Annual meeting of the
Swiss Society of Anaesthesiology and Resuscitation

Interlaken (Switzerland), October 29–31, 2009
Impact of high concentrations of sevoflurane on laryngeal reflex responses in children
T.O. Ehr, B.S. von Ungern-Sternberg, K. Keller, F.J. Frei
Anesthesia and Intensive Care, University Children’s Hospital, Basel, CH

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% (ED48–50) to depress laryngeal 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.

Result: There was no difference between PM and EP.

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.

Do paramedics and emergency physicians communicate effectively in simulated Emergency Medical Service scenarios?
M. Lüthy, F. Amsler2, S. Gisin1, M. Zürcher1, W. Ummenhofer1
1Department Anästhesie, Universitätsspital Basel; 2Academic Neurosurgery, University of Cambridge, UK; 3Service d’Anesthésiologie, CHUV, Lausanne

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 29%, PM 46.7%), question (EP 10.6%, PM 30.4%), command (EP 49.2%, PM 3.9%) and confirmation of drug application (EP 74%, 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.

Intraoperative cerebral perfusion and neurotransmitter changes in geriatric patients
C.S. Burkhardt1, M. Gamberrini2, A. Moescii2, P. Smeleveski2, S.P. Strebel1, L.A. Steiner2
1Department Anästhesie, Universitätsspital Basel; 2Academic Neurosurgery, University of Cambridge, UK; 3Service d’Anesthésiologie, CHUV, Lausanne

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.

Results: MAP (91 ± 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 O2 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 CO2 (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.

Supported by SNF Grant 32003B-121956

Intraoperative cerebral perfusion and postoperative cognitive dysfunction in geriatric patients
C.S. Burkhardt1, M. Gamberrini2, P. Smeleveski2, A.U. Monsch2, S.P. Strebel1, L.A. Steiner4
1Department Anästhesie, Universitätsspital Basel; 2Academic Neurosurgery, University of Cambridge, UK; 3Memory Clinic, Universitätsspital Basel; 4Service d’anesthésiologie, CHUV, Lausanne

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.

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.

Supported by SNF Grant 32003B-121956

Intraoperative cerebral perfusion and postoperative cognitive dysfunction in geriatric patients
C.S. Burkhardt1, M. Gamberrini2, P. Smeleveski2, A.U. Monsch2, S.P. Strebel1, L.A. Steiner4
1Department Anästhesie, Universitätsspital Basel; 2Academic Neurosurgery, University of Cambridge, UK; 3Memory Clinic, Universitätsspital Basel; 4Service d’anesthésiologie, CHUV, Lausanne
Incidents occurring during anaesthesia for total hip arthroplasty: a comparison of general versus regional anaesthesia

Angéline Adam¹, Patrick Taffé¹, Valérie Pittel¹, Silvia Pichard², Jacques Müller³, Bernhard Burnand⁴, for the ADS study Group
¹Institute of Social and Preventive Medicine, CHUV and University of Lausanne, Lausanne; ²Anesthesiology department, EHNV, Saint-Loup

Background: The type of anesthesia to be used for total hip arthroplasty (THA) is still a matter of debate. We compared the occurrence of peri- 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 peri- 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 peri-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-anesthesia 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 peri-anesthetic problems under RA compared to GA. Whereas increased age (>67), gender (male), and ASA were linked with the choice of GA, 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 peri- and post-anesthetic 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.

Postoperative thoracic epidural analgesia inhibits detrusor activity in patients undergoing total lumbotomy

P.Y. Wuehrich¹, T.M. Kessler², F.C. Burkhard³, M. Curatolo¹
¹Department of Urology, University Hospital Inselspital, Bern

Background: Nocturnal enuresis is a problem that affects millions of people. Providing analgesia without suppressing motor or sensory function is a challenge for regional anesthesia.

Methods: In a prospective, open, observational, follow up study, 10 male patients with no pre-existing lower urinary tract symptoms underwent urodynamic investigations 1 day before open keyhole surgery (lumbotomy) and 2–3 days postoperatively under TEA. Primary outcome was the difference in post void residual before surgery (lumbotomy) and 2–3 days postoperatively under TEA.

Results: Bladder filling and sensation were not influenced by TEA. Post voiding function significantly deteriorated during TEA (P = 0.004), (31 [27–33] to 20 cm H2O [25–29], 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.

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

M. Scherrer³, M. Ott¹, R. Jolliet², J. Gas¹, I. Decoster⁴, R. Jb²
¹Pain Research Center, BWH & HMS, Boston; ²Anesthesiology Department, CHUV, Lausanne; ³DBCM, Lausanne University

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 subtypes-1 (TRPV1) can produce this selective blockade, as TRPV1 is selectively expressed on nociceptors. Furthermore, 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 Aδ-C-fibers is required for microglia activation.

Methods: We applied RTX (0.01%) or bupivacaine microspheres to the sciatic nerve of rats to block the conduction of C-fibers or Aδ-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, bromodioxurine (BrD, 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 hyperalgesia 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.

Effect of local anaesthetics on osteoblasts

Roman Schuler¹, Martin Uner², José Aguirre³, Melanie Hasler³, Alain Borges⁴, Beatrice Beck-Schimmer⁵
¹Institute of Anesthesiology, University Hospital Zurich, ²Department of Anesthesiology, Orthopedic University Clinic Zurich Bachtigelen

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 days (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 anesthetic concentration resulted in a clear dose dependent decrease of proliferation rate, cell viability and cell number for all three anesthetics (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 anesthetics, followed by ropivacaine and bupivacaine.

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.

