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FM 1

Sevoflurane postconditioning reduces postoperative complications in patients undergoing liver resections

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Introduction: Hepatic inflow occlusion is a routine procedure to reduce intraoperative blood loss during liver resection. This manoeuvre however is associated with ischemia-reperfusion injury and may worsen clinical outcome. It has been previously shown that volatile anesthetics can protect against ischemia-reperfusion injury when used prior to the onset of ischemia, rendering the organ less vulnerable to a following injury (preconditioning).
Objectives: To compare the protective effects of sevoflurane, administered after hepatic inflow occlusion (postconditioning) with an established preventive strategy (ischemic conditioning) in liver resection. Tissue markers such as liver transaminases were defined as primary, postoperative complications according to Dindo [1] as secondary endpoints.
Materials and Methods: Patients undergoing liver surgery with hepatic inflow occlusion were randomized into 3 groups: [a] postconditioning with sevoflurane after inflow occlusion (SEVO; n = 48) [b] ischemic conditoning (ISCH; repetitive 15 min clamping, 5 min reperfusion; n = 50), and [c] control group (CON; continuous inflow occlusion; n = 17). In all of the patients, anesthesia was performed with propofol. In the SEVO group upon reperfusion, propofol infusion was stopped and replaced by sevoflurane for 15 min.
Results: Peak values of transaminases were significantly reduced in the SEVO (AST median, IQR: –347 [–646 to –48, p = 0.02]) and ISCH (–193 [–345 to –42, p = 0.01]) group compared to CON. Major complications were lower in both treatment groups (see table).
Conclusions: This is the first randomized controlled trial showing that postconditioning with volatile anesthetics is protective during liver surgery reducing organ injury as well as postoperative complications. Application of a volatile anesthetic is an easy, but effective intervention, which could be performed in individual cases requiring inflow occlusion.

Table
Comparisons of postoperative outcomes for ischemic conditioning (ISCH) and sevoflurane postconditioning (SEVO) versus control (CON).

	CON	ISCH	SEVO	ISCH vs CON	SEVO vs CON
				Odds ratio	Odds ratio
Any complication, n (%)*	13 (77)	23 (46)	12 (25)	0.50 (0.3–0.9, p = 0.03)	0.10 (0.0–0.4, p <0.01)
Major complication (3a-5), n (%)*	7 (42)	8 (16)	5 (10)	0.50 (0.3–1.0, p = 0.04)	0.16 (0.0–0.6, p <0.01)
ICU stay, number (%)	3 (18)	9 (18)	3 (6)	1.00 (0.5–2.1, p = 0.99)	0.30 (0.1–1.7, p = 0.2)

* as assessed by the treatment-oriented complication score [1]

[1] Dindo D et al. Ann Surg. 2004;240:205–13.

FM 2

Transcutaneous nicotine does not prevent postoperative nausea and vomiting: a randomized controlled trial

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Aims: There is empirical evidence that smokers are less likely to suffer from postoperative nausea and vomiting (PONV). We sought to investigate whether transcutaneus nicotine prevents PONV.
Methods: Non-smokers receiving a general anaesthesia for surgery were randomly allocated to Nicotinell® Patch 10 cm^2 (TTS 10), containing 17.5 mg of nicotine (average delivery rate, 7 mg 24 h^{-1}), or matching placebo patch. Patches were applied one hour before surgery and were left in situ until 24 hours after surgery (or until the first PONV symptoms occurred).
Results: We randomized 90 patients (45 nicotine, 45 placebo). In the post-anaesthetic care unit, the incidence of nausea was 22.2% with nicotine and 24.4% with placebo (P = 0.80), and the incidence of vomiting was 20.0% with nicotine and 17.8% with placebo (P = 0.78). Cumulative 24 hours incidence of nausea was 42.2% with nicotine and 40.0% with placebo (P = 0.83), and of vomiting was 31.1% with nicotine and 28.9% with placebo (P = 0.81). PONV episodes tended to occur earlier in the nicotine group. Postoperative headache occurred in 17.8% of patients treated with nicotine and in 15.6% with placebo (P = 0.49). More patients receiving nicotine reported on a low quality of sleep during the first postoperative night (26.7% versus 6.8% with placebo; P = 0.01).
Conclusions: Non-smokers receiving a prophylactic nicotine patch had a similar incidence of PONV during the first 24 hours and tended to develop PONV symptoms earlier compared with controls. They had a significantly increased risk of insomnia during the first postoperative night.
Trial Registration: clinicaltrials.gov identifier: NCT00553709.

FM 3

Intravenous d-9THC (Cannabis) does not prevent postoperative nausea and vomiting (PONV)

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Background: Postoperative nausea and vomiting (PONV) complicates and prolongs hospitalization. Effectiveness of oral THC against PONV is debated [1]. Oral THC undergoes extensive first pass metabolism and it is unpractical to give perioperatively. We therefore evaluated the effects of *intravenous* THC in high-risk patients undergoing elective surgery under general inhalation anesthesia in a prospective, randomized, placebo-controlled, double blind trial.
Methods: With IRB approval and informed consent, 40 of 320 planned patients (39 females) were randomly assigned in blocks (taking into account smoking status and history of PONV) to receive either placebo or one dose of 0.125 mg/kg THC iv 15 min before the end of surgery. Primary outcome was incidence of nausea. Data are presented as mean ± SD, number, or percentage.
Results: Demographic data did not differ between groups. Despite randomization, surgery time was shorter in the THC group (144 vs. 212 min, p = 0.02). Incidence of nausea did not differ significantly between groups (table). There were no differences in vomiting at all time points. Retching was more frequent in the THC group in the first 2 hours (53% vs. 21%, p = 0.04). Time to extubation was longer in the THC group (20 ± 16 vs. 12 ± 6 min, p = 0.04). During the first 30 minutes, patients in the THC group showed higher scores for confusion (p <0.01), anxiety (p = 0.03), change of perception (p <0.01), and sedation (p <0.01). PCA fentanyl consumption was lower in the first 2 hours (p = 0.03) in the THC group. There were no significant cardiovascular or respiratory side effects noted. One patient experienced extensive mood swings during the first 24h after surgery.
Conclusion: Intravenous THC given before emergence is not effective against PONV. The major side effect is sedation, which might explain the decreased opioid consumption. While intravenous THC imposes no cardiorespiratory risks, it seems unsuitable as an adjunct; and we therefore stopped the study after 40 patients due to side effects and lack of benefits.

Incidence of nausea. Data in % or mean ± SD

	THC n = 19	Placebo n = 21	p-value
Nausea overall y/n	58/42	67/33	0.57
Early nausea (0–2h) y/n	47/53	48/52	0.99
Nausea 2–6h postop y/n	21/79	29/71	0.58
Late Nausea (6–24h) y/n	6/94	14/86	0.37
Highest nausea score (0–10)	3.7 ± 3.5	4.1 ± 3.2	0.65

Reference:
1 MR Tramèr, D Carroll, FA Campbell, et al. A qualitative systematic review Cannabinoids for control of chemotherapy induced nausea and vomiting: quantitative systematic review. BMJ. 2001;323:1–8.

FM 4

An intravenous infusion of lidocaine has no impact on rocuronium-induced neuromuscular block but improves intubation conditions. Randomised study

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Background: Lidocaine has neuromuscular blocking effects. We studied the effect of an intravenous infusion of lidocaine on intubation conditions and the time course of the neuromuscular blockade with an intubation dose of rocuronium.
Methods: Fifty-two adults undergoing surgery were randomly allocated to intravenous lidocaine 1.5 mg kg^{-1} followed by an infusion of 2 mg kg^{-1} h^{-1} or physiological saline (control) throughout surgery. Anaesthesia was induced and maintained with a target controlled propofol infusion and sufentanil. After loss of consciousness, rocuronium 0.6 mg kg^{-1} was given. Neuromuscular transmission was measured using TOF-watch SX acceleromyography. Intubation conditions were scored by a blinded observer using a validated three-item scale.
Results: Onset time was analysed in 26 lidocaine patients and 26 controls, recovery in 26 lidocaine patients and 25 controls, and intubation conditions in 26 lidocaine patients and 26 controls. Onset time (to 95% depression of T1) was on average 113.9 sec [SD 35.3] with lidocaine and 119.5 sec [44.9] with saline (P = 0.618). Total recovery time (to TOF 0.9) was on average 58.1 min [15.1] with lidocaine and 54.3 min [16.9] with saline (P = 0.394). Clinical duration was on average 33.3 min [7.2] with lidocaine and 30.6 min [8.1] with saline (P = 0.21). Recovery index was on average 11.5 min [5.0] with lidocaine and 10.6 min [4.1] with saline (P = 0.458). Recovery time was on average 24.8 min [9.3] with lidocaine and 23.2 min [9.2] with saline (P = 0.541). Of 26 lidocaine patients, 22 (85%) had excellent and 4 (15%) had good intubation conditions; of 26 controls, 14 (54%) had excellent and 12 (46%) had good intubation conditions (P <0.016).
Conclusion: An intravenous lidocaine infusion has no impact on onset or recovery times after a single intubation dose of rocuronium but significantly improves intubation conditions.
Trial Registration. clinicaltrials.gov identifier: NCT00828373.

