous infusion of ropivacaine 0.2% and 0.3% administered through an interscalene catheter for the first 48 hours after surgery.
Methods: After approval by the Local Ethics Committee and written informed consent, 80 consecutive patients scheduled for elective open rotator cuff repair were randomized into two groups: group A with ropivacaine 0.2% or group B with ropivacaine 0.3%. The study was conducted in a double-blind fashion. A continuous infusion of ropivacaine was applied during 48 hours at a rate of 14 ml/h through an interscalene catheter. Pain score (VAS 0-100), intensity of motor block, quality of sleep during the first postoperative night, morphine consumption, side-effects and patient satisfaction were assessed by an anesthetist masked to treatment group.
Results: Demographic and surgical data were similar in both groups. Morphine consumption was significantly reduced in group B (12 vs. 30 mg). Quality of sleep was significantly better in group B (4% vs. 27% of awakening during the first postoperative night). Hand grip strength, VAS scores, side-effects and patient satisfaction were similar in both groups.
Conclusions: The use of ropivacaine 0.3% trough an interscalene catheter for the first 48 hours after open rotator cuff repair provided a significant reduction of morphine consumption, a better sleep quality for the first postoperative night without increasing the severity of motor block or side-effects.

FM 15

Interaction of gender with age for pressure pain thresholds in pain-free humans

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Background and aims: Previous investigations on pressure pain threshold quantification suggest that there are robust differences between genders, with woman exhibiting lower pain thresholds than men. The effect of age is less clear. The present study was a comprehensive investigation of determinants of pain thresholds in painfree subjects. In this abstract, gender differences and the interaction of gender with age for the determination of pressure pain thresholds was analyzed.
Methods: We studied 300 healthy subjects, 152 men and 148 women. 75 subjects were analyzed within each of the following age categories: 20–34, 35–49, 50–64 and 65–77. Pressure pain detection and tolerance thresholds were assessed at the 2nd toe, the low back and the suprascapular region. The influence of gender, age and their interaction on the combined pressure pain thresholds were analyzed by principal component multivariate analysis.
Results: Gender (P <0.001) and the interaction gender–age (P <0.001) were significant predictors of pressure pain thresholds. Overall, women had lower pain thresholds than men. However, the influence of gender decreased with increasing age. ANOVA performed on the age groups 50–64 and 65–77 revealed no statistically significant differences between women and men.
Conclusions: We conclude that women are not generally more pain sensitive than men, the influence of gender depending on the age. For pressure pain, there are no gender differences in older age groups. Previous studies on this subject are probably limited by the fact that mostly young subjects were investigated.
Keywords: Pressure pain thresholds, gender differences.

FM 16

Moving from nerve stimulator to ultrasound guidance for peripheral nerve blocks in a University Anaesthesia Department: Block quality and patient satisfaction during the transition period

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Background and objectives: Ultrasound guidance for peripheral nerve blockade has recently been broadly introduced in clinical anaesthesia practice. Any alteration of a technique leads to institutional changes that can impair the block quality and operation-room workflow. The aim of this retrospective cohort study was to assess whether the change from the established nerve-stimulator guidance to ultrasound-guidance for axillary plexus blockade alters block quality or patient satisfaction.
Methods: The anaesthesia records of all patients electively operated at the wrist or hand during the transition time between September 1st, 2006 and August 15th, 2007 were reviewed for block success, block placement time, training level of the anesthesiologist, volume of local anesthetics and requirement of additional analgesics. In a subgroup of patients postoperative records were reviewed and patient satisfaction was assessed by telephone interview.
Results: Significantly more blocks were performed by novices in the ultrasound group (72.3% vs. 14%, p <0.001) but block performing time and success rates were similar between both the ultrasound group and nerve stimulator group. The ultrasound-group applied significantly less local anesthetics compared to the nerve-stimulator group (36.1 ± 7.1 ml vs. 43.9 ± 6.1 ml, p <0.001) and fewer analgesics were needed for block completion (Fentanyl 66.1 ± 30 µg vs. 90 ± 62 µg, p <0.001). Fewer patients reported discomfort or pain at block placement or mentioned prolonged block placement time due to difficulties to localize the nerves when the block was ultrasound-guided (2% vs. 20%, p = 0.002)
Conclusions: The change from nerve stimulator to the ultrasound-guidance for axillary plexus blockade did not increase block performing times nor did it impair success rate. The patient satisfaction was improved even during the early institutional change phase.

FM 17

Axillary brachial plexus blockade is easier to learn with ultrasound guidance

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Background: The use of ultrasound improves the success rate of axillary brachial plexus block compared to nerve stimulation. Little is known about the learning process of the skill needed to perform ultrasound-guided block. The aim of this study was to compare the learning curves of residents trained with ultrasound-guidance (US) versus residents trained in nerve stimulation (NS) when performing axillary plexus block.
Methods: 10 residents trained in US-guided block were compared with 10 residents trained with NS in the years before the US technique was introduced at our institution. The novices' learning curves were generated by retrospective data analysis out of our electronic anaesthesia database. The individual success rates were pooled and the institutional learning curve was calculated using a bootstrapping technique in combination with a Monte Carlo simulation procedure.
Results: A significant difference in the success rates was detectable after 10 blocks (US 86% [77.8–91.5] vs. NS 68% [58.3–76.3] p = 0.002). The number of attempts required to achieve levelling-off of the learning curve (number need to learn) lies between 10 and 15 for the ultrasound, whereas it requires about 25 to 30 attempts to learn the nerve stimulator technique.
Conclusions: US-guided axillary plexus block can be learned faster than NS guided axillary plexus block. Moreover, in concordance to published data, the final success rate after learning the method is higher in the US group compared to the NS group.

FM 19

Accuracy of perioperative haemoglobin measurement using the HemoCue® device and a CO-Oximeter in paediatric surgical patients

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Background and objectives: Acceptance of low perioperative haemoglobin (Hb) levels depends on reliable and fast determination of Hb concentration. The goal of this study was to determine the accuracy of Hb measurement by the HemoCue® device (HemoCue B-Hemoglobin Photometer, HemoCue AB, Ängelholm, Sweden) and a CO-Oximeter (GEM OPL CO-Oximeter, Instrumentation Laboratory, Lexington, MA, USA) (CO-Ox) in comparison with the standard laboratory (lab) analysis (Sysmex XS 2100, Digitana AG, Horgen, Switzerland) in children undergoing surgical procedures associated with significant blood loss.
Methods: Blood samples of 16 patients (age [range {median}] 3.5 months – 14 years [21 months]; weight [range {median}] 6.2–54.0 [9.6] kg) were obtained. For Hb measurement with HemoCue®, CO-Ox and lab analysis, blood samples were drawn at the same time points after induction, at start of surgery, during the intraoperative course and at the end of the procedure and simultaneously measured. HemoCue® was compared to lab analysis, CO-Ox to lab analysis and HemoCue® to CO-Ox using Bland-Altman analysis.

Results: 49 blood samples were simultaneously tested. Ranges (median) for Hb levels were 5.1–17.5 (9.3) g/dl for HemoCue®, 4.7–17.5 (8.9) g/dl for CO-Ox and 4.6–17.6 (9.3) g/dl for lab analysis.

	Bias	Precision	95% limits of agreement
HemoCue® vs. lab analysis [g/dl]	–0.05	0.94	–0.1843; 0.0843
CO-Ox vs. lab analysis [g/dl]	0.47	1.17	0.3043; 0.6357
HemoCue® vs. CO-Ox [g/dl]	–0.51	0.97	–0.6500; –0.3700

Conclusion: Perioperative Hb measurement in pediatric surgery patients using the HemoCue® device is a quick and precise method with minimal bias compared to standard lab analysis over an almost 4-fold Hb range and might therefore be preferable to the CO-Oximeter.

FM 20

Effect of intravenous fluids on blood coagulation assessed by rotation thromboelastometry

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Background and objectives: Impairment of blood coagulation is one of the main side effects of colloids, particularly with artificial colloids such as hydroxyethyl starch (HES) and gelatine preparations. This pilot animal study aimed to evaluate the effect of a standard crystalloid or colloid intravenous fluid bolus on blood coagulation assessed by rotation thromboelastometry (ROTEM®; Pentapharm GmbH, Munich, Germany).
Methods: Piglets (n = 32, weight 5.1 ± 0.4 kg) were infused with 20 ml/kg fluid boluses of either normal saline (NS), 4% gelatine, 5% albumin or 6% HES 130/0.4 (n = 8 per group) over a period of 2 min. Blood samples were analyzed with ROTEM® before and 1 min. after fluid administration. The following ROTEM® parameters are reported: CT (clotting time [sec]), CFT (clot formation time [sec]) and MCF (maximum clot firmness [mm]) in the EXTEM and INTEM and MCF in the FIBTEM test. Kruskal-Wallis test was applied and intergroup comparisons were performed by post-hoc Mann-Whitney-U test followed by Bonferroni correction (significance level $\alpha = 0.05/6 = 0.0083$).
Results:

Table 1
Changes of ROTEM® parameters (median (range)) after fluid bolus. CT change (EXTEM and INTEM) was not different between the 4 fluids tested.

	NS	gelatine	albumin	HES
CFT_{EXTEM}	1.5(–11.0–8.0)	21.5(5.0–37.0)*	13.0(0.0–55.0)*	22.5(8.0–33.0)**
CFT_{INTEM}	2.5(–1.0–8.0)	14.0(9.0–28.0)**	8.0(3.0–13.0)#	20.0(7.0–30.0)*§
MCF_{EXTEM}	–2.5(–7.0–(–1.0))	–6.0(–11.0–(–2.0))	–3.0(–4.0–2.0)#	–6.0(–10.0–4.0)
MCF_{INTEM}	–3.0(–4.0–(–1.0))	–7.0(–9.0–(–5.0))**	–3.5(–5.0–(–2.0))##	–9.0(–11.0–(–7.0))**§§
MCF_{FIBTEM}	–4.0(–6.0–0.0)	–7.0(–11.0–(–3.0))	–6.5(–17.0–0.0)	–13.5(–18.0–(–4.0))*#

comparison vs. NS: *p <0.008, **p <0.001; comparison vs. gelatine: #p <0.008, ##p <0.001
comparison vs. albumin: §p <0.008, §§p <0.001

Conclusion: HES and gelatine showed a stronger impairment of blood coagulation compared to albumin or normal saline. Remarkably, this was observed after only moderate volume loading in this pig model.

FM 21

In vitro determination of the inflammatory potential of platelet concentrates and fresh frozen plasma

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Background: The storage of red blood cells, platelets and FFP leads to the generation and accumulation of inflammatory mediators with a potent neutrophil and/or endothelial priming activity. Although blood components are stored in stabilising storage medium, cellular break down (especially of leukocytes) through time might be responsible for a higher inflammatory potential in older versus fresh blood products. Most blood products are nowadays leuko-reduced, though transfusion-related inflammatory reactions (e.g. TRALI) still remain among the most feared complications of blood transfusions.
Objective: Our investigations focused on the inflammatory potential of leuko-reduced platelets and FFP depending on storage time.
Methods: Immediately before transfusing platelets or FFP a sample of 5 ml was taken from the bag, centrifuged and the supernatant aliquoted to quantitatively measure the concentration of IL-1, IL-6, IL-8, TNF-α, TGF-β1, CD40-Ligand, MCP-1 and CINC-1. To determine the inflammatory potential of these supernatants, human pulmonary microvascular endothelial cells (HMVEC), preincubated with LPS or not, were incubated with the supernatant and the de-novo synthesis of cytokines measured.
Results: No correlation between storage time and cytokine level could be demonstrated. Unstimulated HMVECs incubated with the supernatant of platelets or FFP showed only a moderate inflammatory reaction. However, when HMVECs were previously stimulated with LPS, the addition of supernatants induced a several fold inflammatory burst irrespective of the initial cytokine concentration in the blood products ($p < 0.05$).
Conclusion: These data show that cytokine concentration in leuko-reduced platelets and FFP does not increase with storage time. Interestingly there is no correlation between the initial cytokine concentration of a blood component and the magnitude of the inflammatory reaction induced by its transfusion in previously LPS-stimulated HMVECs. These observations underline the hazardous nature of blood transfusions, irrespective of storage time and cytokine concentration, especially in patients with pulmonary endothelial activation as seen in any systemic inflammatory reaction.

FM 22

Fluid resuscitation with HES 130 attenuates the expression of inflammatory mediators in the kidney compared to Ringer's lactate in an *in vivo* model of LPS-induced sepsis in rats

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Objective: Acute renal failure is a frequent complication of sepsis. Hydroxyethyl starches (HES) are widely used in the treatment of such patients. The question as to which type of solution (colloids or cristalloids) should be used concerning the renal function during sepsis remains controversial. The aim of this study was to compare the effects of HES 130 with Ringer's lactate (RL) on the inflammatory response in the kidney in a model of lipopolysaccharides (LPS)-induced sepsis in rats.
Methods: Rats were anaesthetized, tracheotomized, mechanically ventilated and sedated with sevoflurane. LPS *(E. coli 055:B5)* at a dose of 5 mg/kg respectively phosphate-buffered saline (PBS) as control were administered intravenously (i.v.). One hour after the application of LPS, RL was infused i.v. at a volume of 30 ml/kg. Two hours after application of LPS rats received either RL at a volume of 75 ml/kg (LPS-RL) or HES 130 at a volume of 25 ml/kg i.v. (LPS-HES). 4 hours after LPS challenge rats were sacrificed. Tumour necrosis factor alpha (TNFα) and Interleukin 1 beta (Il-1β) were determined in serum by ELISA (protein). Cytokine-induced neutrophil chemoattractant-1 (CINC-1), monocyte chemoattractant protein-1 (MCP-1) and (TNFα) were determined in kidney tissue (RNA) by realtime PCR.
Results: Levels of serum TNFα and Il-1β were similar in both LPS groups with no intergroup difference, however were higher compared to PBS groups. LPS-HES animals showed a significant lower expression of CINC-1, MCP-1 and TNFα RNA in kidney tissue compared to the LPS-RL group.
Conclusions: Degree of sepsis seems to be comparable with the two strategies of fluid management. However, we could show that HES 130 attenuates expression of inflammatory mediators in kidney tissue compared to RL in an *in vivo* model of LPS-induced sepsis in rats. Therefore, HES 130 could be beneficial in fluid resuscitation in sepsis as already shown in other animal models of sepsis.