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

M. Cachemaille², C. Laedermann¹, M. Pertin¹, C. Towne², H. Abriel¹, I. Decoster²
¹Pain Research Unit, Department of Anesthesiology, CHUV, Lausanne; ²Brain Mind Institute, EPFL, Lausanne; ³Department of Clinical Research, University of Bern, Bern, Switzerland

Background: Neuropathic pain is associated with altered expression of voltage-gated sodium channels (VGSCs). The ubiquitous ligase Nedd4-2 regulates sodium channels and we have previously demonstrated in expression systems that this protein decreases in the spinal cord for mitogen-activated protein kinase (MAPK) p38, bromodioxurine (BrD, marker of proliferation) and Iba1 (microglial marker).
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 <0.005). Immunofluorescence on DRG neurons reveals a decrease in number of positive Nedd4-2 cells with (27.0 ± 12%) 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.

Results:

Effect of sevoflurane on lung oedema in an ALI/ARDS model in vivo and in vitro
M. Schläpfer1, 2, J. C. Schild1, 2, S. Voigtsberger1, 2, D. R. Spahn1, B. Beck-Schimmer1, 2
1Department of Anaesthesiology, University Hospital Zurich; 2Institute of Physiology, University Zuerich, Zürich, Switzerland

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-induced lung injury in vivo and in vitro.

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: ENaC mRNA upon porpofol/LPS treatment, while it remained unchanged in the 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. mRNA of transporters and oxygenation levels 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 positively influenced by sevoflurane.

Oxygenation was improved and expression of ion channels 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.

In vitro exposure of human fibroblasts and osteoblasts to dicyclofenac is cytotoxic at clinically used concentrations
José Aguirre1, Alain Borget1, Melanie Hasler1,2, Caroline Fedder1, Beatrice Beck-Schimmer1, 2
1Institut für Anästhesiologie, Universitätsspital Zürich; 2Institut für Physiologie, Zentrum für integrative Humanphysiologie, Universität Zürich; 3Abteilung für Anästhesiologie, Universitätsklinik Balgrist, Zürich, Switzerland

Background: Dicyclofenac is commonly used in osteoarthritis (OA) for pain relief. OA is a chronic degenerative disease of joints.

Method: At concentrations of 0.25 μg/ml, 0.5 μg/ml, 5 μg/ml and 50 μg/ml, 2d, 24h and 6d, respectively, a decrease of 50% of Nav1.7 signal at the membrane is demonstrated (p <0.005). Immunofluorescence on DRG neurons reveals a decrease in number of positive Dicyclofenac cells with 27.0 ± 12% versus sham group (43.4 ± 3.5%) (p <0.005). Dicyclofenac-2 is mainly colocalized with markers of small neurons and almost absent in large neurons. In addition, Dicyclofenac-2 is predominantly decreased in injured ATF3 positive cells.

Conclusion: Our results indicate that Dicyclofenac 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 Dicyclofenac, after nerve injury, modulates Nav1.7 activity and can contribute to neuropathic pain. We will further try to restore a normal level of Dicyclofenac via a gene therapy approach with viral vectors in order to soothe symptoms of neuropathic pain.

Results:

ICAM-1 independent anti-inflammatory effect of ropivacaine in the double-hit mouse model of acute inflammation
J. Aguirre1, G. Votta-Vels2, B. Beck-Schimmer1, R. Koshy3, M. Castellon1, 4, D.E. Schwartz2, R.D. Minshall2, 4, B. Borget1
1Abteilung für Anästhesiologie, Universitätsklinik Balgrist, Zürich; 2Department for Anesthesiology, University of Illinois College of Medicine, Chicago, USA; 3Department of Pharmacology, University of Illinois College of Medicine, Chicago, USA

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 Intracellular 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 1h, received 2h after LPS challenge NS or 1μl R i.v. and were thereafter connected to a ventilator for high tidal (28 cc/kg) volume-controlled ventilation (VC) for 2h 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 PMN counts.

Results: Lung MPO-activity and PMN counts after BAL were increased in ICAM-1−/− lungs exposed to LPS and 2h of high tidal VC. LPS exposure stimulated LPS challenge activity and BAL (PMN counts) whereas ropivacaine after LPS challenge significantly decreased PMN infiltration in the BAL.

Conclusions: PMN 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.

Conclusions: PMN 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 seems also mediated by ICAM-1 independent mechanisms, suggesting that R may be a useful anti-inflammatory agent through direct actions on circulating neutrophils.

Ultrasound guided, selective block of the ilioinguinal and iliohypogastric nerves: a volunteer study
Michel Schmutz MD, Peter Schumacher PhD, Cédric Luyet MD, Michele Curatolo MD, PhD, Urs Eichenberger MD
Department of Anaesthesiology and Pain Medicine, University Hospital of Berne and University of Berne, Inselspital, CH-3010 Berne, Switzerland

Background: Diagnostic or therapeutic block of the ilioinguinal (IL) and iliohypogastric (IH) nerves 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 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/mm² of mepivacaine. The same procedure was repeated one week later blocking the respective other nerves. 20 min. after injection the anaesthetized skin area was measured and injected 2 x the ED50 dose of 1% mepivacaine in relation to the cross sectional area of the nerve (0.11 m²/mm²).

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/mm² of mepivacaine. The same procedure was repeated one week later blocking the respective other nerves. 20 min. after injection the anaesthetized skin area was measured and injected 2 x the ED50 dose of 1% mepivacaine in relation to the cross sectional area of the nerve (0.11 m²/mm²).

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 anesthetic.
Continuous intercostal analgesia with ropivacaine 0.2% versus ropivacaine 0.3% following open rotator cuff repair: effects on postoperative analgesia and motor function
Stephan Blumenthal1, José Aguirre2, Michael Marquardt2, Stephan Blumenthal1, José Aguirre2, Michael Marquardt2, Steinpilz, Bern; 3Institut für Anästhesiologie und Schmerztherapie, Inselspital, Bern; 4Institut für Anästhesiologie, Universitätsspital Zürich; 5Institut für Anästhesiologie, Zentralspital Lachen Background: Intercostal analgesia is the established standard for the treatment 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 intercostal catheter for the first 48 hours after surgery.
Methods: 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 intercostal 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 intercostal 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.