FM 5

Learning Curves for Rigide Intubation Videostylets

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Background: Rigid intubation stylets are alternatives in the management of expected and unexpected difficulties in airway management. So far, no comparative studies have investigated the efficacy and learning process for the use of the Bonfils Intubation Endoscope (Karl Storz GmbH, Tuttligen, Germany) in contrast to the SensaScope (Acutronic Medical Systems AG, Hirzel, Switzerland). Previous reports mention that for new users of the devices more than 20 uses are needed for successful intubation with the Bonfils stylet [1] but no more than 2 uses for the SensaScope [2]. We were interested in the learning curves of the two devices used by senior anesthesiologists experienced in flexible fibreoptic intubation (>100 uses) and hypothesized that no more than 5 uses are necessary in elective anesthetized patients without predictors of difficult airway management.
Methods: Non of the participants had any prior experience with these devices but were trained 5 times with both devices in an intubation manikin (Laerdal®Airway Management Trainer, Stavanger, Norway). With informed consent patients were intubated with the either the SensaScope or the Bonfils in random order. Each participant intubated 10 patients per device. Major outcome was the time needed until successful intubation. Time was recorded from the removal of the face mask until connection of the respiratory cycle. ANOVA compared the attempts for each device. A p <0.05 was considered as significant.
Results: These preliminary results include 9 out of 15 participating anesthesists who completed the trial (one woman, eight men, 46 ± 6 years of age with 15 ± 6 years in anesthesia). Mean intubation time was comparable (59 ± 18 sec for Bonfils, 55 ± 13 for SensaScope, p = 0.296). First attempt success rate was 80% for Bonfils and 71% for SensaScope (p = 0.225). No learning curve was found for both devices (ANOVA) in that setting.
Conclusion: For anesthesiologists experienced in flexible fibreoptic intubation, training 5 times on a manikin seems to be sufficient to achieve confidence in the application of the Bonfils and the SensaScope. Further studies with inexperienced residents and in patients with predictors of difficult airways are the next steps of our research group.

References:
1 The Bonfils intubation fibrescope: clinical evaluation and consideration of the learning curve. Corbanese U et al. EJA. 2009;26:622.
2 First clinical experience of tracheal intubation with the SensaScope. Biro P et al. BJA. 2006;97:255.

FM 6

Benefit and harm of high inspired oxygen fraction during general anesthesia: systematic review and meta-analysis of randomized controlled trials

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Context: High-inspired oxygen fraction has been proposed as an easy and inexpensive way to reduce the incidence of surgical site infection (SSI) and postoperative nausea and vomiting (PONV). However, it remains unclear whether, and to what extent, supplemental oxygen during surgery has any beneficial effect on outcome. Also, intraoperative hyperoxia has been incriminated as a risk factor for atelectasis formation.
Objective: To quantify benefit and harm of intraoperative high-inspired oxygen fraction.
Data Sources: Comprehensive search (MEDLINE, EMBASE, CENTRAL, bibliographies) for full reports of randomised trials, to 03.2011, without language restriction.
Study Selection: "High" oxygen fraction was defined as an inspired oxygen fraction ≥50%, "low" oxygen fraction as ≤50%. Studies had to test a difference ≥50% between high and low fraction. We eventually analysed data from 16 studies (3,529 patients).
Data Extraction Information on patient characteristics, trial design, oxygen fractions in experimental and control groups, and outcomes were extracted using a standardised protocol. Outcomes included SSI, PONV, and pulmonary complications.
Results: Four trials (2,337 patients) reported on the incidence of SSI. With high oxygen fraction, the incidence was 16%, with low oxygen fraction 18.1%; RR 0.86 (95%CI 0.52–1.40). Eight trials (811 patients) reported on the incidence of late nausea (0–24 hours). With high oxygen fraction, the incidence was 27.4%, with low oxygen fraction 37.4%; RR 0.74 (0.61-0.88), NNT 10. Seven trials (771 patients) reported on the incidence of late vomiting. With high oxygen fraction, the incidence was 17.9%, with low oxygen fraction 25.9%; RR 0.69 (0.53–0.88), NNT 13. Data on pulmonary complications could be extracted from four trials (1,606 patients). Two failed to show a difference between high and low oxygen fraction on the incidence of postoperative atelectasis. In one, there was evidence of a statistically significant worsening of the PaO_2/FIO_2 ratio in patients receiving supplemental oxygen. One reported on significantly worse postoperative spirometry values with high oxygen fraction.
Conclusions: High-inspired oxygen fraction may be considered as part of a multimodal approach to further reduce the risk of PONV. The initially reported beneficial effect on the incidence of SSI cannot be confirmed. Data reporting on pulmonary complications are too sparse to allow drawing meaningful conclusions.

FM 7

Can a practical course in anaesthesia promote 4th year medical students to choose anaesthesia as a career path?

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Background: Recruitment of residents for our specialty is of concern for anesthesia societies. Deciding on anaesthesia as a career path was linked to personal operating experience and expert knowledge as a motivational force. We were interested in the effect of a one week practical course in anesthesia on the hypothesized selection of a medical specialty in fourth year undergraduate medical students.
Methods: All medical students at the University of Bern participated in a mandatory 4-hour anesthesia seminar that includes airway management and full-scale simulation of an anaesthesia case in the 4th year of an undergraduate medical university program. Furthermore all students took a one week mandatory anaesthesia practical course. A simulation session on anesthesia cases was scheduled for all Monday morning and Friday afternoon. During the other days of the week a senior anaesthetist taught, demonstrated and supervised each student in a 1:1 setting. The mandatory learning goals were successful mask ventilation, establishment of I.V. access and patient monitoring with interpretation of the obtained measurements. Students were assessed 1. on their attendance during the week, 2. a direct observation of a procedural skill (DOPS) on one of the learning goals as formative assessment by the end of the week, and 3. a written report on their achieved clinical competencies. With informed consent

all students were asked about their possible future decision for a medical subspecialty according to the FMH specialist list using an internet based questionnaire.
Results: 141 students, 24.5 ± 1.7 years of age, 74 men (52%) took the mandatory anaesthesia course in 18 groups of 8 students in 2010. The Students rated the 4-h simulation session globally very good (5.7 ± 0.6 on a 6 point scale), as well as the content with 5.6 ± 0.6 and the didactic with 5.5 ± 0.7. After 6 months 108 students (77%) responded to the questionnaire and 20 (18.4%) selected anesthesia as their possible choice of specialty.
Conclusion: Even the relatively short one week practical course in anaesthesia during the 4th year with its intense 1-on-1 mentoring identified a surprisingly high rate of 18% of the students who possibly want to choose anesthesiology for their occupational future. This rate is very high compared to the 4.8% of physicians who work as licensed anesthesiologists in Switzerland in 2010.

FM 8

Effects of a Standardized Patient based Training on the Performance of 4th Year Students during a Pre-anaesthesia Patient Assessment: A Rater Blinded RCT

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Background: Medical schools often limit their time for practical anaesthesia course. It is therefore of up most importance to have effective and efficient teaching methods to train students in the basic understandings of the pre-anaesthesia patient assessment. Because of limited time resources of clinicians we were interested in teaching effects with non physicians and asked if a 30 min. teaching by trained standardized patient (SP) improve the performance of 4th year medical students in the pre-anaesthesia patient assessment with real patients?
Methods: All 4th year medical students at the University of Bern received a lecture on a pre-anaesthesia visit starting their 1 week anaesthesia practical course. With written informed consent 144 students were afterwards randomized to control (n = 71) or training (n = 73). The later were taught individually by the SPs for 30 min. Experienced anaesthesiologists blinded to the students' training assessed their performance on a real pre-anaesthesia patient encounter with an adapted mini-CEX. We assessed: history taking, airway assessment communication of peri-operative management, ASA Status Classification, organisation and efficiency, professional behaviour, and overall impression. T-tests compared mean scores and effect size (Cohen's d) was computed.
Results: From 144 students 136 mini-CEX were performed. Trained students (n = 70) scored significantly higher compared with none trained (n = 66) for overall impression (8.8 ± 0.8 vs. 8.3 ± 0.9, p = 0.002; effect size: 0.56). Trained students scored higher in history taking (8.6 ± 1.0 vs. 8.2 ± 1.0, p = 0.020), ASA Status Classification (8.8 ± 1.1 vs. 8.3 ± 1.3, p = 0.050), organisation and efficiency (8.5 ± 1.3 vs. 7.9 ± 1.2, p = 0.019) and professional behaviour (9.2 ± 0.9 vs. 8.8 ± 1.1, p = 0.022) but not in airway assessment (8.8 ± 1.1 vs. 8.4 ± 1.3, p = 0.113), communication of peri-operative management (8.1 ± 1.4 vs. 7.8 ± 1.5, p = 0.418).
Conclusion: A single encounter with trained SP significantly improves the performance of 4th year medical students in pre-anaesthesia patient assessment. Remarkably one 30 minute teaching sequence of a non physician revealed a medium effect size on the overall impression. The reason why no significant differences in airway assessment were found might be that the lecture already covered the necessary content of these scoring systems which could not be improved by the SP encounter. Long term effects of the intervention could not be analysed within the study's framework.

FM 9

Are there common perioperative factors shared by postoperative delirium and postoperative cognitive dysfunction?

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Background: Postoperative cognitive dysfunction (POCD) and delirium occur frequently after surgery in elderly patients and share some characteristics; however, it is unclear whether they are the same entity albeit with different degrees of severity of symptoms. We compared perioperative parameters in elderly patients to test the hypothesis that delirium is associated with the same perioperative factors as POCD.
Methods: 80 patients >65 yrs undergoing elective major surgery (excluding cardiac- and neuro-surgery) under standardized general anaesthesia were investigated. Intraoperative cerebral blood flow was monitored by transcranial Doppler assessing and near-infrared spectroscopy was used to assess cerebral oxygenation. Blood samples (Hb, CRP) were obtained preoperatively, 3 and 7 days postoperatively. Cognitive function was assessed preoperatively and 7 days postoperatively using the CERAD-Neuropsychological Assessment Battery. POCD was defined as a postoperative decline >1 z-score in at least 2 cognitive domains. Screening for delirium was performed for the first 7 postoperative days using the Confusion Assessment Method (CAM).
Results: 42 patients (53%) had no postoperative cognitive impairment, 27 (33%) developed POCD and 11 (14%) delirium. Results are shown in table 1 and 2. There was no difference between the groups regarding intraoperative cerebral perfusion, oxygenation or desaturations.
Conclusion: POCD and postoperative delirium seem to share associations with some perioperative factors but differ in others, particularly blood loss and duration of anesthesia. This suggests that delirium may be more than just a severe form of POCD.