FM 23

Effect of a late Sevoflurane Postconditioning on Pulmonary Performance after On Pump Aortic Valve Replacement

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Introduction: Cardiac surgery with the use of extracorporeal circulation is associated with an induction of a vigorous inflammatory response which leads to a compromised organ function. The lung is one of the affected organs, responding with the picture of an acute lung injury. Volatile anesthetics could be beneficial in suppressing this inflammatory response.
Objectives: The following question was addressed: Does postoperative sedation with sevoflurane compared to propofol have a positive effect on pulmonary performance and complications after aortic valve replacement surgery?
Material and Method: 36 Patients undergoing on pump aortic replacement surgery were analyzed. In the ICU, patients were

randomized to receive either sevoflurane (n = 18) or propofol (n = 18) for further sedation. The oxygenation ratio (= p_aO_2/F_iO_2) was calculated right after the start with either ICU-sedation regime, after 1/2/4 hours , right before and after extubation, 1 hour and in the morning after extubation ($T_{0,1,2,4,be,ae,ma}$). The pulmonary complications during the hospitalisation were recorded.
Results: The oxygenation ratio was always higher in the sevoflurane group. Statistical significance ($p < 0.05$) was reached at T_0, T_1, T_4 and T_{ae}. Even though the median time until extubation was shorter in the sevoflurane group (6.0 h, IQR 5.0–7.0 h) compared to the propofol group (7.0 h, IQR 5.1–8.8 h) it has not reached statistical significance ($p = 0.21$). The number of postoperative pulmonary complications (PPC) was higher in the propofol group (6 total) than the ones in the sevoflurane group (3 total). The odds ratio to have a PPC was 2.5 times higher in the propofol group. Because of the small sample size statistic significance was not reached ($CI_{5–95}$ 0.55–11.12).
Conclusion: Late postconditioning with sevoflurane after aortic valve replacement surgery seems to be a promising strategy to overcome some of the negative pulmonary effects that are induced by the systemic inflammatory response due to the extracorporeal circulation.

FM 24

The effect of n-3 enriched nutrition therapy on post-operative cognitive dysfunction after cardiac surgery

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Background: Postoperative cognitive dysfunction (POCD) occurs frequently after cardiac surgery. Some data suggest that inflammation plays a key role in the development of POCD. N-3 fatty acids have been shown to have a beneficial effect on inflammation. We hypothesised that perioperative n-3 enriched nutrition therapy would reduce the incidence of POCD in this group of patients.
Methods: Randomized, double blind placebo controlled trial in patients aged 65 or older undergoing elective cardiac surgery with cardiopulmonary bypass. 2x 250 mL placebo (Ensure Plus™, Abbott Nutrition) or n-3 enriched nutrition therapy (ProSure™ Abbott Nutrition) were administered for ten days starting 5 days prior to surgery. Cognition was assessed preoperatively and 7 days after surgery with the Consortium to Establish a Registry for Alzheimer's Disease – Neuropsychological Assessment Battery (CERAD-NAB) [1].
Results: 16 patients were included. Mean age was 72 ± 5.3 for placebo and 75 ± 4.8 for ProSure™ respectively. CRP and IL-6 did not differ significantly between groups preoperatively and on postoperative days 1, 3, and 7. Preoperative CERAD total scores were 86 ± 10 and 81 ± 9 (p = n.s.) for Placebo and ProSure™, respectively. Postoperative scores were 88 ± 12, and 77 ± 19 (p = n.s.) The change in score was not different between the two groups (Placebo: +3 ± 5; ProSure: –5 ± 11).
Conclusion: In this very small sample no effect of preoperatively started n-3 enriched nutritional supplements on inflammation or cognitive functions were detected. However, there is a large likelihood of a type II error and more patients need to be included to assess possible beneficial effects of this intervention in elderly patients undergoing elective cardiac surgery.
1 Chandler MJ, et al. Neurology. 2005;65:102–6.

Posters

P 1

Anaesthesia for electroconvulsive therapy: time for a change?

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Introduction: Electroconvulsive therapy (ECT) may be used to treat severe depression and needs a specific general anaesthesia. Important cardiovascular changes occur during the ECT with a parasympathetic induced bradycardia followed by a sympathetic response. A dedicated protocol was designed 6 years ago. The goal of this study was to analyse the management of anaesthesia for ECT in our institution, the adherence to the protocol and the occurrence of adverse events during anaesthesia.
Methods: After Institutional Ethics Committee approval, we conducted a retrospective analysis of our anaesthesia protocol for patients scheduled for electroshock therapy during a five years period (2004–2008). The protocol includes administration of atropine subcutaneously 30 minutes before the procedure, followed by general anaesthesia induced with etomidate (0.2 mg/kg). Suxamethonium (1 mg/kg) is administered after the inflation of a pneumatic tourniquet on the opposite arm, in order to observe the electroshocks convulsive effects. The psychiatrist initiates the convulsive crisis once curarisation is achieved. Face mask ventilation is then applied during the post-ictal phase with closed blood pressure monitoring.
Results: 228 ECT were performed in 25 patients. The median dosage of etomidate was 0.37 mg/kg and suxamethonium 1.20 mg/kg. Hypertension during the ECT procedure was present in 62.7% of cases, tachycardia 23.2% and bradycardia 10.5%. Esmolol was administered in 73.4% of hypertensive patients in a range of 0 to 30 mg. The protocol was followed in half of the cases in regards to atropine administration (50.4%). We observed a significant increase of hypertension (73.9%, p = 0.001) after atropine administration, without effect on heart rate.
Conclusions: The management of anaesthesia for ECT is specific and follows a predefined protocol in our institution. Adherence to our protocol was poor. Adverse events are frequent and significant association between the administration of atropine and the incidence of hypertension as well as poor protocol adherence implies reconsideration of our anaesthesia protocol for electroconvulsive therapy and better quality control of the clinical practice.

P 2

Assessing Patient's belief on HIV testing before elective surgery: place for improvements in Switzerland

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Background and aim of the study: In Switzerland no HIV test is performed without the patient's consent based on a Voluntary Counseling and Testing policy (VCT). We hypothesized that a substantial proportion of patients going through an elective surgery falsely believed that an HIV test was performed on a routine basis and that the lack of transmission of result was interpreted as being HIV negative.
Material and method: All patients with elective orthopedic surgery during 2007 were contacted by phone in 2008. A structured questionnaire assessed their belief about routine preoperative blood analysis (glycemia, coagulation capacity, HIV serology and cholesterol) as well as result awareness and interpretation. Variables included age and gender. Analysis were conducted using the software JMP 6.0.3.
Results: 1123 patients were included. 130 (12%) were excluded (i.e. unreachable, unable to communicate on the phone, not operated). 993 completed the survey (89%). Median age was 51 (16–79). 50% were female. 376 (38%) patients thought they had an HIV test performed before surgery but none of them had one. 298 (79%) interpreted the absence of result as a negative HIV test. A predictive factor to believe an HIV test had been done was an age below 50 years old (45% vs 33% for 16–49 years old and 50–79 years old respectively, $p < 0.001$). No difference was observed between genders.
Conclusion: In Switzerland, nearly 40% of the patients falsely thought an HIV test had been performed on a routine basis before surgery and were erroneously reassured about their HIV status. These results should either improve the information given to the patient regarding preoperative exams, or motivate public health policy to consider HIV opt-out screening, as patients are already expecting it.

P 3

Auditory stimulation does not induce implicit memory during anaesthesia

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Background and aim of the study: Formation of implicit memory during general anaesthesia is still debated. Perceptual learning is the ability to learn to perceive. In this study, an auditory perceptual learning paradigm, using frequency discrimination, was performed to investigate the implicit memory. It was hypothesized that auditory stimulation would successfully induce perceptual learning. Thus, initial thresholds of the frequency discrimination postoperative task should be lower for the stimulated group (group S) compared to the control group (group C).
Material and method: Eighty-seven patients ASA I–III undergoing visceral and orthopaedic surgery during general anaesthesia lasting more than 60 minutes were recruited. The anaesthesia procedure was standardized (BIS® monitoring included). Group S received auditory stimulation (2000 pure tones applied for 45 minutes) during the surgery. Twenty-four hours after the operation, both groups performed ten blocks of the frequency discrimination task. Mean of the thresholds for the first three blocks (T1) were compared between groups.
Results: Mean age and BIS value of group S and group C are respectively 40 ± 11 vs 42 ± 11 years (p = 0,49) and 42 ± 6 vs 41 ± 8 (p = 0.87). T1 is respectively 31 ± 33 vs 28 ± 34 (p = 0.72) in group S and C.
Conclusion: In our study, no implicit memory during general anaesthesia was demonstrated. This may be explained by a modulation of the auditory evoked potentials caused by the anaesthesia, or by an insufficient longer time of repetitive stimulation to induce perceptual learning.

P 4

Comparison of fastening times with gastric volume assessed by magnetic resonance imaging in children

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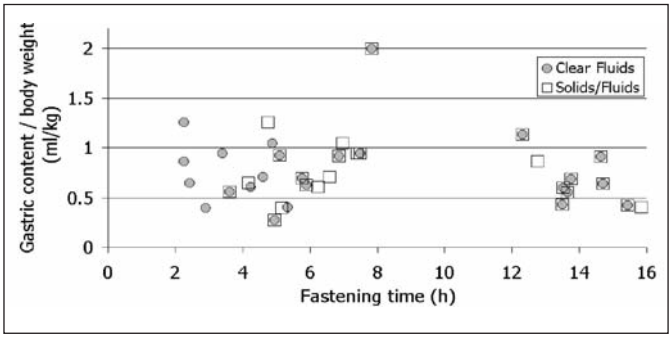
Background: To compare fastening times for solids and fluids with gastric content in children undergoing magnetic resonance imaging (MRI) under deep propofol sedation.
Methods: Paediatric patients undergoing diagnostic total body, abdominal, thoracic or thoraco-lumbar spine MRI were included. Children were allowed to eat/drink until 4 hours and to drink clear fluids until 2 hours before scheduled induction time of anaesthesia according to standard institutional guidelines. Effective fastening times, quality and quantity of food and drinks ingested prior to induction were asked. Volume of gastric content was measured by MRI and calculated with standard post-processing software. Fastening times were compared with gastric content (ml) per kg body weight.
Results: So far 25 children aged from 0.5 to 8.4 years (median 2.9 yrs) were studied.



Conclusions: Limited data suggests that fastening times for solids/fluids shorter than 8 or even 6 hours do not increase volume of gastric content in children.

P 5

The occurrence of intra-operative hypotension varies between hospitals. Observational analysis of over 147 000 anaesthesia

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Background: Hypotension, a common intra-operative incident, bears an important potential for morbidity. It is most often manageable and sometimes preventable, which renders its study important. Therefore, we aimed at examining hospital variations in the occurrence of intra-operative hypotension and its predictors. As secondary endpoints, we determined to what extent hypotension relates to the risk of postoperative incidents and death.
Methods: We used the Anaesthesia Databank Switzerland, built on routinely and prospectively collected data on all anaesthesias in 21 hospitals. The three outcomes were assessed using multi-level logistic regression models.
Results: Among 147 573 anaesthesia, hypotension ranged from 0.6 to 5.2% in participating hospitals, and from 0.3 up to 12% in different surgical specialties. Most (73.4%) were minor single events. Age, ASA status, combined general and regional anaesthesia techniques, duration of surgery, and hospitalization were significantly associated to hypotension. Although significantly associated, the emergency status of the surgery had a weaker effect. Hospitals' Odds Ratios for hypotension varied between 0.12 to 2.50 ($p \leq 0.001$) with respect to the mean prevalence of 3.1%, even after adjusting for patient and anaesthesia factors, and for type of surgery. At least one post-operative incident occurred in 9.7% of the interventions, including 0.03% deaths. Intra-operative hypotension was associated with higher risk of post-operative incidents and death.
Conclusions: Wide variations in the occurrence of hypotension amongst hospitals remain after adjustment for risk factors. Although differential reporting from hospitals may exist, variations in anesthesia techniques and blood pressure maintenance could have also contributed. Intra-operative hypotension is associated with morbidities and sometimes death, and constant vigilance must thus be advocated.

P 6

Hypertension and intra-operative incidents: a multicentre study of 125 000 surgical procedures in Swiss hospitals

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Background: It is debated whether chronic hypertension increases the risk of cardiovascular incidents during anaesthesia.
Methods: We studied all elective surgical operations performed in adults under general or regional anaesthesia between 2000 and 2004, in 24 hospitals collecting computerised clinical data on all anaesthetia since 1996. The focus was on cardiovascular incidents, though other anaesthesia-related incidents were also evaluated.
Results: Among 124 939 interventions, 27 881 (22%) were performed in hypertensive patients. At least one cardiovascular incident occurred in 7549 interventions (6% [95% CI 5.9–6.2%]). The average adjusted odds ratio of cardiovascular risk in patients with chronic hypertension was 1.38 (95% CI 1.27–1.49). However, across hospitals, adjusted odd ratios varied from 0.41 up to 2.25. Hypertension did not increase the risk of other incidents.
Conclusions: Hypertensive patients are still at risk of intra-operative cardiovascular incidents. The heterogeneity of the risk to develop cardiovascular incidents varied across hospitals, despite taking into account casemix and hospital characteristics. These variations suggest that anaesthetic practices differ across anesthesia services.

P7

Pharmacological postconditioning in liver surgery using a volatile anesthetic: preliminary data

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Introduction: To prevent blood loss liver resection often requires inflow occlusion resulting in tissue damage due to ischemia/reperfusion injury. In liver surgery intermittent clamping (instead of continous clamping) as well as a preconditioning with volatile anesthetics are proven protective strategies against ischemia/reperfusion injury.

Objectives: To evaluate in a randomized controlled trial the protective effects of pharmacological postconditioning with a volatile anesthetic compared with intermittent clamping in patients undergoing liver resection with inflow occlusion. These are preliminary data from 45 patients.
Material and method: Patients undergoing liver surgery with inflow occlusion for at least 30 min were intraoperatively randomized into 3 groups: (a) intermittent clamping (repetitive 15 min clamping and 5 min reperfusion), (b) inhalative postconditioning with sevoflurane after reperfusion and (c) control group (continuous clamping). Anesthesia was performed intravenously with propofol. In the postconditioning group, upon reperfusion propofol was replaced by sevoflurane (3.2 Vol% endexpiratory concentration) and reinitiated after 10 min of postconditioning. Primary endpoint was postoperative liver injury assessed by peak value of aspartate-aminotransferase (AST).
Results: Both sevoflurane postconditioning (n = 19, 518 U/l AST) and intermittent clamping (n = 17, 461 U/l AST) significantly reduced postoperative serum peak levels of AST by compared with the control group (n = 9, 1002 U/l AST), p >0.05.
Conclusion: This trial might provide the first evidence of the protective effect of **post**conditioning with volatile anesthetics in liver surgery with inflow occlusion. This strategy could provide a new and easily applicable therapeutic option to protect against ischemia/ reperfusion injury.