Interaction of gender with age for pressure pain thresholds in pain-free humans
Alban Y. Neziroglu, Ole K. Andersen, Antony H. Dickenson1, Lars Arendt-Nielsen, Michele Curato1, 1University Dept. of Anesthesiology and Pain Therapy, University Hospital of Bern; 2Center for Sensory-Motor Interaction, University of Aalborg, DK; 3Dep. of Pharmacology, University College London, UK Background and aims: Previous investigations on pressure pain threshold quantification suggest that there are robust differences between genders, with women 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 were assessed.
Methods: We studied 300 healthy subjects, 152 men and 148 women. Seventy-five subjects were analyzed within each of the following age categories: 18–20, 21–24, 25–29, 30–34, 35–39, 40–44, 45–49, 50–54, 55–59 and 60–77. Pressure pain detection and tolerance thresholds were assessed at the 2nd toe, the low back and the shoulder 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 effect 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. Prevention on this subject are probably limited by the fact that mostly young subjects were investigated.

Accuracy of perioperative haemoglobin measurement using the HemoCue® device and a CO-Oximeter in paediatric surgical patients
C. Madjdpour, N. Koepefer, A. Froitzel, J.Y. Mauch, M. Weiss Department of Anaesthesia, University Children' s Hospital Zurich, Switzerland 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] 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.

Accuracy of perioperative haemoglobin measurement using the HemoCue® device and a CO-Oximeter in paediatric surgical patients
C. Madjdpour, N. Koepefer, A. Froitzel, J.Y. Mauch, M. Weiss Department of Anaesthesia, University Children's Hospital Zurich, Switzerland 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] 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.

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
Cédric Luyet1, Beat Wirthmüller, Lorenz Theiler, Martin Lugrin3, 1Universitätsklinik für Anästhesiologie und Schmerztherapie, Inselspital, Bern; 2Institut für Anästhesiologie, Chirurgische Intensivmedizin und Schmerztherapie, Luzerner Kantons spitzz, 6000 Luzern Background: The use of ultrasound improves the success rate of axillary brachial plexus block compared to nerve stimulation. 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.

Axillary brachial plexus blockade is easier to learn with ultrasound guidance
Cédric Luyet1, Guido Schüpfer2, Marius Wipfli1, Robert Greiff1, Martin Lugrin3, 1Universitätspithik für Anästhesiologie und Schmerztherapie, Inselspital, 3100 Bern; 2Institut für Anästhesiologie, Chirurgische Intensivmedizin und Schmerztherapie, Luzerner Kantons spitzz, 6000 Luzern Background: The use of ultrasound improves the success rate of axillary brachial plexus block compared to nerve stimulation. 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.

Accuracy of perioperative haemoglobin measurement using the HemoCue® device and a CO-Oximeter in paediatric surgical patients
C. Madjdpour, N. Koepefer, A. Froitzel, J.Y. Mauch, M. Weiss Department of Anaesthesia, University Children's Hospital Zurich, Switzerland 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] 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®, 3.7–18.9 (7.5) g/dl for CO-Ox, and 4.6–17.6 (9.3) g/dl for lab analysis.

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

Effect of intravenous fluids on blood coagulation assessed by rotation thromboelastometry

C. Madjidpour1, N. Koepfer1, A.P.N. Kutter2, A. Frotzler1, R. Betschart1, J.Y. Mauch1, M. Weiss1
1Department of Anaesthesia, University Children's Hospital Zurich, Switzerland; 2Section Anaesthesiology, Equine Department, Vetmedic University of Zurich, Switzerland

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 EXTEN and INTEM and MCF in the FM10TEM test. Kruskal-Wallis test was applied and intergroup comparisons were performed by post-hoc Bonferroni correction (significance level α = 0.05/6 = 0.0083).

Results:

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

<table>
<thead>
<tr>
<th>Fluid</th>
<th>NS (n=8)</th>
<th>gelatine (n=8)</th>
<th>albumin (n=8)</th>
<th>HES (n=8)</th>
</tr>
</thead>
<tbody>
<tr>
<td>CT (sec)</td>
<td>3.5-13.0</td>
<td>3.0-12.3</td>
<td>3.5-12.2</td>
<td>2.0-9.3</td>
</tr>
<tr>
<td>CFT (sec)</td>
<td>2.0-12.4</td>
<td>2.0-10.3</td>
<td>2.0-10.2</td>
<td>2.0-9.5</td>
</tr>
<tr>
<td>MCF (mm)</td>
<td>0.0-3.0</td>
<td>0.0-2.0</td>
<td>0.0-2.0</td>
<td>0.0-2.0</td>
</tr>
<tr>
<td>MCF (mm) INTEM</td>
<td>0.0-6.0</td>
<td>0.0-6.0</td>
<td>0.0-6.0</td>
<td>0.0-6.0</td>
</tr>
</tbody>
</table>

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.

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

Felix Buddeleberg1, Melanie Hasler1, Urs Schanz1, Donat R. Spahn1, and Beatrice Beck-Schimmer1
1Institut für Anästhesie, Universitätsspital Zürich; 2Klinik für Hämatologie, Universitätsspital Zürich

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 breakdown (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 stored concentrates and fresh plasma from 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.

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

Stefanie Voigtstetter,1 Martin Schläpfer1, Donat R. Spahn1, Beatrice Beck-Schimmer1,2
1Institute of Anesthesiology, University Hospital Zurich; 2Institute of Physiology and Zurich Center for Integrative Human Physiology, University of Zurich

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 crystalloids) 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 real-time 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.