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Table 1
ANOVA, post-hoc LSD.

Mean ± SD	Age [yrs]	CERAD preop [points]	Blood loss [ml]	Duration of anesthesia [min]	Hospital stay [d]
No POCD	72 ± 6*+	75 ± 14	349 ± 354+	269 ± 86+	11 ± 4+
POCD	75 ± 7§	75 ± 11	376 ± 420+	271 ± 99+	13 ± 7
Delirium	76 ± 7§	69 ± 11	**750 ± 567§***	**383 ± 157§***	18 ± 11§

* Significantly different to POCD, + significantly different to delirium, § significantly different to no POCD

Table 2
Repeated measures ANOVA.

Mean ± SD	CRP preop [mg/l]	CRP d3 [mg/l]	CRP d7 [mg/l]	Hb preop [g/l]	Hb d3 [g/l]	Hb d7 [g/l]
No POCD	5 ± 7	105 ± 60+	47 ± 35	136 ± 18	97 ± 12	106 ± 10+
POCD	22 ± 60	168 ± 116	58 ± 57	133 ± 17	103 ± 13	108 ± 14+
Delirium	9 ± 8	236 ± 96§	74 ± 53	121 ± 23	93 ± 13	91 ± 5§*

* Significantly different to POCD, + significantly different to delirium, § significantly different to no POCD

FM 10

Few effects of hypnosis on outcome in patients undergoing colonoscopy – a randomized controlled trial

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

FM 11

Cervical facet joint nerve blocks, a novel technique based on ultrasound guided needle placement

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Background and aims: Cervical facet joint nerve blocks are typically performed with fluoroscopic needle guidance. The use of ultrasound imaging to block the third occipital nerve has been described in a previous study, but whether this technique is accurate to block the remaining cervical medial branches, is unknown. The aim of this study was to determine the accuracy of ultrasound guided cervical facet joint nerve blocks.
Methods: In 60 volunteers, ultrasound imaging was used to place the needle to the bony target of cervical facet joint nerve blocks. The level of needle placement was determined by randomization (1–3 levels per volunteer). After ultrasound guided needle placement and application of 0.2 ml of contrast dye, fluoroscopic imaging was performed and the pictures saved for later evaluation by a blinded pain physician.
Results: A total of 106 needles were placed in 60 volunteers. In 90 attempts, the contrast dye reached the bony target, corresponding to a simulated block success rate of 85% (95% CI 78–92%). Successful block rate varied from 94% (95% CI 84–100%) for a medial branch block of C4 to 88% (95% CI 74–100%) for a third occipital nerve block, the great exception being the C7 medial branch, where successful block was achieved in only 41% (95% CI 19–63%).
Conclusions: Ultrasound imaging is an accurate technique to perform cervical facet joint nerve blocks in healthy volunteers, with exception of medial branch blocks of C7, where accuracy was low.

FM 12

Comparison of four different rescue regimens to treat circulatory arrest due to bupivacaine intoxication – An experimental study in neonatal pig

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Background: Local anesthetic (LA) intoxication with cardio-vascular arrest is a potential fatal complication of regional anesthesia in anesthetized children. Recently, lipid-resuscitation for early treatment of LA toxicity with cardiac arrest has been promoted. Aim of the study was to investigate four different rescue regimens using epinephrine and/or Intralipid® and vasopressin to treat cardiac arrest due to bupivacaine intoxication.
Methods: Piglets were randomized into four groups, anesthetised with sevoflurane, their trachea intubated and ventilated. Bupivacaine was continuously infused by a syringe infusion pump through a central venous line at rate of 1 mg/kg/min until circulatory arrest (pulseless electrical activity was defined as mean arterial pressure (MAP) 25% of initial value, corresponding to 12–13 mm Hg). Then, bupivacaine infusion and sevoflurane were stopped, chest compression was started and the pigs were ventilated with 100% oxygen. One minute later epinephrine 10 µg/kg (group 1), Intralipid® 20% 4 ml/kg (group 2), epinephrine 10 µg/kg + Intralipid® 4 ml/kg (group 3) or Vasopressin 2 U + Intralipid® 4 ml/kg (group 4) was administered. Return of spontaneous circulation was defined as MAP >40% of initial value. Epinephrine rescue 10 µg/kg (in case of circulatory arrest) or 3 µg/kg (if MAP ≤75%) was given every 5 minutes if necessary. Hemodynamic course was recorded. Results are given in median (range).
Results: Twenty-eight piglets (4x7) aged 27 days (13–36) and weighing 5.1 kg (4.3–6.1) were investigated. Total amount of bupivacaine administered was 7.7 mg/kg (6.0–10.6) in group A, 9.0 mg/kg (5.6–10.5) in group B, 10.2 mg/kg (5.1–20.2) in group C and 8.0 mg/kg (6.4–14.6) in group D. Bupivacaine intoxication caused pulseless electrical activity and asystole.

Number of surviving pigs and intervention leading to ROSC:

	Group A	Group B	Group C	Group D
Surviving Pigs	5	2	6	4
ROSC due to study drug	5	0	6	0
ROSC due to epinephrine 10 µg/kg	0	2	0	4

Number of surviving pigs receiving low dose epinephrine for hemodynamic support:

Epinephrine 3 µg/kg	Group A (n = 5)	Group B (n = 2)	Group C (n = 6)	Group D (n = 4)
0x	2	1	6	3
1x	2	–	–	–
2x	1	1	–	1

Conclusion: During resuscitation of bupivacaine induced cardiac arrest in piglets spontaneous circulation did not return after administration of Intralipid® alone or vasopressin+Intralipid®. First line rescue with epinephrine and epinephrine + Intralipid® was more effective with regard to survival. The later did not need further epinephrine rescue after ROSC.

FM 13

Effect of balanced versus unbalanced HES solution on cytokine response in a rat model of peritonitis

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Background and objectives: Sepsis with multiple organ failure remains a leading cause of death in intensive care units. Acute renal failure (ARF) is a common complication of severe sepsis and septic shock. The effect of hydroxylethyl starch (HES) on kidney as well as on liver tissue remains controversial and has never been tested in detail. We investigated in a model of fecal peritonitis the influence of fluid resuscitation with HES 6% in unbalanced versus balanced solution on inflammatory mediator expression in renal and hepatic tissue.

Methods: Cecal ligation and puncture was performed in anesthetized Wistar rats (CLP group). Sham group animals were treated the same manner but without CLP. One hour after this procedure ringer lactate (RL) was intravenously infused to all animals at a volume of 30 ml/kg. Two hours after initiation of injury rats received RL (control, 75 ml/kg), unbalanced HES 130/0.42 (HES, 25 ml/kg) or balanced HES 130/0.42 (Tetraspan, 25 ml/kg). Animals were euthanized 4 hours after induction of peritonitis. Monocyte chemotactic protein-1 (MCP-1), intercellular adhesion molecule-1 (ICAM-1), and tumor necrosis factor-α (TNFα) mRNA expression was assessed in kidneys and liver. Linear regression was used to evaluate influence of the different fluid resuscitation procedures on inflammatory mediator expression.
Results: CLP had a significant effect on production of inflammatory mediators in kidneys ($p \leq 0.03$) and liver ($p \leq 0.02$). While HES did not alter expression of inflammatory mediators compared to RL, fluid resuscitation with Tetraspan provoked a burst in inflammatory mediator expression, which was at least three-fold higher in the kidneys ($p < 0.001$) and eight-fold in the liver ($p = 0.001$) compared to the ringer lactate group.
Conclusions: While unbalanced HES did not show a proinflammatory effect on renal and hepatic tissue in early sepsis, the balanced HES solution upregulated inflammatory mediators. Further studies have to be performed to elucidate this phenomenon in detail and to assess the functional implication of these results.

FM 14

Preconditioning with volatile anesthetics decreases matrix metalloproteinase-9 release in human neutrophils

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Introduction: The ability to degrade extracellular matrix (ECM) is a hallmark of malignant tumors promoting their spread to distant sites. Matrix metalloproteinase-9 (MMP9) degrades gelatins, which are components of the ECM. Inhibition or genetic deletion of MMP9 was demonstrated to decrease, respectively inhibit, tumor spread in animal models of colorectal cancer (CRC). The 5-year survival rate for patients with CRC and liver metastases is only 40% to 50% after curative resection, which is mostly due to recurrent malignancies within the liver. To reduce intraoperative blood loss, hepatic inflow occlusion is performed during tumor resection. However, this maneuver is correlated with reperfusion injury (RI), which has been shown to increase both CXCL8 and MMP9 levels and to promote liver metastasis. VA (volatile anesthetics) were demonstrated to attenuate RI and to decrease levels of CXCL8, the main cytokine in RI. We aimed at investigating the impact of VA on MMP9-release from CXCL8-stimulated neutrophils.
Methods: Freshly isolated human neutrophils were exposed to 1 MAC of sevoflurane or desflurane for 45 min (preconditioning), followed by stimulation with 100 nM CXCL8 for 15 min. Protein kinase C (PKC) was stimulated with 100 nM phorbol mistrate acetate (PMA) to bypass CXCL8-receptors CXCR1 and CXCR2. CXCL1 at 100ng/ml was used to exclusively activate CXCR2. MMP9 in supernatants was quanitified by ELISA. Zymography was used to assess enzymatic activity of MMP9. CXCR2-expression was assessed by flow cytometry. Statistics were calculated using one-way ANOVA with Bonferroni post-hoc testing.
Results: Preconditioning with VA reduced MMP9-release by 43% (sevoflurane; $p < 0.05$) and 42% (desflurane; $p < 0.05$). This reduction was also evident regarding the enzymatic activity of MMP9. Stimulation of CXCR2 with CXCL1 resulted in a comparable effect (–30% for sevoflurane, –43% for desflurane; $p < 0.05$), excluding CXCR1 as a possible mediator for preconditioning. Direct stimulation of PKC downstream of CXCR2 with PMA neutralized the effect of VA. However, surface expression of CXCR2 did not change with preconditioning.
Discussion: We report that VA decrease the release of MMP9 from neutrophils, the richest source of MMP9 in humans. We further show that this effect involves exclusively CXCR2, with a site of action upstream of PKC. By decreasing MMP9-release, VA might reduce recurrence in cancer surgery involving RI as occurring during liver or lung resection.