P 8

GeneChip resequencing array for genotyping in anaesthesia

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Introduction: Two pharmacogenetic diseases are of primary interest in anaesthesia: malignant hyperthermia (MH) due to the potentially fatal consequences and butyrylcholinesterase (BCHE) deficiency due to its high incidence. MH susceptible patients are known to carry mutations in RYR1 and CACNA1S genes. Because of the large gene sizes and the lack of predominant hot spot regions the acquisition of genetic information in a routine way is difficult. Mutations in the BCHE gene can substantially prolong the duration of action of short acting neuromuscular blocking drugs. Frequentyl combinations of different BCHE variants can be identified.
Methods: The development of the genechip included the selection of the gene sequences, inclusion of the MH-causative RYR1 mutations, setup of the PCR parameters and verification of the PCR fragments by automated sequencing. Data analysis was performed using Affymetrix®'s GeneChip Sequence analysis (GSEQ Version 4.1).
Results: We obtained long PCR products ranging from 500 bp to 6.7 kb. A total of 38 single PCR reactions were required for the amplification of 154 exons. It included 106 exons for RYR1, 44 for CACNA1S and 4 for BCHE gene. After PCR optimization two cycling conditions have been used for the amplification step. A modified protocol for the BigDye terminator sequencing method resulted in long reads.
Discussion: The established protocol allow us to perform exhaustive mutation screening of these genes reducing the tedious work associated with the genetic studies in MH research. We expect to improve accuracy with cumulative analysis. This resequencing array promises a reliable, efficient and high throughput method.

P 9

Anesthetic techniques for labour analgesia and caesarean section

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Introdction: Obstetric anaesthesia includes neuraxial analgesia for labour and delivery and anaesthesia for ceasarean section (C/S). Regional anaesthesia is favoured because general anaesthesia has been identified as a major cause of maternal mortality and morbidity [1]. The aim of this retrospective analysis was to determine the proportion of neuraxial labour analgesia and the techniques used. We also analysed anaesthetic techniques used for caesarean section.
Methods: The anaesthetic database of surgical procedures was searched for obstetrical procedures in the years 2005–2008 and compared with statistics of the Womens University Hospital.
Results: The annual birthrate was 1860–2000. The rate of neuraxial labour analgesia increased from 37% to 47.8%, the C/S rate from 24.5% to 29%. Techniques used are show in the table. General anaesthesia was used in less than 0.5% of C/S and exclusively in emergency situations. Epidural, spinal and combined spinal/ epidural (CSEA) were used C/S in 31, 66 and 2.3%, respectively. In the case of secondary C/S the epidural catheter was used in 92.6% of women receiving neuraxial analgesia, in 6.4% spinal anasthesia was performed.

	Epidural	CSEA	Spinal
2005	678 (95)	26 (3.7)	4 (0.6)
2006	779 (93)	54 (6.4)	6 (0.7)
2007	763 (94)	38 (4.7)	9 (1.1)
2008	800 (88)	96 (10.6)	9 (1.0)

Discussion: The rate of neuraxial labour pain relief increased over the past 4 years with epidural analgesia still being the number one technique despite a slowly rising rate of CSEA. C/S was almost always performed under regional anaesthesia both in patients with primary and secondary C/S.
Reference: 1. Lewis, G (ed) 2007. The Confidential Enquiry into Maternal and Child Health (CEMACH). www.cemach.org.uk

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P 10

Do arterial pressure-based cardiac output monitors reflect changes in stroke volume during orthotopic liver transplantation?

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Background: Arterial pressure-based measurement of cardiac output (APCO) is becoming increasingly accepted as an alternative to thermodilution (TD) in high-risk surgery. The aim of this study was to test the hypothesis that during Orthotopic Liver Transplantation (OLT), APCO monitors could be used to detect changes in stroke voume (SV) with an acceptable sensitivity and specificity.
Methods: Stroke volume was repeatedly measured in 19 patients undergoing OLT. APCO was measured from a radial artery catheter with the LiDCO Plus™ (SV-Li) and the Vigileo™ (v.1.10; SV-Vi) monitors. Reference stroke volume was measured with bolus thermodilution from a pulmonary artery catheter (SV-TD). Using the ROC analysis, changes in SV measured simultaneously with both APCOs, as well as changes in pulse pressure (PP), were tested for their specificity and sensitivity to detect an increase or decrease in SV-TD. An Area Under the Curve (AUC) was generated separately for each method and for an increase and decrease of SV-TD greater than 15% respectively. Results are expressed as AUC (95% confidence interval). A p <0.05 was considered significant. An AUC of 1.0 reflects 100% sensititivy and specificity.
Results: As a measure to predict an increase of SV-TD by ≥15%, AUC was 0.71 (0.58 to 0.84; p = 0.003) for SV-Li, 0.65 (0.50 to 0.79; p = 0.054) for SV-Vi and 0.65 (0.52 to 0.78; p = 0.032) for PP. For a decrease in SV-TD by ≥15%, AUC was 0.74 (0.59 to 0.89; p = 0.004) for SV-Li, 0.59 (0.40 to 0.77, p = 0.3374) for SV-Vi and 0.61 (0.44 to 0.78; p = 0.19) for PP.
Conclusions: In patients undergoing OLT (and possibly other conditions with an uneven distribution of cardiac output), analysis of the blood pressure waveform does not predict changes in stroke volume with an acceptable sensitivity and specificity. The use of different monitors appeared to yield different results.

P 11

Does low cardiac index predict a negative outcome in patients undergoing cardiac surgery?

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Introduction: Low cardiac output in patients undergoing cardiac surgery is associated with an increase in mortality and morbidity. The purpose of this study was to compare the outcome of patients with low cardiac output before and after cardiopulmonary bypass (CPB).
Methods: Prospective observation of 602 patients undergoing on-pump cardiac surgery for 90 days after the procedure.
Results: A cardiac index (CI) <2 L/min/m² was found in 47% (n = 283) before CPB and in 9.6% (n = 58) of all patients after CPB, respectively. Receiver operating characteristic curves displayed a better specifity (SP) for CI after CPB. Area under the curve (AUC) was 0.61, 95% confidence interval 0.57-0.65, sensitivity (ST) 0.55, SP 0.68 before CPB; AUC was 0.70, 0.66–0.74, ST 0.5, sp 0.84 after CPB, respectively (p <0.05).

Table
Cardiac index (CI) 5 min after cardiopulmonary bypass:

	CI ≥2 L/min/m²	CI <2 L/min/m²	p-value
Mortality	4.2%	20.7%	<0.0001
IABP	2.6%	13.8%	<0.0001
Heart failure	38.1%	84.5%	<0.0001
Renal failure	23.0%	53.5%	<0.0001
Extubation >16 h	30.2%	65.5%	<0.000
ICU stay >48 h	29.6%	51.7%	<0.001
Hospital stay	10 (8–15) days	13 (8–19) days	0.32

Patients with a low CI after CPB were significantly more often women and older (p <0.05). They had a significantly higher preoperative Euroscore, an EF <60% and were more often in a critical preoperative state (p <0.05). They underwent more complex and longer procedures (p <0.05).
Conclusion: Cardiac index <2 L/min/m² after CPB was associated with a significant increase in mortality and morbidity in patients undergoing cardiac surgery. The use of resources in these patients is markedly increased. All efforts should be made to avoid a CI <2 L/min/m² after CPB.

P 12

The implications of low cardiac power on outcome in patients undergoing cardiac surgery

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Introduction: Conventional haemodynamic parameters are of limited value in the diagnosis and treatment of acute heart failure [1]. Cardiac power output (CPO) was the strongest hemodynamic correlate of mortality in patients with cardiogenic shock [2].
Methods: Prospective observation of 602 patients undergoing on-pump cardiac surgery for 90 days after the procedure. CPO (Watt) was calculated as mean arterial pressure x cardiac output / 451 [2].
Results: A CPO <0.45W was found in 13% before CPB (n = 78), and in 5.5% of all patients (n = 33) immediately after CPB, respectively. Receiver operating characteristic curves displayed a better specifity (SP) for CPO after CPB. Area under the curve [AUC] was 0.61 95% confidence interval 0.57–0.65, sensitivity (ST) 0.89, SP 0.32 before CPB and AUC was 0.70, 0.67–0.74; ST 0.64, SP 0.7 after CPB, respectively (p <0.05).
Table
Cardiac power output (CPO) 5 min after cardiopulmonary bypass.

	CPO ≥0.45W	CPO <0.45W	p-value
Mortality	4.6%	22.9%	<0.0001
IABP	3.2%	11.8%	0.009
Heart failure	40.0%	85.3%	<0.001
Extubation >16 h	31.4%	67.6%	<0.001
ICU stay >48 h	30.2%	58.8%	0.005

If CPO could be increased at the end of surgery ≥0.45 W mortality was 15%, if CPO remained <0.45W 57% of these patients died (p = 0.04). Patients with a low CPO after CPB were significantly more often women and older (p <0.05). They had a significantly higher preoperative Euroscore, and an EF <30% (p <0.05). They underwent more complex and longer procedures (p <0.05).
Conclusion: CPO <0.45 W after CPB was associated with a significant increase in mortality and morbidity in patients undergoing cardiac surgery. Further studies are needed to confirm the prognostic value of CPO in patients undergoing cardiac surgery.
References: 1. Cotter, et al. Eur J Heart Fail. 2003;5:43–51; 2. Fincke, et al. Am Coll Cardiol. 2004;44:340–8.

P 13

Hysterical paralysis after infraclavicular catheter placement for hand surgery: a case report and a review of the literature

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Background: Hysterical paralysis is a form of conversion disorder representing a sudden loss of motor and sensory function precipitated by a traumatic event manifesting. Its prevalence varies between 5 and 300/100 000 persons. An early recognition may lead to soon remission.
Case: The medical history of a 17 years old girl reporting complete loss of motor control and incomplete and non reproducible sensory loss of the right arm after insertion of an infraclavicular catheter for hand surgery was followed prospectively along with the related laboratory, electrodiagnostic and imaging studies. The patient had a traumatic experience with a forced regional anesthesia without intraoperative sedation for the former operation a year prior to this event. Inconsistence in physical examination and normal test results lead us to the rare diagnosis. The patient had a spontaneous complete remission in her familiar ambiance after ambulation.
Methods: Literature concerning conversion disorder and anesthesia was worked up. This represents the first case report in literature concerning conversion disorder after peripheral nerve block.
Results: The misdiagnosis rate of conversion disorder is of 25%. The typical patient is young, female, from a low socioeconomic and academic background. Remission rate is 98% within the first year. Pain persistence and a recurrence rate of 25% are described in literature. Multimodal therapeutic approach includes psychotherapy, physical and pain therapy. Subsequently diagnosed organic disorders are found in 4–34% of patients, a thorough follow up is therefore mandatory.
Conclusions: Electrodiagnostic and imaging studies are highly recommended. A primary organic cause is subsequently found in 34% of cases. There is no association with regional anesthesia but there is a high risk to develop chronic pain syndrome.

P 14

Massive hydrothorax: a rare complication of gynaegologic laparoscopic surgery in deep endometriosis

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We report the case of an uncommon complication during laparoscopic surgery for diffused endometriosis. During surgery, a "circular peritoneal defect" creating a communication between the peritoneal and pleural cavities was incidentally discovered on the right diaphragmatic cupola. After several hours of surgery, asymmetry in chest examination, absence of vesicular murmur and chest dullness over the right upper pulmonary field appeared progressively. In addition, 1500 ml of the fluid used for irrigation had not been recovered. A Chest X-ray and a transthoracic ultrasound confirmed a massive right hydrothorax. Before extubation, chest drainage was performed and maintained for 72 hours. The suspected aetiology was a porous diaphragm due to pleuro-peritoneal communication secondary to endometriotic necrosis. Constitution of the hydrothorax was facilitated by the necessary Trendelenburg position and large amount of irrigation. Hydrothorax is a rare complication of laparoscopic surgery. Only five cases of pleural effusion during abdominal laparoscopy have been reported in the literature: 3 after gynaecological surgery, 1 after Nissen fundoplication and 1 after an abdominal diagnostic laparoscopy. The suspected pathophysiological mechanisms are mostly diaphragmatic defects or anatomical hernias allowing fluid irrigation to shift from the peritoneal to the pleural cavity. Anaesthesiologists and surgeons should be aware of this rare complication and examination of the diaphragm should be part of every laparoscopy for endometriosis. In case of ventilatory difficulties, a rapid count of irrigation fluid balance should be performed. Furthermore, given the difficulties to obtain an intra-operative chest X-ray, transthoracic echography should be used to help performing a differential diagnosis.

P 15

Naloxone-responsive acute dystonia and parkinsonism following general anaesthesia

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Various movement disorders such as dystonia may acutely develop during or at emergence of general aneaesthesia in patients with or without pre-existing Parkinson disease. These movements have been reported following the use of a variety of drugs including propofol, sevoflurane, anti-emetics, antipsychotics and opioids. The postulated mechanism involves an imbalance between dopaminergic and cholinergic neurotransmitters in the basal ganglia.
We report an acute, severe and generalized dystonic reaction, in a healthy woman, at the emergence of general anaesthesia for diagnostic hysteroscopy and laparoscopic myomectomy. The following drugs were administered to the patient: 1) pre-operative: misoprostol 200 μg, midazolam 7.5 mg po, and clindamycin 600 mg; 2) induction: propofol 150 mg, lidocaine 50 mg, fentanyl 150 μg and rocuronium 35 mg; 3) maintenance: sevoflurane, fentanyl (total 200 μg), rocuronium (total 20 mg) and ketorolac 30 mg. The surgery was uneventful and lasted 2 h. In the recovery room, the dystonic reaction was worsened after 2 mg morphine administration, midazolam 1 mg and clonidine 105 μg did not provide any benefit, however, naloxone 40 μg relieved immediately and completely the dystonic movements. Three weeks later, a detailed neurological examination and a brain MRI were entirely normal, excluding any structural abnormality of the basal ganglia. Because of the severity of the reaction in a patient with no prior history of Parkinsonism, we explored and demonstrated that she exhibited a possible enhanced susceptibility to opioids, involving a genetically determined abnormal function of glycoproteine-P and catechol-O-methyltransferase.
Anaesthesiologists and neurologists who face patients exhibiting rare, anaesthesia-related movement disorders must be aware of this uncommon aetiology and should consider using opioid antagonists when anticholinergic treatment have failed, especially if no anti-emetic and antipsychotic agents have been used.