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

Marc P. Steurer, Martina A. Steurer, Edith R. Schmid, Donat R. Spahn, Beatrice Beck-Schimmer
Institute of Anesthesiology, University Hospital of Zurich, Switzerland

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 anaesthetics 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 (\(P_{FiO_2}/FiO_2\)) 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 \(T_6\). 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 \(T_6\), \(T_4\), and \(T_2\). Even though the median time until extubation was shorter in the sevoflurane group \((6.0 \text{ h}, IQR 5.0–7.0 \text{ h})\) compared to the propofol group \((7.0 \text{ h}, IQR 5.1–8.8 \text{ h})\) it has not reached statistical significance \((p = 0.21)\). The number of postoperative pulmonary complications (PPC) was higher in the propofol group \((6 \text{ total})\) than the ones in the sevoflurane group \((3 \text{ total})\). 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.

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

Departement Anästhesie, Memory Clinic, Herzchirurgie, Universitätsklinik, CHUV, Lausanne

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 cardipulmonary bypass. 2x 250 mL placebo (Ensure Plus\textsuperscript{TM}, Abbott Nutrition) or n-3 enriched nutrition therapy (ProSure\textsuperscript{TM} 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\textsuperscript{TM} respectively. CRP and IL-6 did not differ significantly between groups preoperatively and on postoperative days 1, 3, and 7 Pre operative CERAD total scores were 86 ± 10 and 81 ± 9 \((p = n.s.)\) for Placebo and ProSure\textsuperscript{TM}, 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.


Anesthesia for electroconvulsive therapy: time for a change?

F. Joray, P. Schoettker, Y. Ganzmann, V. Moret, C. Kern
Service d’Anesthésiologie, CHUV, Lausanne

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 \((0.2 \text{ mg/kg})\), Suxamethonium \((1 \text{ mg/kg})\) 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 current anaesthesia protocol for electroconvulsive therapy and better quality control of the clinical practice.

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

Eric Albrecht\textsuperscript{1}, Philippe Frascarolo\textsuperscript{1}, Giovanna Mieystr-Agustoni\textsuperscript{2}, A. Ferron\textsuperscript{1}, Nicolas Gillard\textsuperscript{1}, Matthias Cavassinni\textsuperscript{1}

\textsuperscript{1}Service of Anesthesiology, Centre Hospitalier Universitaire Vaudois and University of Lausanne, Lausanne, Switzerland; \textsuperscript{2}Institut Universitaire de Médecine Sociale et Préventive, University of Lausanne, Lausanne, Switzerland; \textsuperscript{3}Service of Orthopedic Surgery and Traumatology, Centre Hospitalier Universitaire Vaudois and University of Lausanne, Lausanne, Switzerland

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), 80% were female. 376 (38%) patients thought they had an HIV test performed 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.

Conclusions: In Switzerland, nearly 40% of the patients falsely thought an HIV test had been performed on a routine basis 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.
Auditory stimulation does not induce implicit memory during anaesthesia
Eric Albrecht1, Kristoffer C. Abeg1, Elisa M. Tartaglia2, Patrice Soom1, Alain Farroni1, Christian Kern1, Michael H. Herzog1
1Service of Anaesthesiology, Centre Hospitalier Universitaire Vaudois and University of Lausanne, Lausanne, Switzerland; 2Laboratory of Psychophysics, Brain Mind Institute, Ecole Polytechnique Fédérale de Lausanne (EPFL), Lausanne, Switzerland; *Service of Orthopaedic Surgery and Traumatology, Centre Hospitalier Universitaire Vaudois and University of Lausanne, Lausanne, Switzerland

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.

Comparison of fastening times with gastric volume assessed by magnetic resonance imaging in children
A. Schmidt1, Ch. Kellenberger1, D. Neuhaus1, E. Heitz1, D. Deanovic1, P. Taffe1, M. Studhalter1, L. Vollmer1, M. Weiss1
Department of Anaesthesia and Radiology, University Children’s Hospital, Zurich

Background: To compare fastening times for solids and fluids with gastric content (ml) per kg body weight. Compared with gastric content (ml) per kg body weight. Effective fastening times, fluids until 2 hours before scheduled induction time of anaesthesia were assessed by magnetic resonance imaging in children. To compare fastening times for solids and fluids with gastric content (ml) per kg body weight. Effective fastening times, fluids until 2 hours before scheduled induction time of anaesthesia were assessed by magnetic resonance imaging in children.

Methods: Children were allowed to eat/drink until 4 hours and to drink clear fluids until 2 hours before scheduled induction time of anaesthesia. 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.

The occurrence of intra-operative hypotension varies between hospitals. Observational analysis of over 147 000 anaesthesia
Patrick Taffé1, Nadine Sicard1, Kristoffer C. Abeg1, Valerie Pittet1, Silvia Richard1, Bernard Bumard1, for the ADS study Group
1Institute of Social and Preventive Medicine, Hospices-CHUV and University of Lausanne, Lausanne, Switzerland; 2Faculté de Médecine, Département de Médecine Sociale et Préventive, Université de Montréal, Montréal, Canada

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 1.0 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. Hospital’s Odds Ratios for hypotension varied between 0.12 to 2.50 (p ≤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 anaesthesia 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.
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 methods: 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) infraportal 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% end-tidal concentration) and reinitiated after 10 min of postconditioning. Primary endpoint was postoperative liver injury assessed by peak value of aspartate-ammonotransferase (AST).

Results: Both sevoflurane postconditioning (n = 19, 518 UI ALT) and intermittent clamping (n = 17, 461 UI ALT) significantly reduced postoperative serum peak levels of AST by compared with the control group (n = 9, 1002 UI ALT), p < 0.05.