FM 15

Late conditioning with sevoflurane after cardiac surgery

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Background and objectives: Volatile preconditioning on organ preservation has been intensively investigated [1, 2]. The purpose of this randomized controlled trial was to investigate, whether postoperative volatile sedation has any benificial effects in cardiac surgery patients after valve replacement.
Methods: In all cardiac surgery patients total intravenous anaesthesia using propofol was performed. After arrival in the ICU patients (n = 110) were randomized to be sedated for at least a four hour course with either propofol or sevoflurane. Sevoflurane was administered using the anaesthetic conserving device (AnaConDa®). Myoglobin, creatininekinase (CK), creatininekinase from heart muscle tissue (CK-MB), troponin T and oxygenation index (paO_2/FiO_2) were determined upon arrival on the ICU, 4 hours after sedation, an on the first postoperative day (POD1). Secondly extracorporeal circulation (ECC) time, aortic crossclamp (ACC) time, amount of infused colloids, crystalloids, blood products, ventilation time, postoperative pulmonary complications, ICU and hospital stay were documented.
Results: 54 patients were included in the propofol and 46 patients in the sevoflurane group. No significant intergroup differences were found with regard to patients demographics, ECC and ACC time, amount of volume replacement, oxygen indices, ventilation time, length of ICU and hospital stay. CK and troponin T concentrations were significantly lower in the sevoflurane group compared to the propofol group with $p = 0.04$ and $p = 0.03$, respectively. Postoperative pulmonary complications were signficantly reduced in the sevoflurane group ($p = 0.05$).
Conclusion: The data presented in this investigation provide strong evidence that anaesthetic postconditioning with sevoflurane mediates protection in the cardiac and pulmonary system even with a late application of low dose sevolfurane.
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FM 16

Platelet function analysis by Impedance Aggregometry (Multiplate®): Influence of routinely used drugs in cardiac anesthesia and critical care

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Background and Goal of Study: Impedance aggregometry (IA) is a new point of care test evaluating global platelet function and the efficacy of platelet inhibitors. In IA, increase in electrical impedance of whole blood is measured after addition of a platelet activator. The increase in impedance is expressed in arbitrary units (U). Reduced impedance implies platelet dysfunction or the presence of platelet inhibitors. IA may play an important role in the early diagnosis and management of perioperative platelets dysfunction [1, 2]. Many drugs, routinely used in cardiac anesthesia, like midazolam, propofol, lidocaine and magnesium, have known in vitro antiplatelet effects and may interfere with IA interpretation. Their influence on platelet function assessment by IA is unknown. The goal of the study is to evaluate to which extent IA is modified in the presence of these drugs.
Materials and Methods: We performed an experimental, in vitro study, using blood from 20 healthy volunteers between 18 and 65 years old whose mean platelet count was normal (Mean 300,2 G/l, range 203–503). Volunteers with known coagulopathies or having used drugs with antiplatelet effects within the last 14 days were excluded. Baseline IA (Multiplate®) was measured using 4 activators: arachidonic acid (AA), ADP, thrombin and collagen. We then added the study drugs in 3 increasing, clinically relevant concentrations (table 1). IA was compared to baseline using Dunett's test, $P < 0.05$ was considered statistically significant (JMP 8.0 software).
Results: Midazolam, propofol and lidocaine showed no effect on IA at any of the concentrations. Magnesium had a significant effect on the ADP and TRAP tests at 2.5 mmol/L (ADP: 73 ± 21 U and TRAP: 133 ± 28U at baseline vs 31 ± 13 and 96 ± 39 respectively) and a less pronounced effect at 1 mmol/L on the ADP test (39 ± 20 U).

Table
In vitro concentration of study drugs Midazolam, Propofol, Lidocaine and Magnesium.

STUDY DRUGS	High (toxic) concentration	Intermediate (therapeutic) concentration	Low (sub therapeutic) concentration
Midazolam	500 ng/ml	250 ng/ml	150 ng/ml
Propofol	8 mcg/ml	5 mcg/ml	2 mcg/ml
Lidocaine	6 mcg/ml	3 mcg/ml	1 mcg/ml
Magnesium	2.5 mmol/L	1 mmol/L	0.4 mmol/L

Conclusions: Midazolam, propofol and lidocaine do not interfere with IA measurement, even at near toxic plasma concentrations. In patients treated with high to normal doses of magnesium, IA results for ADP and TRAP-Test should be interpreted with caution.

FM 17

Course of FXIII in children undergoing major surgery

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Introduction: Intraoperative acquired coagulopathy due to blood loss and hemodilution is a frequent finding in children; however there is a lack of data about acquired deficiency of coagulation factor XIII and the efficacy of factor XIII replacement therapy. The aim of this prospective observational trial was to investigate the intraoperative course of FXIII in children undergoing elective major surgery with anticipated bleeding.
Material and methods: Blood samples were repeatedly taken from 46 children aged 3.3 years (IQR 0.9–10.7 years). Concentrations of FXIII, plasma fibrinogen level, thrombelastometry (ROTEM®) and cell count were assessed at several time points during surgery. Data are expressed as median (IQR).
Results: All baseline measurements were within reference ranges. Notably, a considerable decrease in FXIII concentration (median 60%; IQR 49–69%) was already observed at the beginning of the surgical procedures (reference range FXIII 70–140%), while ROTEM® traces remain unchanged. At this time, a median cumulative amount of fluids of 19 mL/kg (12–30 mL/kg) were administered, whereby twenty-seven children received additional infusion of colloids (gelatin solution). FXIII levels further deteriorated intraoperatively to minimal levels of 33% (15–61%). Likewise, during the operative course clot strength was additionally impaired (ROTEM® MCF 44 mm (34–50 mm)) and fibrinogen levels deteriorated to minimal levels of 130 mg/dL (95–160 mg/dL). In 43 out of 46 children transfusion of RBC was necessary. Despite of transfusion of FFP (cumulative total dose 22 mL/kg (11–32 mL/kg)) in 21 out of 46 children, FXIII level remains low till the end of surgery at levels of 39 % (20–46%).
Discussion: Although impaired FXIII levels are suggested to be a late phenomenon in the development of dilutional coagulopathy, our results showed a marked and very early decrease to levels that were currently discussed as critically low. The intraoperative decrease of FXIII might be explained by dilutional effects but may be aggravated by influence of infused colloids. Recently published data suggested that perioperative diminished FXIII activity was associated with an increased risk of bleeding; thus maintenance of adequate FXIII levels might be important in treating dilutional coagulopathy and hyperfibrinolysis. However, transfusion of FFP was not able to correct intraoperative decreased levels of FXIII in our study.

FM 18

Reduction of catheter-associated bloodstream infections by a winning strategy: the REDCO-CVC project («REDuction des COmplications liées aux Cathéters Veineux Centraux»)

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Background: Central line associated bloodstream infection (CLABSI) is an avoidable complication related to central venous catheters (CVC). The aim of the study was to evaluate the impact of a global quality project named REDCO-CVC on the CLABSI rate.
Methods: REDCO-CVC is a step by step quality program [baseline (3 month 2006), tracing (January 2008), insertion (June 2008), CVC maintenance (September 2009)]. Documentation, insertion and CVC maintenance were standardized: A theoretical and practical teaching with simulation of insertion on a mannequin was elaborated specifically for anesthesiologists and an interactive e-learning (insertion, dressing, removal) dedicated to all nurses was created. An internal website was created. All CVC were followed from insertion to tip culture after removal. CLABSI was defined allowing to the US National Nosocomial Infection Surveillance System criteria. The following steps were analyzed: baseline, tracing and insertion.
Results: 3975 CVC were included. Cumulative catheter-days and median (IQR) dwell-time were 35914 and 6 (3-11) days, respectively. Anesthesiologists, intensivists and other physicians placed respectively 1665 (42%), 1693 (43%), and 617 (15%) CVC. Insertion place was: jugular (62%), sub-clavian (23%) or femoral (15%). Global CLABSI-rate diminish from 3.8/1000 CVC-day to 1.9. CLABSI rate for anesthesiologist, intensivists and other physician were 4.9 /1000 CVC-day, respectively 2.9 and 2.0 (IRR 0.75; 95%CI 0.57–0.99; p = 0.04) at baseline. After the tracing period, rates were the following: 2.7/1000 CVC-day, respectively 1.4 and 2.2 (0.96; 95%CI 0.63-1.46; p = 0.85) and after the insertion period: 1.6/1000 CVC-day, 2.1 and 3.9 (1.54; 95%CI 0.83–2.84; p = 0.17).
Conclusion: CLABIS rate was reduced by 50% after this global quality program. This decrease was even higher in the studied population, the anesthesiologists, with a statistically significant decrease in CLABSI-rate.