P 16

Subcapsular hepatic hematoma in HELLP syndrome: not only a textbook entity!

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Case report: A healthy 27 yo woman G2P0 at 35 WA was admitted to the ER for thoracic and right upper quadrant pain (RUQP) irradiating to the right shoulder. BP was 150/93 mm Hg, liver function tests (LFTs) were elevated and platelet count was 149 000 G/L. HELLP syndrome was diagnosed and the patient was transferred to the OB ward for an urgent CS. Fetal cephalic presentation was confirmed by US and a rapid liver scan did not show any abnormalities. IV magnesium was initiated. CS under spinal anesthesia was uneventful and a healthy 2020 g girl was delivered. PACU course was favorable except for RUQP worsening 24 h post-CS. LFTs further increased and platelet count and Hb decreased. A large subcapsular hepatic hematoma of 10x20 cm and voluminous right pleural effusion were diagnosed by CT-scan. Patient was admitted to ICU for BP control (labetalol infusion) and coagulation support. ICU discharge occurred on D4. The pleural effusion required delayed drainage. Hospital discharge occurred at 4 wks.
Discussion: This case illustrates a well-known but extremely rare complication of pregnancy (1/45 000–225 000) mostly associated with preeclampsia. Spontaneous liver hematoma followed by liver rupture and massive hemorrhage carries high maternal/fetal mortality. Symptoms include RUQP, epigastric or referred shoulder pain, nausea, vomiting, abdominal distension, hypertension or hypovolemic shock. Except for shoulder pain and shock, all other signs are frequently encountered in otherwise uncomplicated preeclampsia. This can partially explain why the diagnosis is often delayed and only discovered during surgery or collapse. Management can be divided in two groups depending on presentation. Conservative management (fluid resuscitation, blood product transfusion) or IR procedures or open surgery (packing, drainage, vascular ligation, hepatic resection) with ultimately liver transplantation.
Learning points are that the hepatic hematoma seemed to have occurred post-CS emphasizing the need to pursue strict postpartum monitoring. In addition, hematoma can resolve by itself with conservative management even when relatively large.

P 17

Remifentanil TCI for peri- and postoperative analgesia in orthopaedic surgery

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Background: Target-controlled infusion (TCI) has substantially contributed to the development of intravenous anesthesia. It allows rapid establishment of stable drug blood concentration, which can be rapidly and effectively adapted to suit variable surgical requirements. The aim of this study was first, to investigate the clinical characteristics of remifentanil and propofol in TCI systems during different orthopedic surgeries and second, to evaluate remifentanil-TCI for management of postoperative analgesia.
Methods: Two hundred consecutive patients scheduled for elective orthopedic surgery were included in this investigation. Propofol TCI and remifentanil TCI were administered during surgery. Postoperative analgesia in spontaneously breathing patients was provided by remifentanil TCI and a switch to a continuous morphine infusion was simultaneously started.
Results: The mean intraoperative remifentanil concentration varied according to age from 1.56 to 4.61 $ng.ml^{-1}$. Among the different types of surgery, scoliosis correction was the one with the highest remifentanil concentration postoperatively, whereas hip surgery required the lowest remifentanil consumption. The most frequent side effect was postoperative nausea and vomiting (39%). The overlapping time of remifentanil TCI and morphine infusion postoperatively ranged from 45 min to 24 h according to the type of surgery. Efficient analgesia was obtained in all patients with median VAS scores lower than 20 during the stay in the PACU. Remifentanil TCI was associated with a high level of patient satisfaction.
Conclusions: We demonstrated that the combination of propofol TCI and remifentanil provides stable anesthesia for various orthopedic surgeries. Postoperative analgesia can be successfully managed with remifentanil TCI. This technique allows quick, safe and effective postoperative pain relief with a good tolerance and a low incidence of side effects.

P 18

Impact of propofol anaesthesia on ECG changes during intravasal application of a test dose bupivacaine with epinephrine – a pilot animal study

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Introduction: Intravasal injection of local anaesthetics with epinephrine results in increase of heart rate and elevation of T-waves in the ECG. These signs play an important role in the detection of inadvertent intravascular administration of local anaesthetics in routine paediatric anaesthesia care. Aim of this study was to elucidate whether propofol affects these ECG alterations.
Materials and methods: 10 neonatal pigs (median weight 5.3 kg, range 4.6–5.4 kg) were radomised into two groups. After inhalation induction and endotracheal intubation anaesthesia was maintained with sevoflurane (group 1) or sevoflurane + propofol 10 mg/kg/h (group 2). Under steady state condition a test dose of 0.2 ml/kg bupivacaine + epinephrine 1:200 000 was injected through a cannulated ear vein in both groups. ECG was continuously printed and thereafter analysed for changes in heart rate and T-elevation.
Results: Data are presented as range (median). End tidal sevoflurane concentration in group 1 was 4.8–6.1 (5.7) vol% and 3.0–4.4 (3.7) vol% in group 2.
Table 1
ECG alterations after injection of 0.2 ml/kg test solution.

	Group 1 (n = 5)	Group 2 (n = 5)
Δ heart rate [bpm]	26–117 (83)	0–108 (99)
Δ heart rate [%]	22–103 (53)	0–127 (117)
T-elevation [yes/no]	4/1	4/1

Conclusion: Based on this preliminary data, propofol does not suppress tachycardia or T-wave-elevation caused by epinephrine added to a bupivacaine test dose in neonatal pigs.

P 19

EKG changes during intravasal application of three different test solutions of bupivacaine and epinephrine

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Introduction: Early detection of inadvertent intravasal injection of local anaesthetics (LA) by ECG is important in anaesthetised patients. Aim of this study was to elucidate whether ECG changes are caused by a test dose LA or by epinephrine.
Materials and methods: 43 neonatal pigs (median weight 5.2 kg, range 4.1–5.9 kg), anesthetised with sevoflurane, endotracheal intubated and artificially ventilated were randomized into 3 groups: (1) bupivacaine 0.125%, (2) bupivacaine 0.125% + epinephrine 1:200 000 and (3) plain epinephrine 1:200 000. 0.2 ml/kg of the test solution were injected through a cannulated ear vein. 10 minutes later 0.4 ml/kg was applied. ECG was continuously printed and thereafter analysed for changes in heart rate and T-elevation. Comparisons between groups were performed using Kruskal Wallis and Fisher's exact test. The level of significance was set at $\alpha < 0.05$.
Results:
Table 1
ECG alterations after 0.2 ml/kg test solution (range and median).

	Group 1 (n = 15)	Group 2 (n = 13)	Group 3 (n = 15)
Δ heart rate [bpm]	–18 – 12 (-8)*	27 – 116 (86)	73 – 127 (86)
T-elevation [yes/no]	1/14*	12/1	14/1

Table 2
ECG alterations after 0.4 ml/kg test solution (range and median).

	Group 1 (n = 15)	Group 2 (n = 13)	Group 3 (n = 15)
Δ heart rate [bpm]	–16 – 0 (–8)*	60 – 132 (91)	83 – 140 (102)
T-elevation [yes/no]	4/11*	13/0	15/0

Conclusion: Tachycardia and T-elevation in the ECG during intravasal application of a bupivacaine test dose is caused by epinephrine. Whether higher doses of bupvacaine alone can cause similar ECG-changes or not, requires further animal studies.

P 20

ECG changes during continuous intravasal application of bupivacaine in neonatal pigs

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Objectives: To evaluate ECG changes with larger doses of intravascular applied bupivacaine at two different injection rates.
Materials and methods: 17 neonatal pigs (median weight 5.2 kg, range 4.6–5.5 kg) were anaesthetised with sevoflurane, endotracheally intubated and artificially ventilated. Under steady state conditions bupivacaine was continuously infused through cannulated external jugular vene at a rate of 4 mg/kg/min (group 1) or 16 mg/kg/min (group 2). ECG was continuously printed and analysed later on for alterations in heart rate, ventricular de- and repolarisation and arrhythmia.
Results: Sinus rhythm persisted in all pigs with a progressive bradycardia in 88%, QRS morphology changed in various forms. T-wave-elevation occurred in 82% at 5 mg/kg bupivacaine infused. Neither a higher degree AV-block, a complete bundle branch block nor premature atrial or ventricular contractions were observed.

Table 1
ECG alterations after intravenous infusion of 2.5 mg/kg bupivacaine.

	Group 1 (n = 6)	Group 2 (n = 9)
Δ heart rate [bpm]	–2 – –26 (–14)	0 – –5 (–1)
T-elevation [yes/no]	2/4	0/9

Table 2
ECG alterations after intravenous infusion of 5 mg/kg bupivacaine.

	Group 1 (n = 8)	Group 2 (n = 9)
Δ heart rate [bpm]	–19 – –42 (–26.5)	0 – –33 (–10)
T-elevation [yes/no]	6/2	8/1

Conclusion: Higher doses of intravenously applied bupivacaine may cause T-elevation. However, it is not a reliable indicator to detect inadvertent intravascular injection.

P 21

Epidural anesthesia with ropivacaine 1% for major foot and ankle surgery

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Background: Major foot / ankle surgery often requires thigh surgical tourniquet and iliac crest or tibia bone graft harvesting. Epidural anesthesia (EDA) has not been considered effective for major foot / ankle surgery because the L5 / S1 roots are difficult to block showing in previous reports EDA failure rates of 20%. The aim of this study was to analyze the effectiveness and safety of ropivacaine 1% for EDA.
Methods: After approval by the Local Ethics Committee and written informed consent, 100 consecutive patients scheduled for elective major foot or ankle surgery requiring thigh tourniquet and iliac crest or tibia bone graft harvesting were divided into 2 groups: EDA with 150 mg ropivacaine 1% for body height >170 cm or 130 mg ropivacaine 1% for body height <170 cm. A EDA control group with bupivacaine 0.5% was stopped because of a high failure rate: no sensory block of the dermatomes L5/S1 after 45 min. Sensory loss of the dermatomes L5/S1 was assessed every 5min. Success was defined as surgery without further analgesia or sedation. EDA was continued with ropivacaine 0.3% for the first 24 postoperative hours. Adverse EDA ropivacaine effects, pain scores (VAS), analgesic consumption, mobilization and patient satisfaction were assessed.
Results: All patients showed a sensory blockade of the dermatomes L5/S1 within 25 minutes after EDA and 95% had a motor block within 25 minutes. There was no need for intraoperative rescue analgesia. All patients received paracetamol 4x 1 g/d and diclofenac 2x 75 mg/d p.o. and were mobilized 4 hours after stopping EDA. There were no significant differences in block onset, duration, pain scores or satisfaction between the groups. Patient satisfaction with anesthesia and pain management was considered high. No adverse effects of EDA were registered in the immediate postoperative and in the control of patients' clinical sheets after their first surgical follow up.
Conclusions: EDA with ropivacaine 1% for foot and ankle surgery requiring thigh tourniquet and iliac crest or tibia bone graft harvesting is a valuable alternative to general and spinal anesthesia offering the advantage of continuous postoperative analgesia.

P 22

Serious complications associated with external intrathecal catheters used in cancer pain patients: a systematic review and meta-analysis

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Background: Potential risks of intrathecal catheters in cancer patients include infection, bleeding, and neurological injury. To our knowledge, no robust risk estimates have been made on this topic to date.
Methods: A systematic review and a pooled analysis of observational studies were performed.
Results: Our analysis identified ten papers, which included a total of 821 patients. Twenty catheter-related infections were identified, of these, ten were superficial and ten deep infections, with rates of 2.4% and 1.8%, respectively. We identified a risk of 0.6 cases for any catheter-related infections, and 0.3 cases for deep and 0.4 cases for superficial infections per 1000 catheter days. The risk for bleeding was found to be 0.9%, and the best estimate for neurological injury was 0.4%. The infection rates are comparable with other intrathecal catheter techniques, such as implantation of subcutaneous ports or pumps.
Conclusions: Serious complications such as infection, bleeding, and neurological damage are rare in both hospitalized and "homebound" patients with intrathecal catheters. Intrathecal administration of medication provides the only successful means to alleviate pain in a minority of cancer patients. This analysis supports the reasoning that the potential benefit of intrathecal catheters in the treatment of severe cancer pain is likely to outweigh the potential for serious complications associated with this technique. As such, an external intrathecal catheter can be considered an effective and low-cost solution for the control of pain in this group of patients. Nonetheless, advanced medical knowledge for physicians and education programs geared towards patients and their relatives are mandatory.

P 23

Subclinical femoral neuropathy after anterior cruciate ligament reconstruction

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Background and aim of the study: Patients with anterior cruciate ligament (ACL) reconstruction and femoral catheter analgesia may develop quadriceps amyotrophy. We aimed to determine whether this amyotrophy might be related to a femoral neuropathy.
Material and method: After Ethical Committee approval and patients' written informed consent, 17 patients ASA I and II scheduled to undergo ACL reconstruction were recruited. An electromyography (EMG) was performed before the operation in order to exclude a femoral neuropathy. A femoral nerve catheter was inserted before the surgery with the aid of a nerve stimulator, and 20 ml of 0.5% ropivacaine was injected. The operation was done under spinal or general anaesthesia. Postoperative analgesia was provided with 0.2% ropivacaine for 72 hours, in association with oxycodone, paracetamol and ibuprofen. A second EMG was performed 4 weeks after the ACL repair. A femoral neuropathy was defined as a reduction of the surface of the motor response of more than 20%, compared to the first EMG. A third EMG was performed at 6 months if a neuropathy was present.
Results: Mean age of this group of patients was 27 years old (range 18–38 y.). Among the 17 patients, 4 developed a transient femoral neuropathy (incidence of 24%) without clinical complain.
Conclusion: In this study, the incidence of subclinical femoral neuropathy after ACL reconstruction is high. This lesion may be caused by the femoral catheter (mechanical damage, toxicity of local anaesthesia) or by the Tourniquet. Further studies are needed to investigate the incidence of subclinical neuropathy, according to the type of analgesia (epidural analgesia, PCA) and surgery.