Conclusion: This trial might provide the first evidence of the protective effect of postconditioning 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.

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 CSE. C/S was almost always performed under regional anaesthesia both in patients with primary and secondary C/S.


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

Vladimir Krejci1, Andrea Vannucchi1, Ivan Kangrag1
1Department of Anesthesiology, University Hospital of Bern, Inselspital, CH-3010 Bern; 2Department of Anesthesiology, Washington University School of Medicine, Saint Louis, MO, USA

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 volume (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™ (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 APCO (95% confidence interval). A p <0.05 was considered significant. An AUC of 1.0 reflects 100% sensitivity and specificity.

Results: As a measure to predict an increase of SV-TD by ≥15%, APCO 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, 0.65 (0.52 to 0.78; p = 0.032) for PP. For a decrease in SV-TD by ≥15%, APCO was 0.74 (0.59 to 0.89; p = 0.004) for SV-Li, 0.59 (0.40 to 0.77; p = 0.3376) 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 waveforms does not predict changes in stroke volume with an acceptable sensitivity and specificity. The use of different monitors appeared to yield different results.

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

A. Lehmann1, P. Schmuck1, A.H. Kiessling2, J. Boldt3
1Kliniken für Anästhesiologie und Herzchirurgie, Klinikum der Stadt Ludwigshafen, Ludwigshafen, Germany

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. Receiver operating characteristic curves displayed a better specificity (SP) for CI after CPB. Area under the curve (AUC) was 0.61, 95% confidence interval 0.50-0.65, sensitivity (ST) 0.35, 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:

<table>
<thead>
<tr>
<th>CI ≥2 L/min/m²</th>
<th>CI &lt;2 L/min/m²</th>
<th>p-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mortality</td>
<td>4.2%</td>
<td>20.1%</td>
</tr>
<tr>
<td>ABP</td>
<td>2.6%</td>
<td>13.8%</td>
</tr>
<tr>
<td>Heart failure</td>
<td>38.1%</td>
<td>84.5%</td>
</tr>
<tr>
<td>Renal failure</td>
<td>23.0%</td>
<td>53.5%</td>
</tr>
<tr>
<td>Extubation &gt;16 h</td>
<td>30.2%</td>
<td>65.5%</td>
</tr>
<tr>
<td>ICU stay &gt;48 h</td>
<td>29.6%</td>
<td>51.7%</td>
</tr>
<tr>
<td>Hospital stay</td>
<td>10 (8-15) days</td>
<td>13 (12-19) days</td>
</tr>
</tbody>
</table>
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 \( <2 \text{ L/min/m}^2 \) 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 \( <2 \text{ L/min/m}^2 \) after CPB.

The implications of low cardiac power on outcome in patients undergoing cardiac surgery A. Lehmann1, P. Schmuck1, A.H. Kessling2, J. Boldt3
1Klinikum für Anästhesiologie und Herzchirurgie, Klinikum der Stadt Ludwigshafen, Ludwigshafen, Germany

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 specificity (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

<table>
<thead>
<tr>
<th>CPO (&lt;0.45W)</th>
<th>CPO (&gt;0.45W)</th>
<th>p-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mortality</td>
<td>4.6%</td>
<td>22.9%</td>
</tr>
<tr>
<td>MAP</td>
<td>3.2%</td>
<td>11.8%</td>
</tr>
<tr>
<td>Heart failure</td>
<td>40.0%</td>
<td>85.3%</td>
</tr>
<tr>
<td>Extubation &gt;16 h</td>
<td>31.4%</td>
<td>67.6%</td>
</tr>
<tr>
<td>ICU stay &gt;48 h</td>
<td>30.2%</td>
<td>58.8%</td>
</tr>
</tbody>
</table>

If CPO could be increased at the end of surgery \( \geq 0.45 \text{ W} \) mortality was 15%, if CPO remained \( <0.45 \text{ W} \) 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 <60% (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.


Hysterical reaction after intraocular catheter placement for hand surgery: a case report and a review of the literature H. Schaerer, J. Aguiu, R. Ruland, M. Risch, G. Ekatozrannis, A. Borget
Abteilung für Anästhesiologie, Universitätsklinik Balgrist, Zürich

Background: Hysterical reaction 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 arm of an intraocular catheter for hand surgery was followed prospectively along with the related laboratory, electrodiagnostic and imaging data. 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 rate 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.

Massive hydrothorax: a rare complication of gynaecologic laparoscopic surgery in deep endometriosis Plojoux Naïja1, Mathey-Doret Hélène1, Julien Oliver2, Jean-Marie Wenger3, Savoldelli Georges4
1Hôpital Cantonal Universitaire de Genève: 1Service d’anesthésiologie, Dpt APSI, Hôpitaux universitaires de Genève, Suisse; 2Service de gynécologie, Dpt de Gynécologie et obstétrique de Genève, Suisse

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 cupula. 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 thoracosthographic ultrasound confirmed a massive right hydrothorax. Before extubation, chest drainage was performed and maintained for 72 hours. The suspected etiology was a para diaphragm due to pleuro-peritoneal communication secondary to endometriotic nesosis. 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 gynecological 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, thoracosthographic echography should be used to help performing a differential diagnosis.