FM 19

Effect of perioperative systemic alpha2-agonists on postoperative morphine consumption and pain intensity: systematic review of randomized controlled trials

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Background: Systemic alpha2-agonists are believed to reduce postoperative opioid requirements and pain intensity.
Methods: We searched Medline, Embase, Central and bibliographies, for randomized trials (to 02.2011) testing any systemic alpha2-agonist (versus placebo or no treatment), administrated before, during or after surgery, in adults undergoing non-cardiac surgery under general anaesthesia, and reporting on postoperative cumulative opioid consumption and/or pain intensity. Opioid doses were converted to morphine equivalents. We estimated weighted mean differences (WMD) for continuous data and numbers-needed-to-treat/harm (NNT/H) for dichotomous data, both with 95% confidence intervals (CI), when data from ≥5 trials and/or ≥100 patients could be combined.
Results: Thirty studies (1,792 patients, 933 received clonidine or dexmedetomidine) were included. Regimens of alpha2-agonists varied widely. With both molecules, there was evidence of postoperative morphine-sparing: at 2h, WMDClon –0.6 mg [95%CI, –1.8 to 0.5] and WMDDex –6.3 mg [–8.3 to –4.2]; at 12h, –9.8 mg [–16.2 to –3.4] and –6.0 mg [–8.9 to –3.0]; at 24h, –4.1 mg [–6.0 to –2.2] and –14.5 mg [–22.1 to –6.8]. Both molecules decreased pain intensity during the first 24h. At 24h, WMDClon –0.7 cm [–1.2 to –0.1] on the 10 cm VAS; WMDDex –0.6 cm [–0.9 to –0.2]. The incidence of early nausea was decreased with clonidine (NNT 9 [5 to 87]), and of late nausea with dexmedetomidine (NNT 7 [4 to 40]). Clonidine increased the risk of intraoperative and postoperative hypotension (NNH 9 [6 to 16] and NNH 17 [10 to 41]); dexmedetomidine increased the risk of postoperative bradycardia (NNH 3 [2 to 5]). Recovery times were not prolonged.
Conclusions: Peri-operative systemic alpha2-agonists have a weak beneficial effect on postoperative opioid consumption, pain intensity and nausea. Awakening time is not prolonged. Adverse effects are bradycardia and arterial hypotension.

FM 20

Systemic ropivacaine does not reduce pain and hyperalgesia in electrically induced pain in human

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Aim: Ropivacaine is a local anesthetic widely used in clinical practice for continuous regional anesthesia because of its advantages regarding systemic toxicity. The aim of this study was to elucidate possible effects of systemic ropivacaine at clinically relevant concentrations on pain, hyperalgesia, allodynia and flare response.
Methods: 20 healthy subjects were included in a randomized, double-blinded, placebo-controlled, crossover study approved by the local ethical committee. Electrical pain was evoked over two subcutaneously implanted gold wire electrodes in the forearm. The stimulation software adjusted the stimulus strength in a feedback controlled way according to the rating of the subjects on a numeric rating scale (0–10).
20 minutes after the start of the stimulation (t0) saline, lidocaine or ropivacaine were infused intravenously. The time to reach the defined stimulation threshold was recorded (t1). Areas of hyperalgesia, allodynia, flare response and plasma concentrations were measured at t0 and t1.
Results: t1 was significantly shorter with lidocaine (13.8 ± 2.1 min) than with saline (18.4 ± 1.5 min; P <0.05). The area of hyperalgesia increased with saline (+16 cm^2, P <0.05) and ropivacaine (+15 cm^2, P <0.05), but not with lidocaine (+3 cm^2, P = 0.62). The area of allodynia increased with all three medications. No change of the area or intensity of flare reaction was recorded.
Conclusion: In contrast to lidocaine, systemic ropivacaine at clinically relevant concentrations did not reduce electrically evoked pain, hyperalgesia or flare response.

FM 21

Perioperative intravenous application of lidocaine in laparoscopic renal surgery. A randomized, controlled study

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Background: Recently published randomized studies have suggested that intraoperative continuous intravenous lidocaine application may reduce analgesic requirement and shorten hospital stay after abdominal surgery. Lidocaine has not been investigated in renal surgery. The primary aim of this randomized, double-blinded, placebo-controlled study was to evaluate the effect of perioperative intravenous application of lidocaine on hospital stay. Secondary aims were to study the effect of lidocaine on postoperative analgesia, inflammatory response and gastrointestinal functions in patients undergoing laparoscopic renal surgery.
Methods: Sixty-four patients who underwent laparoscopic renal surgery were randomly assigned to receive lidocaine or saline solution (placebo). Lidocaine was initially administrated with a bolus of 1.5 mg/kg during anaesthesia induction, followed by an infusion of 2 mg/kg/h intraoperatively and 1.3 mg/kg/h for 24 h postoperatively. Primary outcome was the duration of the hospital stay. Postoperative pain and sedation, analgesic requirement, incidence of postoperative nausea and vomiting, inflammatory and stress response (C reactive protein (CRP), procalcitonin (PCT), cortisol) and return of bowel function were recorded.
Results: The length of hospitalisation did not differ between both groups (6.75 days for the lidocaine group (SD ± 1.69) vs 6.37 days for the placebo group (SD ± 1.89), P = 0.07). There were no significant differences between both group concerning the time course of pain scores at rest (P = 0.71), at coughing (P = 0.14), during mobilization (P = 0.13) sedation (P = 0.54) and morphine consumption (P = 0.59) during the two days after surgery. No differences were observed in postoperative return of bowel function, plasma concentration of CRP, PCT and cortisol, postoperative nausea and vomiting and sedation.
Conclusion: Systemic administration of lidocaine failed to decrease the duration of hospital stay in patients undergoing laparoscopic transperitoneal renal surgery. Our study could not show any benefit of perioperative intravenous application of lidocaine in terms of reduction of pain intensivity, morphine consumption, postoperative sedation, gastrointestinal function and inflammatory response.

FM 22

Rufinamide a new alternative for the treatment of neuropathic pain?

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Background: Lack of efficiency and heavy side effects of available drugs prevent satisfactory treatment of neuropathic pain. Dysregulation of voltage-gated Na channels (Nav1.x) is a central feature of pain hyperexcitability. Nav1.7 isoform is essential to pain perception since mutations in its gene are associated to either inherited pain syndromes or insensitivity to pain. We tested the potential of rufinamide (RUF), a Na channel blocker anticonvulsant licensed for treatment of Lennox-Gastaud syndrome (a severe form of epilepsy resistant to conventional therapy). In the present study, we compared the effect of RUF to amitriptyline (AMI, currently used to treat chronic pain) on a model of neuropathic pain and on Nav1.7 channel.
Methods: We used the SNI model of neuropathic pain in C57BL/6 mice (n = 8–10/group). One week after nerve injury, RUF (5,10,25 or 50 mg/kg) was injected (ip). A week later AMI (10 or 20 mg/kg) was tested. Mechanical allodynia was assessed with von Frey filaments for 1 day. Drugs were also tested on naïve animals. Whole-cell patch clamp was performed to test RUF and AMI on Nav1.7 expressed in HEK293 cells.
Results and Discussion: RUF dose-dependently alleviated mechanical allodynia for 4h ($p < 0.05$, 25 and 50 mg/kg vs ctrl) as well as AMI ($p < 0.05$, 10 and 20 mg/kg vs ctrl). At 24 hours effect had worn off. On naïve animals, AMI increases withdrawal threshold to mechanical stimulation and latency of withdrawal to heat stimulation whereas RUF had no effect at the doses used. IC50 to decrease peak current for AMI was 10 µM and the reduction for RUF was 21.2% at 100µM (highest achieved in physiological solution). No significant difference on the V1/2 of voltage-dependence of activation was seen; however a shift in the steady-state inactivation curve was observed (–5.76 mV for RUF and –9.56 mV for AMI, $p < 0.005$). Use dependent block was observed at 5, 10, 25 and 50Hz ($p < 0.05$). RUF and AMI modulate Nav1.7 in vitro and demonstrated efficacy in alleviating neuropathic in an animal model. At equipotent doses on SNI induced allodynia, AMI showed alteration in behavioral response in naïve animals possibly due to either alteration of basal pain sensitivity or a sedative effect.
Conclusion: Side effect is a major problem with drugs such as AMI. RUF shows a better tolerability in an experimental pain model. Taken together our results suggest RUF could be a new alternative for the treatment of neuropathic pain.

FM 23

Buprenorphine but not morphine modulates nerve excitability of primary sensory afferents of rat at clinically relevant concentrations

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Aim: Previous data suggest that buprenorphine acts as a potent Na+-channel blocker in peripheral sensory nerves. In this investigation we compared axonal excitability changes in unmyelinated and myelinated primary sensory afferents of rat evoked by buprenorphine, morphine and lidocaine.
Methods: C and Aβ compound action potentials were recorded extracellularly in an in-vitro model of rat saphenous nerve. A computerized threshold tracking program (Qtrac©) was used to determine excitability thresholds, peak amplitude and latency. Parameters were tracked continuously over time. To enhance the blocking effect, nerve fibres were stimulated with a supramaximal 1 ms current pulse either alone or after a 300 ms conditioning polarizing ramp current of varying size, in the presence of morphine, buprenorphine and lidocaine.
Results: In C fibers buprenorphine caused a significant increase in excitability thresholds at low concentrations: BUP 50µM: 367.8% ± 47.6% ($P < 0.01$) whereas morphine did not change excitability thresholds even at very high concentrations: MO 1 mM: 80% ± 12.3% (P = 0.74). In Aβ fibers, both, buprenorphine and morphine caused an increase in excitability thresholds: BUP 100 µM: 242% ± 21% ($P < 0.01$); MO 1mM: 121% ± 5.9% ($P < 0.01$). However, the concentration-effect curve indicated that morphine has its effect only at high concentrations. In contrast, the blocking potency of buprenorphine is similar to the one of lidocaine in both, Aβ and C fibers.
Conclusion: Buprenorphine but not morphine acts as a Na+-channel blocker in primary sensory afferents at clinically relevant concentrations. Buprenorphine and lidocaine have similar blocking potencies.