P 24

Tumescent anesthesia in combination with a femoral nerve block for surgery of varicous veins: 0.1% in comparison with 0.2% prilocaine

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Introduction: For surgery on the greater saphenous vein (GSV) tumescent anesthesia (TA) can be combined with femoral nerve block (FNB) [1]. We report about TA applied by an anesthetist using 0.1 or 0.2% prilocaine in this setting.

Method: Giving informed consent, patients scheduled for primary GSV surgery were included in this prospective, randomized, double blinded trial, and were randomized in groups P0.1 or P0.2. In each patient FNB was performed involving nerve stimulation and injection of 20 ml of prilocaine 0.75%. TA was carried out using prilocaine 0.1% vs. 0.2% in groups P0.1 and P0.2, respectively. Rescue medication was standardized. The amount of administered prilocaine was recorded, and resulting plasma levels were measured at defined time points (10 patients of each group; 3 h to 10 h postoperatively). Side effects were recorded. Patient satisfaction and pain scores were obtained (VAS 0-10). Data were compared by unpaired t-test, Mann-Whitney U-test or Chi-square-test as appropriate ($p < 0.05$).
Results: Ninety patients were included. In one patient (group P0.1) general anesthesia was necessary. There was no difference in demographics, operating time, amount of iv infusion, pain scores, and need for rescue medication. Patient satisfaction was high in both groups (median 10 [3–10] in group P0.1). More prilocaine was administered in group P0.2 ($p < 0.0001$). Resulting were higher plasma levels ($p < 0.05$ at all time points), which however remained far below toxic levels in all patients [2]. In 3 patients in group P0.2 clinical suspicion prompted confirmation of mild methemoglobinemia.
Discussion and conclusion: TA in combination with a FNB provides high patient satisfaction during GSV surgery. Prilocaine 0.1% for TA is sufficient, leaving a higher margin of safety than using prilocaine 0.2%.
1 Bush RG, et al Tumescent Anesthetic Technique for Long Saphenous Stripping. J Am Coll Surg. 1999;189:626–8.
2 Sagoo KS, et al. Pharmakokinetische Untersuchungen bei der Tumeszenz-Lokalanästhesie mit Prilocain in der Varizenchirurgie. Phlebologie. 2000;29:154–62.

P 25

Ultrasound guided spermatic cord block for scrotal surgery: A feasibility-pilot-study

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Background and aims: Regional anaesthesia for scrotal surgery has the potential to reduce costs and to avoid the risks of neuraxial and general anaesthesia. Furthermore a deep profound long lasting postoperative analgesia is a major advantage. Blindly performed spermatic cord blockade is known to be difficult, painful and has potential risk (intravasal injection of local anaesthesia, perforation of vessels and of the ductus deferens). The use of ultrasound may reduce these disadvantages. The aim of this study was to test the feasibility of ultrasound guided spermatic cord blockade.
Methods: After antiseptic cleaning of the external genitalia, the spermatic cord is grasped gently between the left thumb and index finger. Using a 2 cm linear paedriatic ultrasound probe, the spermatic cord is identified by searching the testicular artery and the ductus deferens. A 22 G Microlance® needle is advanced avoiding vessel perforation and the local anaesthesia (10 ml) is slowly injected around the ductus deferens. Primary outcome: success rate of the blockade defined as surgery without any substitution (additional analgesics, conversion to general anaesthesia).
Results: Preliminary data (11 patients; 20 blocks) showed a long lasting (12 hours) and effective blockade using our ultrasound guided new approach. Intra- and postoperative pain was minimal in all patients.

P 26

The expressions of GABA and glutamate transporters are altered in the spared nerve injury model of neuropathic pain in the rat

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Neuropathic pain is a common form of chronic pain, and is unsuccessfully alleviated by usual medications. Mounting evidence strongly point at non-neuronal glial cells in the spinal cord as key actors behind the persistence of pain. In particular, a change in the astrocytic capacity to regulate extracellular concentrations of neurotransmitters might account for the strengthened spinal nociceptive neurotransmission. Therefore, we investigated whether spinal expressions of GABA (GAT) and glutamate (EAAT) transporters were affected in the spared nerve injury (SNI) rat model of neuropathic pain. SNI was induced in male Sprague-Dawley rats by a unilateral section of tibial and common peroneal branches of the sciatic nerve, leaving the sural branch untouched. Western-blot analysis was performed to study the expression of GAT-1 and GAT-3 as well as EAAT-1 and EAAT-2, the main astrocytic GABA and glutamate transporters respectively. Seven days post-surgery, a significant increase in GAT-1, GAT-3 and EAAT-1 expressions is detected in both ipsilateral and contralateral sides of lumbar spinal cord in comparison to sham animals. No change in EAAT-2 signal could be detected. Furthermore, the astrocytic reaction parallels the glutamate and GABA transporters changes as we found an increased GFAP expression compared to the sham condition, in both spinal sides. Together, our results indicate that modifications in GABA and glutamate transport may occur along with SNI-associated painful neuropathy and identify spinal neurotransmitter reuptake machinery as a putative pharmacological target in neuropathic pain.

P 27

Radiofrequency denervation for lumbar zygapophysial joint pain: An analysis of the factors determining the success rate

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Background and aims: Radiofrequency denervation of the lumbar zygapophysial joints has been proven highly effective in well selected patients. The aim of the present study was to evaluate its long term success rate and the influence of different factors on the outcome. In this abstract, the results of the influence of depression and working ability are presented.
Methods: Success was defined as at least 50% reduction of pain as assessed by the visual analogue scale (VAS). Depression was defined as a score >16 with Beck Depression Inventory (BDI).
Results: Complete follow-up was available for 50 of 55 radiofrequency denervations from 01/2006 to 06/2008. The overall initial success rate after denervation was 76%. It decreased to 34% at 6 months and to 18% at 1 year. In the 11 patients with and 39 patients without depression before treatment, the initial success rate of 55% and 82% decreased to 18% and 38% at 6 months, and 0% and 23% at 1 year, respectively. In the 9 patients who were unable to work before the therapy and in the 14 who worked full time the initial success rate of 89% and 79% decreased to 11% and 50% at 6 months, and 0% and 21% at 1 year, respectively.
Conclusions: Depression and work inability seem to be related with the long term outcome of the treatment. Based on these findings a comprehensive study is warranted to evaluate if psychosocial factors should be considered in the decision of performing a radiofrequency denervation.

P 28

Assessment of local mechanical pain sensitivity is not diagnostic for cervical zygapophysial joint pain

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Background and aims: The zygapophysial joints are well documented sources of chronic neck pain and headache. Unfortunately, simple non-invasive diagnostic methods for this condition lack scientific validation and the only validated tool to diagnose zygapophysial joint mediated pain are the invasive zygapophysial joint nerve blocks. We hypothetized that symptomatic joints display lowered pressure pain thresholds, which would allow the development of a non-invasive quantitative diagnostic tool.
Methods: Patients with unilateral chronic neck pain meeting the clinical criteria for diagnostic zygapophysial joint nerve blocks were included. The exact location of each zygapophysial joint (C2-3 until C6-7) of the painful and non-painful side were located by ultrasound. Pressure pain thresholds (PPT) were measured directly over each of the joints using an electronic pressure algometer. Afterwards conventional zygapophysial joint nerve blocks were performed as diagnostic “Gold Standard”.
Results: 33 patients underwent zygapophysial joint nerve blocks. Zygapophysial joint pain was present in 14 patients, of whom 13 were positive for one joint, one patient was positive for two joints. There was no statistically significant difference in PPT between the affected and the contralateral joint. There was no statistically significant difference in PPT between the affected joint and non-affected joints on the same side. No statistically significant difference in PPT at the painful side was found between the patients with and without zygapophysial joint pain.
Conclusions: The assessment of mechanical pain thresholds does not reliably help to distinguish zygapophysial joint mediated pain from other sources of pain in patients suffering from chronic, unilateral neck pain.

P 29

Feasibility and reliability of a variable ventilation mode run by a remotely controlled ventilator

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Background: Biologically variable ventilation results in better oxygenation in compromised lungs of animals and humans (Mutch BJA 2000, Boker AJRCCM 2002). Lots of biological variables show a fractal pattern, and obviously life support systems benefit from noise (Navalesi Curr Opin CC 2003, Suki Nature 1998). Varying tidal volumes could have a positive effect on lung tissue. The aim of this work was to evaluate a ventilator mode that allows application of randomly assigned tidal volumes, within well defined limits.
Materials and methods: 10 pigs with a weight of 29 ± 1.6 kg were ventilated with a variable ventilation mode run by a remotely controlled ventilator. A DIVAN ventilator (Dräger Medical, Lübeck, Germany) was controlled by a target-host system (XPC, MATLAB/Simulink, Mathworks Inc., Natick, MA, USA), to provide randomly varying tidal volumes from 5 to 11 ml/kg with a defined distribution. Spirometry and hemodynamics were recorded with a Datex Ohmeda S5 Monitor.
Results: All animals were successfully ventilated for 6 hours with this variable ventilation mode. Hemodynamics were not affected by the varying tidal volumes delivered and oxygenation was constant during the entire period. Median tidal volume delivered was 8.2 ml/kg. Linear regression of tidal volumes and end-tidal CO_2 confirmed adequate tidal volumes for CO_2 excretion.

Gasexchange and hemodynamic parameters as mean ± SD

Parameter	Baseline	3 hours	6 hours
PaO_2 [mm Hg]	241 ± 14	234 ± 11	226 ± 27
$PaCO_2$ [mm Hg]	44 ± 2	45 ± 5	44 ± 3
MAP [mm Hg]	77 ±16	76 ± 19	76 ± 8.4
MPAP [mm Hg]	14 ± 2.8	15 ± 2.6	16 ± 3.6
CO [l/min]	5.2 ± 1.2	4.8 ± 1.3	5.6 ± 1.7

Conclusion: This variable ventilation mode in an animal experiment resulted in normal hemodynamic values and adequate gas exchange for 6 hours. This setting may be used in further investigations of controlled ventilation with variable tidal volumes.

P 30

Implementation of noninvasive positive-pressure ventilation in a regional hospital: increase in safety and efficiency through the integration of a doctor/physiotherapist/ nurse team into treatment algorithm.

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Introduction: The Riaz Hospital, which is part of the Fribourg Hospital Network, is an acute care hospital serving a population of 75 000 residents and providing 91 beds, 6 of which are dedicated to multidisciplinary continuous adult care. Hospital wards are regularly confronted with patients requiring noninvasive positive-pressure ventilation *(NIV)*. However, neither device nor algorithm existed for this procedure. The project aim was the implementation of *NIV* therapy using a ventilator and an algorithm integrating the doctor/physiotherapist/nurse team *(DPN)*.
Methods: A working group composed of an anaesthesiologist/ intensivist, a physiotherapist and a continuous care nurse was formed. *NIV* implementation was performed with *1)* respiratory physiology and pathophysiology education, *2)* workshops and *3)* supervised application in emergency room and continuous care unit using a treatment algorithm [1, 2] integrating the *DPN* team. Specific forms were used for the prescription of the *NIV* and for the assessment of its safety and efficiency. *NIV* was performed with a bilevel positive-airways-pressure ventilator.
Results: The *NIV* safety and efficiency was increased with the integration of the *DPN* team into the treatment algorithm. Moreover, this technique has reduced the number of intubation and the patient transfers to the reference hospitals (data not available).
Conclusions: A standardized algorithm integrating the *DPN* team facilitates the implementation of *NIV* using ventilator and increases its safety and efficiency in a regional hospital. Moreover, this technique can lower the health care costs by limiting the secondary transfers. A prospective study addressing these questions should be conducted.
1 O. Penuelas M.D. and Al., Noninvasive positive-pressure ventilation in acute respiratory failure, Review, *CMJA* 2007.
2 Evans T.W. M.D., International Consensus Conference in Intensive Care Medicine. Noninvasive positive-pressure ventilation in acute respiratory failure. Int Care Med. 2001.

P 31

Tracheal fluid leakage in benchtop trials: Comparison of static versus dynamic ventilation model with and without lubrication

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Background: Longitudinal folds in tracheal tube cuffs cause leakage of pooled secretions past the tube cuff (1) and the commonest *in vitro* method to test the efficacy of a new tube is a benchtop model using an artificial rigid trachea. This study compared the potential of static and dynamic ventilation benchtop model and cuff lubrication, in testing the tracheal sealing characteristics of a given tracheal tube cuff.
Methods: Static trial: Six different brands of 7.5 mm internal diameter (ID) cuffed tracheal tubes (TT) (n = 8) with high-volume low pressure cuffs (Tapered Seal Guard, Standard Seal Guard, HiLo (all Covidien), Microcuff, Rueschelit and Portex Profile Soft Seal TT) were inflated in an artificial trachea (18 mm ID) without and with lubrication.
Dynamic trial: The same tube cuffs without lubrication, were subjected to positive pressure ventilation (PPV) + positive end-expiratory pressure (PEEP) of 5 cm H_2O, to PPV alone (without PEEP) and to PEEP alone (without PPV). Ventilation settings included fresh gas flow (air) 61 min^{-1}; respiratory rate 12 min^{-1}; peak inspiratory pressure 20 cm H_2O. Clear water (5 ml) was placed above the tube cuff and fluid leakage (ml) was measured at various time intervals and at 60 min.
Results: Gel lubrication, PPV + PEEP and PEEP alone completely prevented fluid leakage across the tube cuffs in all 6 TT brands tested within 60 min when compared to the static model without ventilation and lubrication (0% leak versus 100% leak) ($p < 0.01$). Fluid leakage in the static unlubricated model and in the dynamic model with PPV but without PEEP was 1.38–4.76 ml and 0.23–4.47 ml respectively.
Conclusion: Gel lubrication, PEEP alone and PPV + PEEP in the lung model has a much stronger protective effect than PPV alone on fluid leakage. Studies testing fluid sealing efficiency of tube cuffs might be more conclusive in a static benchtop model without lubrication rather than in a dynamic model.
Reference: 1) Young PJ, Rollinson M, Downward G, Henderson S. Leakage of fluid past the tracheal tube cuff in a benchtop model. Br J Anaesth.