Naloxone-responsive acute dystonia and parkinsonism following general anaesthesia L.A. Jelin-Chatex1, H. Grötzsch1, M. Besson2, P.R. Burkhard3, G.L. Savoldelli4
1Department of Anaesthesiology; 2Department of Neurology; 3Department of Clinical Pharmacology and Toxicology, Geneva University Hospitals

Various movement disorders such as dystonia may acutely develop during or at emergence of general anesthesia 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 Parkinson disease, we extensively investigated and demonstrated that she exhibited a possible enhanced susceptibility to opioids, involving a genetically determined abnormal function of glycine/glycoprotein-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 antispasmodic agents have been used.
Subcapsular hepatic hematoma in HELLP syndrome: not only a textbook entity!
Nicolas Mariotti, Guy Haller, Ruth Landau, Jean-Louis Blouin, Georges Savoldelli
Hopitaux universitaires de Genève; ¦University of Washington medical school (Seattle)

Case report: A healthy 37 yo woman G2P0 at 35 WA was admitted to the ER for thoracic and right upper quadrant pain (RUPG) 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 shoulder pain and shock, all other signs are frequently encountered in otherwise uncomplicated preeclampsia. This can result in increased heart rate and T-elevation. 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). T-elevation was 4.6–8.1 (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.

<table>
<thead>
<tr>
<th>Group 1 (n = 5)</th>
<th>Group 2 (n = 5)</th>
</tr>
</thead>
<tbody>
<tr>
<td>∆ heart rate [bpm]</td>
<td>26–117 (83)</td>
</tr>
<tr>
<td>T-elevation [yes/no]</td>
<td>1/14*</td>
</tr>
</tbody>
</table>

### Results

**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.

Impact of propofol anaesthesia on ECG changes during intravenous application of a test dose bupivacaine with epinephrine – a pilot animal study
J. Mauch1,2, A.P.N. Kütt3, C. Madjdpour1, N. Koepfer6, A. Frotsler3, R. Bettchart-Wolfsberger3, M. Weiss7
1Department of Anaesthesia and Perioperative Medicine, Kantonsspital Aarau, Switzerland and 2Department of Anaesthesia, University Children’s Hospital Zurich, Switzerland, and 3Section Anaesthesiology, Equine Department, Vetsuisse Faculty University of Zurich, Switzerland

Introduction: Intravascular 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 randomised 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). T-elevation was 4.6–8.1 (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.

<table>
<thead>
<tr>
<th>Group 1 (n = 15)</th>
<th>Group 2 (n = 13)</th>
<th>Group 3 (n = 15)</th>
</tr>
</thead>
<tbody>
<tr>
<td>∆ heart rate [bpm]</td>
<td>18–74 (48)</td>
<td>27–116 (86)</td>
</tr>
<tr>
<td>T-elevation [yes/no]</td>
<td>1/14*</td>
<td>12/1</td>
</tr>
</tbody>
</table>

**Conclusion:** This technique allows quick, safe and effective postoperative pain relief with a good tolerance and a low incidence of side effects.
Epidural anesthesia with ropivacaine 1% for major foot and ankle surgery

Georgios Ekatodramis, José Aguirre, Philipp Ruland, Markus Risch, Alain Borgeat

Abteilung für Anaesthesiologie, Universitätsklinik Balgrist, Zürich

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 an inadvertent intravascular injection.

Methods: After approval by the Local Ethics Committee and 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 new stimulator, and 20 ml of 0.5% ropivacaine was injected. The operation was done under spinal or general anesthesia. Postoperative analgesia was provided with 0.2% ropivacaine for 72 hours, in association with oxycodeone, 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 complaint.

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.

Subclinical femoral neuropathy after anterior cruciate ligament reconstruction

Eric Albrecht1, Fabrizio Gronchi2, Julien Niederhäuser2, Thierry Kunz1, Claus Löcherbach3, Cyril Kombo4, Alain Faron5, Christian Kern1

1Service of Anaesthesiology, Centre Hospitalier Universitaire Vaudois and University of Lausanne, Lausanne, Switzerland; 2Service of Neurology, Centre Hospitalier Universitaire Vaudois and University of Lausanne, Lausanne, Switzerland; 3Service of Orthopaedic Surgery and Traumatology, Centre Hospitalier Universitaire Vaudois and University of Lausanne, Lausanne, Switzerland

Background and aim of the study: Patients with anterior cruciate ligament (ACL) reconstruction and femoral catheter analgesia may develop quadriceps atrophy. We aimed to determine whether this atrophy 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 new 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 oxycodeone, 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 complaint.

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.

Tumescent anesthesia in combination with a femoral nerve block for surgery of varicose veins

0.1% in comparison with 0.2% prilocaine

T. Hiltermann1, A. Dullenkopf2, J. Traber2

1Capio Venensklinik Kreuzlingen; 2St. Lukas Limmatstetten

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

Romai-Daniel Gosselin, Marie Pertin, Isabelle Decosterd
Research Support Unit, Institute of Social and Preventive Medicine, University of Bern, Inselspital, Bern, Switzerland

Neuropathic pain is a common form of chronic pain, and is unsuccessfully alleviated by usual medications. Mounting evidence suggests that neurodegenerative changes within the spinal cord may account for the strengthened spinal nociceptive neurotransmission. Therefore, we investigated whether spinal expressions of GABA (GAT) and glutamate (EAAT) transporters were altered 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-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 modification of GABA and glutamate transport may occur along with SNI-associated painful neuropathy and identity spinal neurotransmitter reuptake machinery as a putative pharmacological target in neuropathic pain.

P 26

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

Konrad Streitberger, Tina Müller, Urs Eichenberger, Michele Curatolo
University Department of Anaesthesiology and Pain Therapy, University of Bern, Inselspital, Bern, Switzerland

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 36% at 6 months, and 0% and 23% at 1 year, respectively. In the 8 patients who were able 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 to 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 27

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

Andreas Siegenthaler, Urs Eichenberger, Kurt Schmidt, Lars Arendt-Nielsen, Michele Curatolo
University Department of Anaesthesiology and Pain Therapy, University of Bern, Inselspital, Bern, Switzerland

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 hypothesized 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. Zygoprophysical 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 28
Feasibility and reliability of a variable ventilation mode run by a remotely controlled ventilator

Peter Schumacher, Daniel Leibundgut, Balthasar Eberle
Department of Anaesthesiology and Pain Medicine, University Hospital Insel, Bern

Background: Biologically variable ventilation results in better oxygenation of compromised lung units of animals and humans (Mutch BJAA 2000, Boker AJRCMCC 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 ventilation 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 CO2 confirmed adequate tidal volumes for CO2 excretion.