FM 24

Single nucleotide polymorphism (SNP) of CYP2C9 influences degradation of intravenous Tetrahydrocannabinol (d9-THC) in healthy volunteers

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Background: d9-THC is the main active Cannabinoid Receptor-1 (CB1) agonist in the plant Cannabis sativa. Medical and recreational use is on the rise, increasingly affecting anesthesia patients. Degradation of THC to the active metabolites OH-THC and COOH-THC largely depends on hepatic P450 activity. For the first time, this study examines the effect of the frequent single nucleotide polymorphisms CYP2C9*2 (Arg144Cys) and CYP2C9*3 (Ile359Leu) on inter-individual differences in pharmacokinetics of intravenous THC.
Methods: 306 healthy volunteers were screened for CYP2C9 polymorphisms. According to genetic subgroups, we included 40 volunteers. Blood samples were drawn before and in short intervals up to 300 minutes after a single intravenous bolus of 0.1 mg/kg d9-THC, and 24 and 48 hours afterwards. Samples were analyzed by mass spectrometry. Concentration vs. time data for THC, OH-THC and COOH-THC were analyzed using standard non-compartmental methods and subjected to ANOVA.
Results: Data from 16 of 40 volunteers have been analyzed so far (7 males, 9 females). Mean age was 23 ± 1 years. There was a significant difference in the amount of the COOH-THC metabolite produced related to CYP2C9*3 status. Subjects homozygous for *3 had the lowest COOH-THC concentrations (table 1). The AUC ratio of COOH-THC: OH-THC in this group was <1.0 compared with 38.2 in the wild type (p = 0.04).

Conclusion: The COOH metabolite of THC accumulates to exceed the concentrations of the parent by up to 100 fold in individuals with wild type CYP2C9. Our findings show there is a slow metabolizer phenotype for CYP2C9*3. Genetic variability determines the pharmacokinetics of THC with impact on vital signs and psychotropic side effects, and may influence clinical and forensic medicine.

Table 1
Pharmacokinetic data of d9-THC and its active metabolites OH-THC and COOH-THC.

Parameter	*1/*1	*1/*2	*2/*2	*1/*3	*2/*3	*3/*3	p-value
Number (n)	3	5	1	5	1	1	
THC							
C_0 (mcg/L)	1180	1694	882	2593	1116	1589	0.8
AUC0-∞ (mcg/L*h/kg)	187	158	112	174	131	170	0.5
T½ (h)	10.6	14.2	14.7	16.7	13.0	13.4	0.4
OH-THC							
Cmax (mcg/L)	45	37	47	37	45	24	0.9
AUC0-∞ (mcg/L*h/kg)	56	59	47	60	57	47	1.0
T½ (h)	11.2	10.8	12.2	13.3	12.3	12.2	0.3
COOH-THC							
Cmax (mcg/L)	146	133	70	86	52	11	0.06
AUC0-∞ (mcg/L*h/kg)	2130	1330	1227	767	373	63	0.25
T½ (h)	24.7	27.3	128	28.3	29.4	30	<0.01

Cmax: maximal concentration; AUC: area under the concentration time curve; T½: half life; Cl: clearance

Posters

P 1

Gastric emptying in children: 4 versus 6 hours fasting after a light breakfast using magnetic resonance imaging (MRI)

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Background: To minimize the risk of pulmonary aspiration and to allow for sufficient patient comfort, compliance, and homeostasis, ASA guidelines recommend 6 hours fasting for food and non-clear fluids in children [1]. However, some institutions allow shorter fasting times of 4 hours for food [2–3], which has not yet been directly compared with the ASA guidelines so far.
Aim: To compare residual gastric contents volumes (GCV_w) and emptying half-life ($T_{1/2}$) after 4 versus 6 hours fasting for food, using magnetic resonance imaging (MRI).
Methods: Eighteen healthy volunteers aged 6.8 to12.2 years participated twice, to simulate 4 / 6 hours fasting (Sim-4 / Sim-6) in a crossover study: after overnight fasting (baseline), a light breakfast was ingested (cereal flakes, milk products, same kind and amount on both days), followed by 7 $ml.kg^{-1}$ raspberry syrup after 2 / 4 hours and half-hourly MRI acquisition for 2 hours (F1 – F5). MRI were obtained on a 1.5 Tesla scanner as 5 mm axial images (FIESTA) and volumes were traced manually by one blinded observer.
Results: GCV_w for Sim-4 / Sim-6 were similar at baseline, after breakfast and after 4 / 6 hours; all previous MRI after and immediately before syrup intake revealed significantly higher GCV_w for Sim-4:

GCV_w [ml/kg]	Sim-4 (4 hours fasting for food)*		Sim-6 (6 hours fasting for food)*		p§
Baseline	0.44	0.30–0.62	0.76	0.38–1.06	0.071
After breakfast	9.27	7.16–12.51	9.91	7.04–12.04	0.679
Before fluid	4.86	3.74–6.43	0.66	0.32–1.74	0.000
F1	9.92	8.31–10.26	6.74	5.94–7.49	0.000
F2	6.00	4.11–6.84	3.01	2.48–3.51	0.001
F3	2.63	1.46–4.05	1.38	0.83–2.80	0.006
F4	1.39	0.68–2.68	0.51	0.17–0.99	0.001
F5	0.33	0.23–1.13	0.40	0.30–0.67	0.879

* Values given as median (IQR); § Wilcoxon test

Mean gastric emptying half-life $T_{1/2}$ after syrup intake was 30.8 (±12.2) / 28.3 (±5.7) minutes (p = 0.47) for Sim-4 / Sim-6 (Wilcoxon test).
Conclusion: GCV_w at anaesthesia start and $T_{1/2}$ were similar for 4 and 6 hours food fasting in healthy volunteer children. Our results support that fasting times shorter than recommended by the ASA guidelines may be practicable.

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P 2

Comparison of standard plasmatic coagulation tests to thrombelastometry (ROTEM®) in children undergoing major pediatric surgery

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Introduction: Timely and close meshed monitoring of perioperative hemostasis is suggested to be of great importance in the management of major pediatric surgery. Thrombelastometry (ROTEM®) provides fast and on-line information about hemostasis in the OR and may be useful to early detect intraoperative coagulation disorders. We performed an observational trial to compare results of this technique to standard plasmatic coagulation tests and to compare the times of performance.
Material and methods: Intraoperative blood withdrawals were obtained in children undergoing elective major surgery at the discretion of the anesthesiologist. At each time point, standard coagulation tests (aPTT, PT, fibrinogen level) as well as ROTEM® analyses (InTEM, ExTEM, FibTEM) were performed simultaneously by trained hospital laboratory staff.
Results: A total of 288 blood samples from 50 children were analysed and compared. While there was only moderate correlation between PT and aPTT to ExTEM CT and InTEM CT respectively, a good correlation was detected between plasma fibrinogen level and FibTEM assay (r = 0.882; p <0.001). Notably, 64% of all PT and 94% of all aPTT measurements were outside the reference range, while impaired clotting times were observed in 13.0% and 6.3% respectively. Standard coagulation test results were available after median of 53 minutes (45 min – 63 min IQR), whereas 10 minute values of ROTEM® results (A10) were available online after 23 minutes (21 min – 24 min IQR).

Discussion: Based on our data, PT and aPTT compared to ROTEM® clotting times are not interchangeably to detect hemostatic disorders. Good correlation was found between plasma fibrinogen level and FibTEM assay. Turnaround times are considerably longer with plasmatic coagulation testing than with ROTEM®, which may have an impact on timely monitoring and guiding coagulation therapy. In addition our results showed that impaired standard coagulation tests was a very common and early finding, while meaningful changes in the ROTEM® tests were observed less frequent. Thus, there might be a strong need to re-evaluate clinical meaningful thresholds for all coagulation parameters.

P 3

Evaluation of the feasibility of rotational thrombo-elastrometry during cardiopulmonary bypass (CPB) using a heparinase modified ROTEM® assay

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Background and Goal of Study: ROTEM® is a whole blood point of care test used to assess the patient's coagulation status. Three of the available ROTEM-tests are EXTEM (activation by recombinant thormboplastin, rTP), INTEM (activation by elagic acid) and HEPTEM. In the latter, heparinase, added to the INTEM reagent, eliminates heparin to reveal underlying coagulopathies. Performing ROTEM analysis during CPB might allow the anaesthesiologist to anticipate the need for blood products. The goal of this study was to evaluate the feasibility of ROTEM analysis in the presence of very high heparin concentrations as seen during CPB; and to evaluate whether heparinase could reverse heparin effect on EXTEM and INTEM during CPB.
Materials and Methods: In this prospective observational study, informed consent was obtained from 20 patients scheduled for elective cardiac surgery using CPB. Arterial blood samples were drawn for analysis after induction of anaesthesia (T0) and 10 minutes after the administration of heparin (T1). The following tests were performed: EXTEM, INTEM, HEPTEM and a heparinase modified EXTEM (hEXTEM). For the latter, rTP instead of the elagic acid was used in the HEPTEM test. Heparin concentrations were measured at T1 and at the end of bypass (T2). HEPCON® was used for heparin management. Paired t-test was used for statistical analysis using JMP 7.0. Data are presented as mean ± SD.
Results and Discussion: Heparin plasma concentration at T1 was 7.19 ± 2.19 IU/ml, and remained stable during CPB (T2 8.22 ± 1.38 IU/ml, p >0.6). At T0, hEXTEM differed significantly from EXTEM. At T1, EXTEM and hEXTEM were significantly altered, compared to EXTEM at T0. HEPTEM at T1 was significantly different from INTEM at T0.
Conclusions: High heparin concentrations on CPB, influence EXTEM. The heparinase concentration in HEPTEM is insufficient to reveal underlying INTEM. Heparinase in itself influences the EXTEM test. ROTEM analysis cannot reliably be performed during CPB.