P 32

Tapered tracheal tube cuffs are superior to cylindrical tracheal tube cuffs in preventing fluid leakage in different sized tracheas

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Background: Tapered shape tube cuff offers a sealing zone with reduced folds and channels along a wide range of tracheal diameters. The aim of this study was to compare fluid leakage in the new 'tapered' shaped against the classic 'cylindrical' shaped tracheal tube cuffs when placed in different sized tracheas.
Methods: 7.5 mm internal diameter (ID) tracheal tube cuffs – Tapered Seal Guard (TSG), Standard Seal Guard (SSG), Hi-Lo tracheal tube (all Covidien), Microcuff (KCC), Ruesch Super Safety (Ruesch), Portex Profile Soft Seal (Portex) were compared in an *in vitro* set up. Vertical artificial tracheas with 16, 20 and 22 mm ID were intubated and the unlubricated tube cuffs were inflated to a constant cuff pressure. Clear water (5 ml) was applied above the tube cuff and fluid leakage was measured at 5 min and at 60 min. Experiments were repeated two times with eight new tubes in each tube brand. Data of tapered versus non-tapered tube cuffs were compared for each tracheal diameter using Mann-Whitney U test (Bonferroni's correction $\alpha < 0.05$).
Results: Fluid leakage (ml) at 60 min in mean (SD) was 2.45 (1.38), 1.54 (1.53) and 0.28 (0.37) respectively for 16, 20 and 22 mm trachea in the TSG tube as compared to 4.15 (1.23) ($p < 0.05$), 2.44 (1.54) and 0.64 (1.27) in the SSG tube and 3.87 (1.07), 1.15 (1.33) and 4.81 (0.16) ($p < 0.01$) in the Microcuff tube. Leakage in all polyvinylchloride (PVC) tube cuffs was almost complete (5 ml) within 5 min ($p < 0.01$).
Conclusion: The new TSG tube with a tapered shaped cuff efficiently reduced fluid leakage in a wide range of tracheal diameters when compared to the tube cuffs with standard cylindrical shape. PVC tube cuffs leaked much more and faster than polyurethane cuffs.

P 33

Effect of closed tracheal suction system on fluid leakage past the tracheal tube cuff

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Background: Closed tracheal suction system is believed to prevent lung collapse and desaturation in intensive care setups. There is substantial evidence now that sub -atmospheric pressures are created in the airway during closed tracheal suctioning [1]. This study investigated the effect of closed tracheal suctioning on leakage of fluid collected above the tracheal tube cuff in an *in vitro* benchtop lung model.

Methods: High volume – low pressure cuffs of HiLo tracheal tube (n = 16) were placed in an artificial trachea connected to a test lung and subjected to pressure controlled ventilation (PCV). Peak inspiratory pressures (PIP) of 15, 20 and 25 cm H_2O and positive end expiratory pressures (PEEP) of 5 and 10 cm H_2O were tested. A closed tracheal suction catheter 14 Fr was attached to the tracheal tube and suction was performed for 5, 10, 15 and 20 seconds under 200 and 300 cm H_2O negative suction pressures. Airway pressure was recorded using a blood pressure transducer and measured fluid leakage (ml) during different ventilator settings and suction conditions was compared using Mann Whitney U test.
Results: Airway pressure dropped considerably during closed tracheal suctioning. All tracheal tube cuffs that never leaked under PCV + PEEP consistently demonstrated fluid leakage past the cuff during closed suctioning (0%leak versus 100%leak). During 10, 15 and 20 sec suctioning, airway pressure consistently became as low as –8 to –13 cm H_2O Higher (–300 cm H_2O) suction pressure resulted into much more fluid leakage than lower (–200 cm H_2O) pressure at PIP of 15 cm H_2O (p <0.05) but not during higher PIP. Fluid leakage at the end of 20 sec suction time was much more than that observed at 5 sec suction time (p <0.05).
Conclusion: Substantial negative pressure is created in the airway during closed tracheal suctioning procedure during mechanical ventilation. The positive effects of PCV + PEEP in preventing fluid leakage past the tracheal tube cuff are abrogated with closed tracheal suctioning. Negative intratracheal pressures, associated with closed tracheal suctioning considerable increase fluid leakage past tracheal tube cuff.
Reference: 1) Stenqvist O, et al. Acta Anaesthesiol Scand. 2001;45(2):167–72.

P 34

Two years of prehospital experience with an adult intra-osseous device (BIG®)

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Introduction: The 2005 AHA guidelines mention the intra-osseous (IO) vascular acces as the primary alternative venous access in cardiac arrests (Class IIa).
Method: We analyzed retrospectively the data from the missions where the adult IO device (BIG®) was used, with or without success, from the 01. 01. 2007 to the 01. 05. 2009.
Results: 37 patients on whom the BIG® was used were reported. The mean age was 62.06 years (range 15–87, SD 18.90 years). 76% were male (sex ratio M/F = 3.11/1). 9/37 (24%) were trauma related. In 33 patients (89%) the insertion resulted in good flow on the first attempt.

Type of injury (N = 37)		NACA index (N = 37)	
Medical cardiac arrest	73% (N = 27)		
Traumatic cardiac arrest	16% (N = 6)	5	3% (N = 1)
Avalanche victim	8% (N = 3)	6	30% (N = 11)
Polytraumatism	3% (N = 1)	7	67% (N = 25)

Conclusion: The avantages of the adult BIG® include ease of use and short insertion time, even in hard conditions. Its use as a backup method for IV access in life-threatening situations when other methods of IV access fail is well known. In several situations, the use of the IO route in first intention (i.e without preceding failure of obtaining a peripheric veinous catheter) is also possible. Two years after the introduction of the adult BIG® in our EMS system, we decided to use this device in first intention for obtaining rapid IV access in avalanche victims. Inherent difficulty of adequate IV access because of the associated hypothermia, easy access to the patient himself in often reduced available space on site, and the rapidity needed in case of residual avalanche danger were major concerns.

P 35

Transfusion practice in early trauma management

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Introduction: Blood transfusions carry risks and complications. At the University Hospital of Lausanne the need for transfusion in early trauma resuscitation is based on clinical judgment and standard laboratory tests. We aimed to assess the transfusion practice for trauma patients during their early management.
Method: Based on 2008 data from the Lausanne Trauma Registry of Acute Care (TRAC), we analyzed all adult trauma patients admitted to the shock room who received blood products or pro-coagulants in shock room and/or during their emergency operation. Demographics, physiological parameters and lab tests were recorded at arrival and at the end of anesthesiologic management. Coagulopathy was defined as PT <70%, PTT >60 sec, Fibrinogen <1 g/l or Thrombocytes <100 x 10^9 g/l.
Results: In 2008, 323 trauma-patients were included in TRAC. 55 patients (17%) received blood products or pro-coagulants. 44 (83%) had an ISS >15 (med 29, IQR 10-35.5). 43 (78.2%) needed an emergency intervention. Coagulopathy was present in 25 patients (45.5%) at arrival vs. 30 (54.5%) after resuscitation (p = 0.446).

Product	n	%	Median amount	IQR
RBC	49	89.1	3	2.0–6.0
FFP (IU)	34	61.8	4	2.0–6.0
Thrombocytes (IU)	5	9.1	5	5.0–5.0
Fibrinogen g	7	12.7	1.0	1.0–1.0
Prothromplex IU	9	16.4	1200	900–1200
Protamine mg	1	1.8	50	NA
Novo-Seven	2*	3.6*	NA	NA

	Arrival %	End %	P
PT <70%	48.9	52.4	0.91
PTT >60 sec	10.9	23.0	0.26
Tc <100 x10^9g/l	18.8	52.4	<0.01
Fibrinogen <1 g/l	19.5	18.0	0.89
Hemoglobin >90 g/l	74.5	79.1	0.78

*included and double-blinded in "CONTROL"-study

Conclusion: Clinical judgment and standard laboratory tests failed to improve trauma related coagulopathy. After initial resuscitation a significant number of patients presented with an insufficient level of platelets. Post-resuscitation hemoglobin-values were high.

P 36

Interhospital aeromedical transfers: need for a specific training

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Introduction: The interhospital aeromedical transfers concern mainly unstable patients presenting with multiple organ failure and among whom the intensity, as well as the difficulty of care are often underestimated.
Material and method: Retrospective analysis of 2094 interhospital transfers made by the Rega helicopter of Lausanne between 2003 and 2008, with description of the pathologies, the demographic characteristics, as well as the medical and technical difficulties.
Results: Male patient are overrepresented (65 vs 35%), their age being 40–80 years old. On the other hand, we note an important number (10%) of patients less than 10 years. The average time of flight is 13 minutes, with a high rate of night transfers (34%). In 73% of the cases, the transfers concern medical, especially cardiovascular and neurological situations. Trauma and surgical situations account for less than 20%. The transferred patients often require mechanical ventilation (27%), as well as invasive measure of blood pressure (11%), particularly in cases of neurological, pulmonary or cardiac diseases. In 6% of the cases, we note a haemodynamic instability, requiring the use of catecholamines. In 1% a cardiopulmonary resuscitation was initiated during the flight. The overall mortality at 48 hours is about 5%.
Conclusions: In spite of relatively brief flights, the complexity and the variety of the pathologies require a specific training for the medical teams involved in the transfers, concerning the aspects of resuscitation, mechanical ventilation, and the knowledge of advanced life support in paediatrics, traumatology and cardiopulmonary intensive care.

P 37

Intraosseous infusion in children with failed venous access after inhalational induction of anaesthesia

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Background: Although commonly used in the 1940s, intraosseous infusion is usually reserved for the care of the critically ill or injured child when venous access fails. We report the beneficial use of intraosseous infusion in children with difficult or failed venous access after inhalation induction anaesthesia for elective procedures.
Case reports: Intraosseous infusion was successfully performed in eleven children aged 0.1–1.4 yrs (median 0.8 yrs). Most children

suffered chronic cardiac, metabolic or dysmorphic abnormalities. Time interval from induction of anaesthesia until decision for intraosseous access showed a median of 27 min (17–65 min).

Sex	Age (yrs)	Weight (kg)	ASA class	Site of puncture	Type of needle	Site of removal	Compli-cations
m	0.6	5.4	3	Right prox. tibia	EZIO - 15G	OR	No
m	1.3	9.5	4	Right prox. tibia	EZIO - 15G	Ward	No
m	1.4	7.6	3	Right prox. tibia	EZIO - 15G	Ward	No
w	0.3	5.9	3	Right prox. tibia	Cook 18 G	OR	No
m	0.2	3.5	4	Right prox. tibia	EZIO - 15G	Ward	No
w	0.8	7.0	3	Right prox. tibia	EZIO - 15G	Ward	No
m	1.1	9.0	3	Right prox. tibia	EZIO - 15G	Ward	No
m	0.1	4.4	2	Right prox. tibia	Cook 18 G	Ward	No
m	0.8	8.1	1	Left prox. tibia	Cook 16 G	Recovery	Dislocation
m	0.8	8.0	1	Left prox. tibia	Cook 16 G	Recovery	No
m	0.6	7.0	3	Left prox. tibia	Cook 18 G	OR	No

Conclusion: Intraosseous access is a safe, quick and reliable alternative for elective patients with difficult venous access and therefore needs to be re-visited. The morbidity of intraosseous access is likely to be less when compared with central venous cannulation. It may also be cost beneficial when operating theatre time is considered.

P 38

Intraosseous infusion in paediatric prehospital emergency care – a 10 year analysis

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Background: To review indications and outcome of intraosseous infusion in critically ill or injured paediatric patients in our paediatric ambulance and helicopter service.
Methods: Prehospital emergency care charts between 1999–2009 were retrospectively analysed with regard to the incidence of intraosseous cannulation, its indications, site of insertion, its performance, type of needle, medication and patient's outcome.
Results: In 46 out of 1105 emergency patients (4%), aged from 1 month to 14.5 years (median 21 month) an intraosseous needle was placed for emergency treatment. Main indication was cardiopulmonary resuscitation (CRP) in 54% (e.g: SIDS 15%, trauma 13%, respiratory insufficiency 13%), acute shock in 24% (hypovolemic 7%, septic 11%, anaphylactic 2%), pain management in 4% (burns), respiratory insufficiency in 7% and persistent seizures in 9%. CPR succeeded on scene in 20%, 72% stayed in cardiopulmonary arrest, 8% were admitted to hospital under CPR. Treatment of shock stabilized 5 of 11 patients prehospitally. The pain-, respiratory- and seizure patients were all reported as admitted to hospital in improved conditions. According to the indications, medication via intraosseous access contained catecholamines, electrolytes, volume expanders, sedatives, opioids, muscle relaxants and antibiotics. First choice site of cannulation was the proximal tibia bone in 27 cases. The humerus bone was punctured once in a severely injured child. In 18 patients data about insertion site are missing. No complications with cannulation of the bone and infusion were reported in 89%. Only needle dislocation is documented in 4 patients. Data shows no rise in incidence of indication since the automated EZ-IO intraosseous system was established in 2007.
Conclusion: The presented data shows that intraossoues infusion technique was well indicated based on current international guidelines for paediatric emergency care [1]. The intraosseous infusion technique provided simple, safe and rapid vascular access in patients with difficult or failed venous cannulation and allowed the early application of urgently required medications and fluids in order to improve patient's conditions already on scene.
Reference: 1) American Heart Association, Circulation. 2005;112: 167–87.

P 39

Use of intraosseous infusion in paediatric anaesthesia – A questionnaire analysis

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Background: Intraosseous infusion has become a well established technique in the emergency management of critically ill and injured paediatric patients with difficult or impossible venous access. The aim of this study was to evaluate the up-to-date standing of intraosseous infusion in German speaking anaesthesia departments with respect to its use in paediatric patients.
Methods: Anaesthesia services in Austria, Germany and Switzerland were asked to complete an online questionnaire, including issues like their individual experience concerning incidence, indications and complications with intraosseous infusion for paediatric anaesthesia as well as the availability of the equipment, its teaching practice or the existence of guidelines.
Results: So far, 45 completed forms were electronically returned and analysed. Department size ranges between less than 500 to more than 7000 patients, with 48% anaesthetizing between 1000 and 5000 paediatric patients a year (n = 22). Most of these departments store COOK®-needles (80%), followed by the EZ-IO®-(46%), the BIG®-(15%) or the FAST®-(7%) system, alone or in combination. Usually, these devices are available in the emergency room (71%) or at a central location in the OR (51%). Only 12 anaesthesia departments (27%) have each working place regularly equipped with an intraosseous device. Cardiopulmonary resuscitation (93%), hypovolemic shock (96%) and layryngospasm (80%) were the most consistent indications. Departments caring for ≥3000 paediatric patients however, tend to propose a more liberal indication in anaesthesia routine, such as patients with Ileus (37%) or even otherwise healthy elective patients with prolonged and difficult venous access (13%). Within the previous 12 months in 29 of 45 departments at least one intraosseous needle (mean 1.4) was placed, in 79% without any problems. Needle dislocation was the most frequently complication (n = 9).
Conclusion: Based on this preliminary data, intraosseous infusion seems to become also an established alternative to facilitate paediatric anaesthesiologic care in patients with difficult venous access, especially in critical situations.