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.

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.

Roberto Romano M.D.1, Bruno Vandeweghe2, physiotherapist
1Dpt Anesthesiology, 2Physiotherapy Unit, HFR Riaz

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 doctor nor algorithm exists 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-airway-pressure (bNIV) ventilator.

Results: The NIV safety and efficiency was increased with the implementation 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.


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

M.H. Dave, N. Koepfer, C. Madjidpour, A. Frotzler, M. Weiss
Department of Anaesthesia, University Children’s Hospital, Zurich

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 75 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), Microut, Ruschellit 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 H2O 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 H2O. 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/min 0.23–4.47 ml respectively.

Conclusion: Gel lubrication, PPV alone 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/min 0.23–4.47 ml respectively.


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

M.H. Dave, N. Koepfer, C. Madjidpour, A. Frotzler, M. Weiss
Department of Anaesthesia, University Children’s Hospital, Zurich

Background: Tapered tracheal 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: 75 mm internal diameter (ID) tracheal tube cuffs – Tapered Seal Guard (TSG), Standard Seal Guard (SSG), Hi-Lo tracheal tube (all Covidien), Microut (KCC), Ruschellit 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 un lubricated 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 performed twice 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 α <0.05).

Results: Fluid leakage (ml) at 60 min in mean (SD) was 2.45 (1.38), 1.54 (0.53) 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 Microut 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.

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

M.H. Dave, N. Koepfer, C. Madjidpour, A. Frotzler, M. Weiss
Department of Anaesthesia, University Children’s Hospital, Zurich

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 5, 10, 15 and 25 cm H2O and positive end expiratory pressures (PEEP) of 5 and 10 cm H2O 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 H2O 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 –10 cm H2O. Higher (–300 cm H2O) suction pressure resulted in much more fluid leakage than lower (–200 cm H2O) pressure at PIP of 15 cm H2O (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.


Transfusion practice in early trauma management
C. Heim, S. Di Marzo, P. Frascarolo, P. Schoettler
Service d’anesthésiologie CHUV-Lausanne

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 Sion. We collected and analyzed the data of 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 anaesthesiological management. Coagulopathy was defined as PT <70%, PTT >60 sec, Fibrinogen <1 g/l or Thrombocytes <100 x 10³/µl.

Results: In 2008, 332 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).

<table>
<thead>
<tr>
<th>Product</th>
<th>n</th>
<th>Median amount</th>
<th>IQR</th>
</tr>
</thead>
<tbody>
<tr>
<td>RBC</td>
<td>49</td>
<td>89.1</td>
<td>3</td>
</tr>
<tr>
<td>FFP</td>
<td>34</td>
<td>61.8</td>
<td>2.0–6.0</td>
</tr>
<tr>
<td>Thromboyes</td>
<td>9</td>
<td>5.1</td>
<td>5.0–5.0</td>
</tr>
<tr>
<td>Fibrinogen</td>
<td>7</td>
<td>12.7</td>
<td>1.0–1.0</td>
</tr>
<tr>
<td>Prothromplex IU</td>
<td>9</td>
<td>16.4</td>
<td>1200–900</td>
</tr>
<tr>
<td>Protamine mg</td>
<td>1</td>
<td>1.8</td>
<td>50</td>
</tr>
<tr>
<td>Novo-Seven</td>
<td>2</td>
<td>3.6</td>
<td>NA</td>
</tr>
</tbody>
</table>

Arrival % | End % | P  
---|---|---|
PT <70% | 48.9 | 52.4 | 0.91 |
PTT >60 sec | 10.9 | 23.0 | 0.26 |
T<100 x10³/µl | 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 |

Transfusion practice was overestimated.

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.

Interrahospital aeromedical transfers: need for a specific training
P.-N. Carron, L. Vallotton, B. Yersin
Service des Urgences, Centre Hospitalier Universitaire Vaudois, Lausanne, Suisse; Service d’Anesthesiologie, Centre Hospitalier Universitaire Vaudois, Lausanne, Suisse

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 2004 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 time (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.

Intraosseous infusion in children with failed venous access after inhalational induction of anaesthesia
Dept. of Anaesthesia, University Children’s Hospital, Zurich; Dept. of Anaesthesia, Royal Children’s Hospital, Aberdeen, UK; Instute of Anaesthesiology, University Hospital Zurich; Dept. of Anaesthesiology, University Medical Centre, Göttingen, Germany

Background: Although commonly used in the 1940s, intraosseous infusion is rarely used 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 of 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
Intraosseous infusion in paediatric prehospital emergency care – a 10 year analysis

A. Sommer, D. Deanovic, F. Kunz, M. Weiss, D. Neuhaus
Department of Anaesthesia, University Children’s Hospital, Zurich

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 prehospitaly. The pain-, respiratory- and seizure patients were all reported as admitted to hospital in improved conditions. According to the intravascular medication via intraosseous access 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.

Discussion: The presented data shows that intraosseous 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 condition already on scene.


P 39

Use of intraosseous infusion in paediatric anaesthesia – A questionnaire analysis

D. Neuhaus, G. Herze, A. Froitzler, M. Weiss
Universitäts-Kinderkliniken Zürich

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 BIO®-(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 (95%), traumatic shock (96%) and laryngospasm (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 liles (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 frequent complication (n = 9).