Table 1
Results.

	CT (sec)	CFT (sec)	A10 (mm)	MCF (mm)	α (°)
EXTEM T0	53.6 ± 5.79	66.6 ± 15.79	63.1 ± 4.89	69.1 ± 4.04	77.9 ± 3.14
EXTEM T1	69.9 ± 9.54*	78.9 ± 21.04	58.8 ± 5.79*	67.7 ± 4.69	74.7 ± 4.42
hEXTEM T0	50.4 ± 7.79	69 ± 13.95	57.1 ± 5.51*	60.1 ± 5.67*	76.4 ± 2.82
hEXTEM T1	63.3 ± 10.94*	74.2 ± 21.57	55.2 ± 5.69*	60.9 ± 5.23*	76 ± 4.08
INTEM T0	147.5 ± 18.22	56.2 ± 7.79	61.2 ± 3.49	66.2 ± 3.56	79.1 ± 0.78
HEPTEM T1	193.5 ± 34.4*	62.8 ± 15.27	58.2 ± 4.82*	65 ± 3.5	77.5 ± 7.83

CT = coagulation time, A10 = amp. at 10 min., CFT = Cloth formation time, MCF = Max cloth firmness. *p <0.005.

P 4

Difficult intubation in Neuro and ENT Anesthesia: changes of practice after introduction of new airway devices

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Introduction: Difficult intubation remains a challenge in anesthesia and rates as high as 8–12% are reported in Neurosurgical or ENT patients. New airway devices have been introduced and are now routinely used in these patients, leading to changes of practice with regard to the difficult airway algorithm.
Method and Results: We studied the management of airway before (Period A: March 05-February 07) and after (Period B: March 07-February 09) the introduction of the Airtraq© and Glidescope© in our Neuro and ENT patients. Preoperative airway assessment (mouth opening MO, Mallampatti class MP, Thyromental distance TMD, neck mobility) was assessed and intubation predicted potentially difficult if MO <5 cm, MP III or IV, TMD <7 cm or if neck mobility was restricted. The introduction of new airway devices was preceded by teaching sessions about their use and emphasis on proper airway assessment.
Discussion and Conclusion: The introduction of new airway devices has changed its management and adherence to the difficult airway algorithm must be questioned. Special attention must be paid to assessment and the place of new devices in airway management.

	A (%)	B (%)	p
Patients	522	667	
MO <5 cm	241 (46.2)	299 (44.8)	0.688
MP III	133 (25.5)	183 (27.4)	0.489
MP IV	32 (6.1)	24 (3.6)	0.006
TMD <7 cm	14 (2.7)	65 (9.7)	<0.001
Restricted neck mobility	105 (20.1)	200 (29.9)	<0.001
Predicted potential difficult intubation	398 (76.2)	536 (80.4)	0.100
Tool used to intubate			
Laryngoscope	388 (74.3)	400 (59.9)	<0.001
McCoy	14 (2.7)	12 (1.8)	0.405
Bougie	58 (11.1)	61 (9.1)	0.306
Airtraq	0	94 (14.1)	<0.001
Glidescope	0	79 (11.8)	<0.001
Fiberscope	130 (24.9)	52 (7.8)	<0.001
others	1	17	0.002

P 5

Ventilation strategies in obese patients undergoing surgery under general anaesthesia: systematic review and meta-analysis

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Background: The most appropriate ventilation strategy to optimize intraoperative gas exchange and pulmonary mechanics and to prevent postoperative respiratory complications in obese patients undergoing surgery remains unknown. We performed a systematic review and meta-analysis of randomized controlled trials to assess the impact of different intraoperative ventilation strategies in obese patients undergoing surgery.
Methods: We searched Medline, Embase, Central, and bibliographies (up to December 2010), without language restriction. We included randomized trials in patients with a Body Mass Index ≥30 kg m^{-2} that reported on intraoperative gas exchange, pulmonary mechanics or postoperative respiratory complications. We estimated weighted mean differences (WMD) with 95% confidence intervals (CI) using data extracted from published papers.

Results: Twelve studies (441 patients) met the inclusion criteria. They reported on 11 different interventions: pressure controlled ventilation (PCV), volume controlled ventilation (VCV), pressure support ventilation, various tidal volumes, different levels of positive end-expiratory pressure (PEEP) with or without different alveolar recruitment maneuvers (RM), and a variety of RM with or without PEEP. PEEP plus RM had a positive effect on the intraoperative PaO_2/FiO_2 ratio (WMD, 91.3 mm Hg; 95% CI, 54.8–127.9) compared with PEEP alone without any impact on mean arterial blood pressure. In comparing PCV with VCV, there was no difference in PaO_2/FiO_2 ratio, mean airway pressure, or mean arterial blood pressure. For all other comparisons, combination of data was not feasible.
Conclusions: The evidence base on the impact of different ventilation strategies on pulmonary outcomes in obese patients undergoing surgery is sparse. Most comparisons have been tested in 1 or 2 studies and a small number of patients. There is some limited evidence that in presence of PEEP, alveolar recruitment maneuvers may improve intraoperative oxygenation without adverse hemodynamic effects. There is a lack of evidence of any difference between PCV and VCV. A consensus on how to test ventilation strategies in obese patients undergoing surgery is needed.

P 6

Effects of perioperative blood glucose targets on glucose metabolism

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Background: Surgical injury provokes stereotypical metabolic alterations including hyperglycaemia and protein catabolism. This appears to be particularly pronounced in patients with diabetes mellitus type 2 (DM2) and is related to increased perioperative morbidity. Recently, perioperative blood glucose target has been widely discussed since intensified insulin therapy does not only reduce glucose toxicity but is also associated with adverse events namely hypoglycaemia. The aim of this study was to assess glucose metabolism when applying two different blood glucose protocols in patients with DM2 undergoing colon surgery.
Methods: Nineteen patients were randomly assigned to receive standard blood glucose control (subcutaneous insulin boli, blood glucose <10 $mmol \cdot l^{-1}$; SC group n = 9) or continuous intravenous insulin (blood glucose <6 $mmol \cdot l^{-1}$; IV group n = 10). All patients received general anaesthesia and an epidural catheter. During surgery and immediately after surgery while receiving an amino acid infusion a stable isotope study with [6,6-$^2H_2$]glucose was performed over 3 h to assess glucose kinetics. Plasma glucose, glucagon as well as insulin were measured.
Results: Fasting glucose and baseline insulin sensitivity assessed as HOMA (homoeostasis model assessment) were comparable for both groups. The stress of surgery induced higher endogenous glucose production (EGP) ($p = 0.001$) and reduced glucose clearance (GCL) ($p < 0.001$) compared to the postoperative state in both groups. Intravenous insulin suppressed EGP ($p < 0.001$) and increased GCL ($p < 0.001$) compared to the SC group during both study periods. HOMA increased over time ($p < 0.001$) whereas the IV group showed higher insulin sensitivity in both study periods ($p = 0.003$). Blood glucose increased in the SC group from 6.5 $mmol \cdot l^{-1}$ to 9.5 $mmol \cdot l^{-1}$ intraoperatively and to 10.1 $mmol \cdot l^{-1}$ postoperatively. A mean of totally 9.1 IU of insulin were necessary to achieve a blood glucose of 5.5 $mmol \cdot l^{-1}$ intraoperatively and 12.8 IU for a blood glucose of 5.7 $mmol \cdot l^{-1}$ postoperatively in the IV group. Eleven incidences of blood glucose levels between 4.3–4.9 $mmol \cdot l^{-1}$ were noted in the IV group.
Conclusion: Tight perioperative glucose control suppresses EGP and increases GCL, but it is labour intensive and bears the risk of hypoglycaemic events. Therefore, the appropriate perioperative glucose target needs to be adapted to the special needs and benefits of subgroups but an overall target of 8 $mmol \cdot l^{-1}$ might be suggested.