P 40

Management of major accidents with on-site 144 dispatcher

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Introduction: An excellent coordination between firefighters, policemen and medical rescue is the key to success in the management of major accidents. In order to improve and assist the medical teams engaged on site, the Swiss "medical command and control system" for rescue operations is based on a binomial set up involving one head emergency doctor and one head rescue paramedic, both trained in disaster medicine. We have recently experimented an innovative on-site "medical command and control system", based on the binomial team, supported by a dedicated 144 dispatcher.
Methods: A major road traffic accident took place on the highway between Lausanne and Vevey on April 9th 2008. We have retrospectively collected all data concerning the victims as well as the logistics and dedicated structures, reported by the 144, the Hospitals, the Authority of the State and the Police and Fire Departments.
Results: The 72-car pileup caused one death and 26 slightly injured patients. The management on the accident site was organized around a tripartite system, gathering together the medical command and control team with the police and fire departments. On the medical side, 16 ambulances, 2 medical response teams (SMUR), the Rega crew and the medical command and control team were dispatched by the 144. On that occasion an advanced medical command car equipped with communication devices and staffed with a 144 dispatcher was also engaged, allowing efficient medical regulation directly from the site.
Discussion: The specific skills of one doctor and one paramedic both trained for disaster's management proved to be perfectly complementary. The presence of a dispatcher on site with a medical command car also proved to be useful, improving orders transmission from the medical command team to all other on- and off-site partners. It relieved the need of repeated back-and-forth communication with the 144, allowing both paramedic and doctor to focus on strategy and tactics rather than communication and logistics.

P 41

Paramedic based transmission of 12 lead-ECG in patients with an Acute coronary syndromes reduces the "call-to-balloon-time"

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Background: The aim of this prospective study was to test if prehospital telemetric transmission of a 12-lead ECG performed by paramedics for patients with suspected acute coronary syndrome (ACS) is feasible and reliable. We tried to investigate if bypassing the emergency department (ED) reduces the "call-to-balloon-time".
Methods: A 12-lead ECG transmission system linked to an ECG server developed at the Swiss federal institute of technology (ETH) was introduced in the local Emergency Medical System (EMS). This

allowed to link the existing algorithm for the management of patients with symptoms of an ACS with concomitant ECG transmission to the cath lab decision maker. All relevant time points from alarm phone call, start of the coronary angiography or angioplasty (PTCA) and the patient admission pathway were assessed.
Results: EMS personnel performed an ECG in 210 patients suspected to have an ACS; 16 patients were excluded. From the remaining 184 patients 66 (34.8%) underwent a coronary angiography during their hospitalisation; 21 (11.4%) were transported directly to the cath lab; 25 (13.6%) had a coronary angiography within 4 hours after the initial alarm phone call. Among these 25 patients, 9 who had a ST-Elevating Myocardial Infarction (STEMI) or a high possibility for it in their prehospital ECG were not primarily directed to the cath lab. Comparison of patients who were sent directly to the cath lab with the group of 9 STEMI patients transported to the ED first showed a significant decrease of the call-to-balloon-time (89.1 ± 14.0 min vs. 144.4 ± 30.9 min; p <0.005) and door-to-balloon-time (48.4 ± 13.0 min vs. 100.7 ± 25.0 min; p <0.005).
Conclusion: A 12-lead prehospital ECG is a feasible intervention for paramedics; technical failure should be reduced. Comparison of time demonstrates a benefit of 55.3 min for the call-to-balloon-time or 52.3 min for door-to-balloon-time. Earlier arrival in the cath lab will probably save heart muscle ("Time is muscle"). A higher number of patients will be needed to test if patient outcomes can be improved.

P 42

Effect of hypoxia on the inflammation in alveolar epithelial and pulmonary endothelial cells

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Introduction: The effect of dexamethasone on rat alveolar epithelial cells (AEC) and rat pulmonary artery endothelial cells (RPAEC) under hypoxic conditions was assessed, simulating conditions of alveolar hypoxia. Inflammatory mediators and ion channels were quantified. Based on previous data we hypothesized that hypoxia might trigger an inflammatory response [1].
Methods: AEC and RPAEC, preincubated for 1 hour with or without dexamethasone (10^{-7} mol/l) under normoxic conditions were subsequently exposed to hypoxic conditions (5% O_2) for 24 hours. Protein levels of cytokine-induced neutrophil chemoattractant-1 (CINC-1), monocyte chemotactic protein-1 (MCP-1), interleukin-6 (IL-6) and intercellular adhesion molecule-1 (ICAM-1) were analyzed.
Results: In AEC, ICAM-1 protein expression was not affected by hypoxia or dexamethasone. Upon hypoxia, a decrease of IL-6, CINC-1 and MCP-1 protein level was observed compared to control. Dexamethasone lead to a further significant decrease compared to the hypoxia group. In RPAEC, ICAM-1 and IL-6 protein levels remained unchanged upon exposure to hypoxia and hypoxia/dexamethasone. CINC-1 expression was attenuated by hypoxia. This was even more pronounced in the presence of dexamethasone. MCP-1 expression was not affected by hypoxia, but significantly decreased by dexamethasone and hypoxia. Cytotoxic effect of hypoxia or dexamethasone could be excluded.
Conclusions: These data suggest that exposure of AEC and RPAEC to mild hypoxia for 24 hours does not as expected upregulate, but attenuate expression of inflammatory mediators. The effect of dexamethasone on hypoxic cells was for some mediators even more pronounced than with hypoxia alone.
References: 1) Beck-Schimmer B, et al. Am J Respir Cell Mol Biol. 25:780–7.

P 43

Interactions of metal oxide nanoparticles with healthy and endotoxin-injured alveolar epithelial cells

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Introduction: We investigated the interaction of pulmonary alveolar epithelial cells (AEC) with metal oxide nanoparticles (titanium dioxide, cerium dioxide), representing an industrially most relevant class of nanomaterials with an annual production rate in the mega-tonnes quantities. The inflammatory response was evaluated for healthy and lipopolysaccharide (LPS)-injured AEC, both exposed to these nanomaterials over different periods of time, assessing the expression of cytokine-induced neutrophil chemoattractant-1 (CINC-1). CINC-1 is a strong neutrophil chemoattractant, playing a crucial role in the inflammatory orchestration upon injury.
Methods: AEC were exposed to phosphate-buffered saline (PBS, control) or LPS (20 mg/ml) and incubated with titanium dioxide or cerium dioxide nanoparticles at concentrations of 5 ppm, 10 ppm and 20 ppm, dispersed in cell culture medium for 4 h, 8 h and 24 h. Expression of (CINC-1) protein was analyzed by ELISA.
Results: CINC-1 expression did not differ in the control PBS groups of AEC with or without exposure to nanoparticles. In contrast, a significant increase of CINC-1 levels upon incubation with LPS and titanium dioxide (5 ppm, 10 ppm, 20 ppm) compared to levels in the LPS group was measured (all p values <0.05). This enhanced expression of CINC-1 upon LPS stimulation and exposure to nanoparticles could not be shown for cerium dioxide nanoparticles (same time course, same concentrations).
Conclusions: Non-injured AEC do not show an inflammatory reaction upon exposure to nanomaterials. In injured cells, the additional inflammatory response depends on the surface properties of the nanomaterials. Investigations on the interactions of LPS with the different nanomaterials might offer further insights into the mechanism of additional damage on injured cells through nanomaterials.

P 44

The effect of sepsis on renal acid base transport

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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. 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) 5 mg/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. At all time points, LPS injected rats showed a nearly compensated metabolic acidosis with an appropriate respiratory compensation. A slightly elevated anion gap was seen only after 48 h. LPS injected rats showed after 12 h urinary a massive phosphate loss ~10 fold higher than in control animals. No difference was seen after 48 hours. P_i levels in serum were the same at all time points and in all groups. After 48 h 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 of the metabolic acidosis. All described differences were highly significant. The results obtained so far 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 in progress on RNA and protein level will provide further insight in the underlying pathophysiology.

P 45

Quest for the holy grail about fibrinogen

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Background: Intraoperative real time coagulation monitoring is an open problem. Guidelines for transfusion of blood products and procoagulatory drugs based on point of care rotation thromboelastometry have been published recently. This pilot study compared quantitative standard laboratory fibrinogen measurement with point of care functional rotation thromboelastometry fibrinogen measurement.
Materials and methods: Blood samples from both genders aged 18 to 90 years undergoing major surgery were investigated. Cardiac surgery and liver transplantation were excluded. Blood samples were drawn according to the clinical judgment of the attending anesthesiologist. Standard coagulation tests were done by the hematology laboratory (BCS, Siemens Healthcare Diagnostics, USA), thromboelastometry by trained study personnel with ROTEM® (Pentapharm, Germany). Main interest was in the comparison of fibrinogen test (Clauss) and Fibtem-MCF (maximum clot firmness). Patients were grouped according to blood loss. More than 20% blood loss of estimated total blood volume (70 ml/kg) qualified as major bleeding. Duration of obtaining results from the tests (time from blood sampling to result) was recorded.
Results and discussion: Blood from 38 patients (21 females, aged 55 ± 17 years, height 169 ± 8 cm, weight 71 ± 12 kg) was measured, 17 had major bleeding. Spearman correlation coefficient over all is 0.71, for patients with minor blood loss it is 0.55, for patients with major blood loss it is 0.86. Time to gain results averages 70.1 min for

standard coagulation test (processing time in laboratory averages 43.9 min) and 20.7 min. for Fibtem-MCF.
Conclusion: Fibtem-MCF showed a higher sensitivity for fibrinogen impairment, which could mean that fibrinogen cross-linking is impaired before fibrinogen deficiency can be measured in the standard coagulation test according to clauss. Time to results was clearly shorter with the Fibtem-MCF, information about coagulation disorder is available faster by rotation thromboelastometry.

P 46

Protamine inhibits conversion of prothrombin to thrombin

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Introduction: Protamine sulfate is the standard antidote for heparin anticoagulation. Previous studies have shown that protamine per se exerts weak anticoagulation via extrinsic and intrinsic pathway. Therefore, we evaluated the anticoagulation effects of protamine and potential reversal agents using endogenous thrombin generation (TG) [1] and standard coagulation tests.
Methods: After written informed consent, platelet-poor plasma was obtained from six healthy volunteers and incubated with protamine at a concentration of 0, 4, 8, 12, 24 mg/ml (range 0 to 5.3 mM). TG was measured using 5 pM tissue factor or dilute actin FS (1/20 dilution v/v) as triggers. The following parameters were evaluated: peak thrombin, lag time and time to thrombin peak. In addition, prothrombin time (PT), partial thromboplastin time (aPTT), and to evaluate the effects of added phospholipid, dilute Russell viper venom (dRVV) screen and confirm tests were performed. To evaluate potential reversal agents we added increasing concentrations of prothrombin complex concentrate (PCC, Beriplex®, CSL Behring, Marburg, Germany) and recombinant factor VIIa (rFVIIa, NovoSeven®, NovoNordisk, Bagsbaerg, Denmark) to protamine plasma samples.
Results: Protamine dose-dependently decreased peak thrombin and increased lag time and time to thrombin peak. TG was inhibited maximally by 65%, lag time increased by 191%, and time to thrombin peak by 174%. Highest protamine dose increased PT from 12.9 sec at baseline to 15.1 sec and aPTT from 35.2 to 47.2 sec. TG was not restored by therapeutic doses of PCC (0.3–0.9 U/ml) or rFVIIa (60 nM). There was no difference in clotting time between dRVV screen and confirm tests.
Conclusions: Protamine seems to affect prothrombinase dependent conversion of prothrombin to thrombin based on the inhibition of TG and prolongation of time to peak. Protamine anticoagulation was not restored by phospholipid supplementation (dRVV confirm) or additional vitamin K dependent factors. Present data suggest that protamine overdose potentially increases bleeding risks, and thus it should be carefully titrated.
Reference: 1. Hemker et al. Thromb Haemost. 2000:84:747.

P 47

Pre-analytical effects of pneumatic tube transport on impedance platelet aggregometry

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Background: Point-of-care platelet monitoring is increasingly used in cardiac patients treated with antiplatelet agents. The aim of this study was to determine whether the transport of blood specimen by pneumatic tube system (PTS) has an effect on the results of impedance platelet aggregometry.
Methods: Two blood samples were collected from 50 consecutive patients scheduled for coronary artery bypass surgery under medication with acetylsalicylic acid (aspirin) before induction of anaesthesia. The first sample was defined as reference value. The second sample was analyzed after PTS transport or no transport (random allocation). Platelet function was assessed in whole blood by impedance aggregometry with a Multiplate™ analyzer (Dynabite GmbH, Munich, Germany) using thrombin-related activation peptide (TRAP test) and arachidonic acid (ASPI test). TRAP values ≥771 were defined as normal platelet function, and ASPI values ≥300 as reduced aspirin responsiveness.
Results: Bias ± 95% limit of agreement [1] between the reference and the second measurement for TRAP test were 126 ± 284 U for untransported samples (n = 25) and 181 ± 316 U (n = 25) for transported samples. In the reference measurements, 48/50 (96%) of TRAP values were within the normal range. In the second measurement, 22/25 (88 %, p = 0.500 *vs.* reference) untransported and 15/25 (60%, p = 0.004 *vs.* reference) transported samples showed normal platelet function. Bias ± 95% limit of agreement for ASPI test were 12 ± 109 U (n = 25) for untransported and 68 ± 250 U (n = 25) for PTS transported samples. As defined by the reference analyses, reduced aspirin responsiveness was found in seven samples (five allocated to PTS transport, two to no transport). The second analysis revealed reduced aspirin responsiveness in one of the two untransported samples (p = 1.000) but in none of the five transported samples (p = 0.074).
Discussion: PTS transport had a relevant influence on platelet function testing by the Multiplate™ analyzer. Thus, our data suggest that blood samples for platelet function analysis by the Multiplate™ system should not be transported by PTS.
Reference: 1) Bland JM, Altman DG. Lancet. 1986;1:307–10.