Conclusion: Based on this preliminary study, 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 on-site 144 dispatcher

F. Dami1,2*, V. Fuchs3, L. Valotton1, E. Peclard2, P. Carron1
1Service des Urgences, CHUV, Lausanne; 2Fondation Urgence Sante 144 VD; 3Service d’Anesthésiologie, CHUV, Lausanne; 4Groupe Sanitaire, Lausanne

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” was developed for rescue operations in major accidents 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 syndrome reduces the “call-to-balloon-time”

M. Löthy1, M. Zürcher1, W. Unmenhofer1, S. Marsch2, R. Hunziker1
1Department Anästhesie, Universitätsklinik Basel; 2Klinik für Intensivmedizin, Universitätsklinik Basel

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

Martin Umer1,2, Liva Reyes1, Marco Maggioni3, Beatrice Beck-Schimmer1,2
1Institute of Anesthesiology, University Hospital Zurich, Switzerland; 2Zurich Center for Integrative Human Physiology, University of Zurich, Zurich, Switzerland

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 were preincubated for 1 hour with or without dexamethasone (10−7 mol/l) under normoxic conditions were subsequently exposed to hypoxic conditions (5% O2) for 24 hours. Protein and mRNA expression of the neutrophil chemotactic factor CINC-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 levels 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 unaltered upon exposure to hypoxia and remained unaltered by 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.

standard coagulation test (processing time in laboratory averages 43.9 min) and 20.7 min. For Fibtem-MCF, the coagulation test according to Claus. Time to results was clearly shorter with the Fibtem-MCF, information about coagulation disorder is available faster by rotation thromboplastometry.

Protamine inhibits conversion of prothrombin to thrombin

D. Böliger1, F. Stolz1, J.H. Levy1, K.A. Tanaka1
1Department Andästhesie, Universitätsklinik Basel; 2Department of Anesthesiology, Emory University School of Medicine, Atlanta, USA

Introduction: Protamine sulfate is the standard antidote for heparin anticoagulation. Previous studies have shown that protamine can exert weak anticoagulation via intrinsic and intrathymic pathway. Therefore, we evaluated the anticoagulation effects of protamine and potential reversal factors 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 PMF 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 adding phospholipid, dilute Russel viper venom (dRVV) screen and confirm tests were performed. To evaluate potential reversal agents we added increasing concentrations of prothrombin complex concentrate (PCC, Berlex®, 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 154%. 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 should be carefully titrated.


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

D. Böliger1, M.D. Seeberger1, M. Gregor1, U. Zenkhusen1, M. Grapow1, M. Filipovic1
1Department Andästhesie und 2Kardiochirurgische Klinik, Universitätsspital Basel

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 specimens 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 anaesthesia. The first sample was defined as reference value. The second sample was analyzed after PTS transport or no transport. 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.


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

N. Koepfer1, A. Frotzler1, J. Mauch1, M. Weiss1, C. Madjidpour1
1Department of Anaesthesia, University Children’s Hospital Zurich, Switzerland; 2Department of Anaesthesia and Perioperative Medicine, Kantonsspital Aarau, Switzerland

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 (INR) 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).

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

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

N. Koepfer1, A.P.N. Kutter1, J. Mauch1, A. Frotzler1, R. Bettschart1, M. Weiss1, C. Madjidpour1
1Department of Anaesthesia, University Children’s Hospital Zurich, Switzerland; 2Section Anaesthesiology, Equine Department, Vetsuisse Faculty University of Zurich, Switzerland

Background and objectives: To investigate intrarater and interrater 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 (p = 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 Apektr (both r = 0.49, p <0.05) and ranged from 0.68 to 0.96 (p <0.05).
Material and methods:
Fastrach. We report preliminary results of the first 105 patients.

Background:
With IRB approval and patient informed consent, this Department of Anesthesiology, University Hospital and University, Lorenz Theiler, M.D., Thomas Graf, M.D., Natalie Urwyler, M.D., Fiberoptic intubation through the i-gel™ vs. LMA Fastrach™ Blind Intubation Success, n (%) 6 (15) 27 (69) <0.001 i-gel cannot be recommended and fibreoptic scope for guidance is in predicted difficult airway patients.

Discussion and conclusion:
Fiberoptic 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

<table>
<thead>
<tr>
<th>Material and methods:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Differences in blind intubation through the i-gel™ compartment to the LMA Fastrach™</td>
</tr>
<tr>
<td>Lorenz Theiler, Thomas Graf, Natalie Urwyler, Cedric Luyet, and Robert Greif</td>
</tr>
<tr>
<td>Department of Anesthesiology, University Hospital and University, Bern, Switzerland</td>
</tr>
</tbody>
</table>

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 fiberoptically 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 fiberoptic 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 fiberoptic 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 fiberoptic scope for guidance is necessary. Reshaping of the i-gel airway outlet may be beneficial.

Table 1

<table>
<thead>
<tr>
<th>Material and methods:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Prospetive multicenter clinical evaluation of the cuffless supraglottic airway device i-gel</td>
</tr>
<tr>
<td>Mirko Guttmann, Jacqueline Roemer, Lorenz Theiler, Natalie Urwyler, and Robert Greif</td>
</tr>
<tr>
<td>Department of Anesthesiology, University Hospital and University, Bern, Switzerland</td>
</tr>
</tbody>
</table>

Background: This industry independent multi center clinical observation trial investigates a large population of i-gels 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/m², ASA class I in 41%, II in 43%, ≥III in 16%, 60% 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 2

<table>
<thead>
<tr>
<th>Material and methods:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Evaluation of the GlideScope® for tracheal intubation in patients with cervical spine immobilization by a semi-rigid collar</td>
</tr>
<tr>
<td>Istvan Bathory, Christian Kern, Patrick Schoetterl, CHUV Lausanne</td>
</tr>
</tbody>
</table>

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.

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.