P 48

Comparison of POCT i-Stat International Normalized Ratio (INR) with standard INR in paediatric surgery

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Background and objective: Standard coagulation tests are time-consuming and do not represent the actual haemostatic situation. The goal of the present study was to determine the correlation of the Quick test's corresponding International Normalized Ratio (INR) of the i-Stat device (Abbott Laboratories, Illinois, USA) with the standard INR measured with the STA® Compact device (Roche Diagnostics AG, Rotkreuz, Switzerland) in paediatric patients undergoing surgery with significant blood loss.
Methods: 10 patients (age between 0.7–14.0 years [median 4.3]; weight between 8.2–4 kg [10.8]) undergoing craniofacial (n = 4) or spine surgery (n = 6) were included. Blood samples for both tests were drawn at the same time points after induction, at start of surgery, during the intraoperative course and at the end of the procedure and simultaneously measured. Data were compared using Bland-Altman analysis and Spearman correlation analysis.
Results: INR of i-Stat (iINR) ranged from 1.09 to 2.29 (median 1.29) and standard INR (sINR) from 1.06 to 3.43 (1.34) with a Spearman correlation of r = 0.861 (p <0.001).

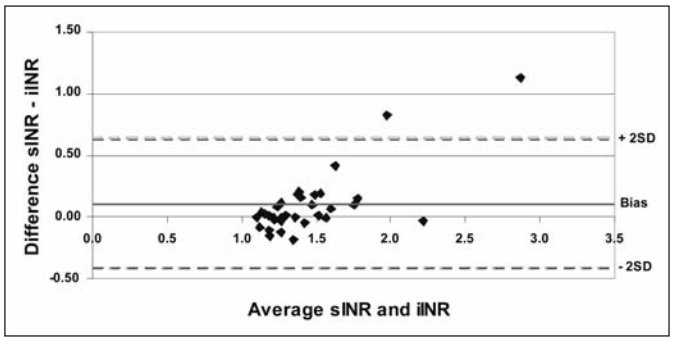

Figure 1 shows the Bland-Altman-Plot of iINR and sINR (bias = 0.11; precision = 0.52). The two outliers had extreme low Quick values of 21 and 31%, representing a severe coagulopathy.

Conclusion: For Quick values ≥40% (INR ≤1.50), the i-Stat represents a fast and reliable alternative to the standard Quick test.

P 49

Intrarater and interrater reliability of point of care coagulation testing using the ROTEM® *delta*

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Background and objectives: To investigate intrarater and inter-rater reliability of point of care (POC) coagulation testing using the 4 channel ROTEM® *delta* device (Pentapharm GmbH, Munich, Germany).
Methods: Blood was taken from 43 newborn pigs (median weight 5.2 kg, range 4.1–5.9 kg) and paired tested for the parameters clotting time (CT), clot formation time (CFT), maximum clot firmness (MCF) and Alpha angle using ROTEM® *delta*. Paired simultaneous testing in two channels was performed either by a single operator (intrarater) or by two different operators (interrater). Results were analysed using intraclass correlation coefficient (ICC) as well as Spearman correlation with Bonferroni's correction (α = 0.05). Bland-Altman analysis was also performed.
Results: ICC was high for all parameters and ranged from 0.71 to 0.99 (p <0.05). Spearman correlations of interrater reliability were high except for MCF in Extem and CT in Aptem (both r = 0.49, p <0.05) and ranged from 0.68 to 0.96 (p <0.05).

Table 1
Intrarater / interrater reliability of ROTEM® *delta* (bias/precision [median]).

Intrarater	CT [s]	CFT [s]	MCF [mm]	Alpha angle [°]
Extem	1.0 / 25.3 (62.5)	2.3/11.7 (49.5)	0.3/3.5 (67.0)	–0.4/1.8 (80.0)
Intem	–4.9/26.6 (129.0)	1.2/5.7 (37.5)	–0.8/2.1 (66.5)	–0.2/1.1 (82.0)
Fibtem	–1.4/49.1 (59.5)	6.1/19.5 (106)	–1.4/4.0 (40.5)	–0.5/3.2 (72.0)
Aptem	–5.8/61.4 (64.0)	1.4/18.7 (42.5)	–0.5/4.3 (69.5)	–0.2/3.3 (82.0)
Interrater				
Extem	0.4/20.6 (58.0)	3.1/14.7 (45.0)	–1.8/5.8 (68.0)	–0.5/2.1 (81.0)
Intem	0.6/19.9 (130.0)	1.9/6.6 (39.0)	–0.6/2.1(67.5)	–0.2/1.4 (82.0)
Fibtem	2.7/20.5 (57.5)	7.3/32.0 (87.5)	0.7/4.4 (40.5)	–1.5/6.6 (75.0)
Aptem	11.0/50.8 (60.0)	3.0/19.2 (41.5)	–2.5/7.2 (69.0)	–0.6/2.9 (82.0)

Conclusion: Based on our results POC coagulation testing by ROTEM® *delta* has a considerably good intrarater and interrater reliability.

P 50

Differences in blind intubation through the i-gel™ compared to the LMA Fastrach™

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Background: We compared first attempt blind tracheal intubation success rates through the i-gel with the gold-standard LMA Fastrach in predicted difficult airway patients.
Material and methods: 80 patients with IRB approval and informed consent were randomly assigned to either LMA Fastrach or i-gel. Endotracheal insertion of the tube was continuously fibreoptically visualized but not guided. In case of blind intubation failure we advanced the fibrescope out of the tube's tip into the trachea and performed a fibreoptic guided intubation. Removal of airway masks was performed with the LMA Stabilizer Rod™. Primary outcome was first attempt blind success rate.
Results: Demographic data were comparable between the groups. Blind intubation through the ILMA resulted in significantly higher success. Back up fibreoptic guided intubation failed in one i-gel and two ILMA, all of these failures could be intubated by conventional laryngoscopy. Removal of supraglottic airway devices was without problems and with no difference between the devices. Difference in airway leak pressure was statistically significant but of no clinical relevance. We found no side effects.
Discussion and conclusion: Blind tracheal intubation through the i-gel cannot be recommended and fibreoptic scope for guidance is necessary. Reshaping of the i-gel airway outlet may be beneficial.

Table 1
Success rates and Performance.

	i-gel	ILMA	*p*
Blind Intubation Success, n (%)	6 (15)	27 (69)	<0.001
Blind Intubation Time (sec), mean ± SD	45 ± 14.5	44 ± 22.5	0.907
Fibreoptic glottic view (1–4), n (%)	25/7/3/4	20/13/2/5	0.610
1 = full view, 4 = no glottic structures visible	(63/18/8/10)	(50/33/5/13)	
Airway Leak Pressure (cm H_2O), mean ± SD	26 ± 8	30 ± 7	0.045

P 51

Fiberoptic intubation through the i-gel™ vs. LMA Fastrach™ (ILMA) in patients with predicted difficult airway

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Background: With IRB approval and patient informed consent, this prospective RCT compares the success of fiberoptic assisted endotracheal intubation through supraglottic devices: i-gel vs. LMA Fastrach. We report preliminary results of the first 105 patients.
Material and methods: In 105 patients with predicted difficult airways either the LMA Fastrach or the i-gel was placed in random order. Then followed a fiberoptic assisted intubation of the trachea through the supraglottic airway device. Primary outcomes were the fiberoptic intubation success rate and intubation time.
Results: Patients demographic data and insertion success time of the supraglottic devices did not differ between groups. Fiberoptic intubation success rates were comparable (see table). One failed intubation through an i-gel was rescued by conventional oral intubation. Same counts for 3 of the 4 LMA Fastrach failures. The 4th was rescued by fiberoptically assisted intubation with an i-gel. Significant differences in airway leak pressure are of no clinical relevance. Time to intubate took about 20 sec. longer with the i-gel.
Discussion and conclusion: Fiberoptically assisted tracheal intubation through i-gel and Fastrach are equally successful but the time necessary differs. However, the easy to use i-gel might be an alternative approach for fiberoptic assisted endotracheal intubation, particularly if we compare the costs of both supraglottic airway devices.

Table
Supraglottic Mask Performance.

	i-gel (n = 51)	LMA Fastrach (n = 54)	p-value
Mask Insertion Success n (%)	50 (98)	53 (98)	0.501
Supraglottic Mask Insertion (sec), mean ± SD	34 ± 21	34 ± 19	0.974
Airway Leak Pressure (cm H_2O), mean ± SD	25 ± 08	30 ± 07	0.002
Fiberoptic tracheal intubation success n (%)	49 (98)	50 (94)	0.652
Fiberoptic intubation time (sec), mean ± SD	90 ± 47	70 ± 44	0.001
Remove mask (sec), mean ± SD	42 ± 15	44 ± 19	0.649

P 52

Prospective multicenter clinical evaluation of the cuffless supraglottic airway device i-gel

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Background: This industry independent multi center clinical observation trial investigates a large population of i-gel uses to provide performance and safety data from the real anesthesia practice at different care level hospitals from several Swiss regions (primary level hospitals: Visp, Ziegler-Bern, secondary level hospitals: Fribourg, Biel, tertiary level hospitals: Sion and University Hospital Bern).
Material and methods: Patients with IRB approval and informed consent for procedure, scheduled for surgery under general anesthesia and a supraglottic airway device were included. We assessed demographics, anesthesia data, insertion success rates, difficulty of placement, airway leak pressure, side effects and complications.
Results: 974 patients so far, were analysed (aged 46 ± 20 years, BMI 25.5 Kg/m^2, ASA class I in 41%, II in 43%, ≥III in 16%, 60% 583 females). The table shows the overall insertion success rate, simplicity of placement, airway leak pressure, mean duration of anesthesia, and some side effects. One patient complained of bilateral numbness at the tip of the tongue, presumably because of pressure injury. Another major complication was an epiglottic hematoma treated conservatively without further sequela.
Discussion and conclusion: The i-gel is a highly successful and easy-to-place supraglottic airway device which allows controlled ventilation in a large number of patients in a large variety of settings at a very low incidence of severe complication.

Table
Performance of the i-gel supraglottic airway device (total n = 974).

Insertion success rate, n (%)	922 (95)
Simplicity of placement	1:697 (72); 2:186 (19); 3:52 (5)
(1 = easy to 5 = impossible), n (%)	4:17 (2); 5:2 (0.2)
Airway Leak Pressure (max. = 40 cm H_20), mean ± SD	25 ± 9
Gastric regurgitation (vent), signs of aspiration, n (%)	1 (0.1)
Laryngeal / bronchogenic spasm, n (%)	3 (0.3)
Mean (± SD) duration of anesthesia (min)	71 ± 49

P 53

Evaluation of the GlideScope® for tracheal intubation in patients with cervical spine immobilization by a semi-rigid collar

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Background: In patients with cervical spine injury, a cervical collar may prevent cervical spine movements but renders tracheal intubation with a standard laryngoscope difficult if not impossible. We hypothesized that despite the presence of a semi-rigid cervical collar and with the patient's head taped to the trolley, we would be able to intubate all patients with the GlideScope® and its dedicated stylet.

Methods: 50 adult patients (ASA 1 or 2, BMI ≤35 kg/m²) scheduled for elective surgical procedures requiring tracheal intubation were included. After standardized induction of general anesthesia and neuromuscular blockade, the neck was immobilized with an appropriately sized semi-rigid Philadelphia Patriot® cervical collar, the head was taped to the trolley. Laryngoscopy was attempted using a Macintosh laryngoscope blade 4 and the modified Cormack Lehane grade was noted. Subsequently, laryngoscopy with the GlideScope® was graded and followed by oro-tracheal intubation.
Results: All patients were successfully intubated with the GlideScope® and its dedicated stylet. The median intubation time was 50 sec [43; 61]. The modified Cormack Lehane grade was 3 or 4 at direct laryngoscopy. It was significantly reduced with the GlideScope® ($p < 0.0001$), reaching 2a in most of patients. Maximal mouth opening was significantly reduced with the cervical collar applied, 4.5 cm [4.5; 5.0] vs. 2.0 cm [1.8; 2.0] ($p < 0.0001$).
Conclusions: The GlideScope® allows oro-tracheal intubation in patients having their cervical spine immobilized by a semi-rigid collar and their head taped to the trolley. It furthermore decreases significantly the modified Cormack Lehane grade.

P 54

Block of the sinuvertebral nerve: diagnostic value for lumbar discogenic pain and effect on central hypersensitivity

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Aims: The diagnostic value of the block of the afferent lumbar discal nerve (sinuvertebral nerve) in patients with proven discogenic pain and its effect on central hypersensitivity were evaluated.

Methods: An interlaminar CT-guided technique was used. Bupivacaine 0.5% and contrast medium 2:1 were injected dorsal to each intervertebral disc previously considered positive by provocation discography. Success of the block was defined as 80% decrease in visual analogue scale (VAS). 1 h after the block, subjective improvement in physical restrictions was recorded as none, moderate or excellent. As measures of central hypersensitivity, pressure pain detection and tolerance thresholds (PPDT and PPTT) were assessed at a painful and non-painful point of the back, and the ipsilateral great toe.
Results: The overall-decrease in VAS was 71.7% ($p < 0.001$). The block was successful in 8 of 15 patients. Two additional patients reported excellent improvement in physical restrictions. In those 10 patients, VAS decreased by 83.2%. Minimal VAS was reached after a median time of 15 min (10–25 min). PPDT did not change significantly after the block. PPTT increased significantly after the intervention by 28%, 12% and 24% at the painful point, the non-painful point and the toe, respectively ($p = 0.01$). No differences among the tested sites were found.
Conclusion: Diagnostic block of the sinuvertebral nerve was not positive in all patients with discogenic pain. This indicates that the block can unlikely replace discography, but can be seen as complement to it in selected cases. The increase in pressure pain thresholds after successful block implies that processes of central sensitisation can be modulated by short-term suppression of nociceptive input.

Index of first authors

The numbers refer to the pages of this supplement.