P 7

Impact of intraoperative fluid management on outcome in patients undergoing Robotic-assisted laparoscopic prostatectomy – a retrospective analysis

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Background and Goal of Study: Intraoperative application of fluids has been discussed largely [1]. Its influence on outcome after robotic-assisted laparoscopic prostatectomy (RALP) has not been examined. We hypothesised, that a more restrictive fluid regimen leads to a decrease in complication rate and reduces length of hospitalisation [2].
Materials and Methods: Retrospective analysis of 194 patients (ASA classification I–III) undergoing RALP at the University Hospital Zurich between 2005 and 2008. The effect of crystalloids, colloids, and erythrocyte concentrates (EC) on the rate of complications was evaluated. The smallest unit of interest was 500 ml (crystalloids and colloids) or 300 ml (EC).
Results and Discussion: Perioperative data of 194 male patients with prostate cancer who underwent RALP were reviewed. Patients were 64 (median, range 44–78) years old. Every patient was given a total median amount of 3700 ml (1200–10500) fluids, with a median of 3100 ml (1000–8000) crystalloids. 154 patients received beside crystalloids also colloids. Applied to the whole patient group (n = 194) a median of 500 ml (0–3500) colloids were infused to a patient. 12 patients needed one or several EC. Crystalloids had a significant effect on the incidence of an anastomotic leak between bladder and urethra ($p = 0.026$), while colloids increased not only the incidence of a leaking anastomosis ($p = 0.01$), but also vascular complications, e.g. a surgical vessel injury ($p = 0.024$) and intraoperative bleeding ($p = 0.012$). Anastomosis leakage was favoured by transfusion of EC ($p = 0.001$) as well as revision after primary surgery ($p = 0.015$). Crystalloids ($p = 0.5142$) and colloids ($p = 0.4811$) had no influence on the length of hospitalisation, while EC transfusion significantly increased it ($p = 0.0029$).
Conclusion: These results underline the importance of a well-balanced fluid treatment in patients with RALP, which co-determines complication rate as well as length of hospitalisation. A more restrictive fluid management with less complications and a faster hospitalisation are not only advantageous for the patient, but lead to decreased hospital costs.

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P 8

Postoperative outpatient continuous regional analgesia: safety and effectiveness

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Background and goal of the study: Continuous regional analgesia (CRA) is an effective method to provide optimal analgesia with minimal side effects in ambulatory orthopaedic surgery [1–2]. Aim of this study is to evaluate its safety.
Material and methods: Following ethics committee approval, an observational prospective study was conducted on a consecutive cohort undergoing ambulatory foot surgery with a continuous popliteal block. After informed consent, patients were discharged from hospital with a 5 ml/h ropivacaine 0.15% continuous infusion through a disposable elastomeric pump (Easy-pump, Braun, Germany). Exclusion criteria were contraindications to regional anaesthesia, patient's refusal, lack of an accompanying person, difficult accessibility to hospital, age less than 18 years. Patients were monitored daily by trained anaesthetic nurses through a telephone follow-up. Data are expressed as means ± standard deviations.
Results and discussion: From January 2010 until September 2010, 117 patients were enrolled (11 males/106 females, age 58.0 ± 12.8 years, ASA class 1/2). All of them bypassed PACU to be directly discharged to the day-hospital clinic. Home-based CRA was 4.3 ± 1.4 days long, at the end of which all patients successfully removed their perineural catheters. Treatment was very effective (mean NRS: 1.9 ± 2.6), with a low incidence of PONV (1.7%). The more frequent side effect was persistent motor block of the ankle and foot (5.9%), which in all cases was successfully managed over the telephone, giving instructions to stop the infusion temporarily. Complications observed were: accidental removal (5.9%) or obstruction (2.5%) of the catheter, mostly requiring readmission to day-hospital for repositioning and infections at insertion point (2.5%), which were all superficial and resolved completely after antibiotic therapy. 2.5% of patients referred an accidental fall at home, this was uneventful and not clearly related to CRA.
Conclusion: Outpatient CRA has few, generally benign complications, which can be effectively managed on an ambulatory basis.

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P 9

Predictors of maternal satisfaction with anaesthesia during labour

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Introduction: Assessing maternal satisfaction with anaesthesia provides a valuable insight into patients› perspective on the quality of anaesthetic care provided. It is however largely unknown which factor really contribute to maternal satisfaction. The study purpose was to determine the predictors of maternal satisfaction with anaesthesia management during childbirth.
Materials and Methods: We performed a retrospective cohort study on 15386 parturients admitted between August 2003 and November 2008 in our labour and delivery units. We used anaesthetic records and retrieved data on patients' demographics, comorbidities, procedures performed and various aspects of their anaesthetic experience including their level of satisfaction measured on a Likert scale from 0–10. We performed a multivariate analysis to identify the different predictors of maternal satisfaction and more specifically those related to pain management, continuity and coordination of care, experience of the anaesthetic procedure and complications.
Results: We found that 761 parturients (7.6%) were dissatisfied with their anaesthetic care. Factors decreasing patient satisfaction were a high risk pregnancy and a dystocic delivery process, OR 95% CI 0.59 (0.34–1.02) and 0.62 (0.52–0.74) respectively. In addition, pain, a negative experience of the anaesthetic procedure performed, delay in analgesia, perceived poor coordination within healthcare teams and the presence of maternal or neonatal complications following delivery were the main factors decreasing patient satisfaction, OR 95% CI 0.07 (0.06–0.09) to 0.71 (0.59–0.85), P <0.001.
Discussion-Conclusion: Maternal satisfaction with anaesthesia care is largely determined by the effectiveness and overall experience of the anaesthetic procedure performed. However, other factors such as a good coordination in patient management and the absence of complications also influence maternal satisfaction. These should be all considered when defining and assessing quality of anaesthesia care during labour and delivery.

P 10

Quality control in pain relief and satisfaction for epidural analgesia in labour

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Background: Epidural analgesia (EDA) is commonly performed for pain relief in parturients in our hospital. We controlled quality in performance of the epidural, pain relief and satisfaction of the parturients.
Methods: With hospitals ethics committee approval every EDA in nulliparous women from july to october 2010 was enclosed in the prospective observational study. Time of every procedural step from informed consent to first epidural medical bolus administration (5 ml bupivacain 0.125% with 2 µg fentanyl/ml) was recorded. Efficacy of analgesia was measured by visual analogue score (VAS; 0 = no pain; 10 = most pain imaginable) before and 30 minutes after first bolus was administered. Satisfaction was investigated by an anonymous questionnaire postpartum.
Results: 78 primipara parturients were included. 3 have been excluded by an incomplete dataset, 1 for spinal analgesia. Median time from informed consent until EDA order was 12 min. (range 1–60), from order to arrival of the anaesthetist to the parturient 6 (1–110) min. and further to administration of the first bolus 25 (11–60) min. Median time from consent to bolus was 51.5 min. (24–130). Initial mean VAS of 8.2 (3–10) was reduced to 1.8 (0–6) within 30 minutes after bolus application and 69 of 74 women considered analgesia satisfying. Improved satisfaction was achieved by further bolus application or partial withdrawal of the catheter. One catheter had to be replaced and one pain control failed. 10 women complaining about postpartum headache were treated conservatively. One blood patch was administered successfully for severe headache after accidental dural perforation. The 68 collected questionnaires showed a mean retrospective VAS of 4.5 after starting the EDA and the global delivery VAS was 2.8. Self-control level was quoted 2.9 (0 = complete control, 10 = no control at all). Satisfaction with ability to move was 3.5 (0 = very satisfied; 10 = no satisfaction at all) and global satisfaction with the EDA was rated 2.7. 60 patients (88%) would like to have another EDA for delivery, 5 would refuse another placement and 3 did not answer.
Conclusion: EDA is a safe and effective technique for pain relief in parturients, achieved within less than 1 hour in an institution with obstetric and anaesthesia 24h service. Although onset of pain relief may be delayed and self-control and mobility are slightly reduced, satisfaction of parturients is high. Faster onset by combined spinal-epidural analgesia may improve satisfaction.

P 11

Atypical postdural puncture headache in a serie of 25172 patients

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Introduction: Postdural puncture headache (PPDH) is a well known complication of neuraxial techniques in obstetrical patients. It can occur following intentional or accidental spinal and epidural puncture. It is defined as a postural fronto-occipital headache occurring within 5 days of a dural puncture. Some patients will however have unusual and atypical signs and symptoms. This may lead to missed diagnosis and erroneous treatments. Currently, the signs, symptoms and proportion of atypical PDPH is largely unknown .The purpose of this study was to determine the incidence and clinical presentation of patients having atypical PPDH in obstetrics.
Material and Methods: We performed a retrospective analysis of our quality audit database on data collected between 2001 and 2010. The dataset includes pre, intra and postpartum information collected within 24 hrs after delivery. We retrieved information on all patients with a PDPH and an atypical presentation defined as deterioration or modification of clinical symptoms deemed to require neurological consultation and/or radiological tests. In this case serie we analysed and detailed specific signs, symptoms, radiological findings, treatments and clinical course. We used descriptive statistics to summarise information.
Results: The audit database included 25172 patients. We identified 141 patients (0.6%) with a PPDH. Of these 12 (9.3%) had atypical symptoms. 11 had received one or two blood patches (BP). All had been examined by a neurologist. The majority had radiological tests (CT scan, MRI). In 10 cases intracranial hypotension was confirmed. In 2 cases (after partially effective BP) an alternative diagnosis was made (sinusitis, migraine). Atypical symptoms included the following:
neck pain irradiating to shoulders, arm, spine (42%); cranial nerves symptoms in 25% (hypoacousia, diplopia, scotoma); in patients with alternative diagnosis the type of headache changed after BP; one patient presented neuropsychiatric symptoms attributed to persistent intracranial hypotension one month after delivery despite having received a blood patch 1 day post-partum.
Discussion-Conclusion: Atypical symptoms are not rare in patients having PDPH. In a number of cases severe complications such as HAS and engagement of the cerebral trunk must be considered. We recommend a systematic MRI examination and a prompt neurological examination of these patients.

P 12

Risk factors for recurrence of post-dural puncture headache following blood patch in obstetric patients

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Background and Goal of Study: Postdural puncture headache (PPDH) is a well known
complication following neuraxial anaesthesia. In obstetrics, the reported incidence varies greatly, between 0.16 to 5%. It is due to cerebral hypotension caused by the continuous leakage of cerebro-spinal fluid through the dural hole. Usual treatment includes NSAID, paracetamol, caffeine, hyperhydration and strict bed rest. When symptoms persist, a blood-patch (BP) is performed. Despite this treatment some patients have persistent symptoms requiring additional BP. Incidence and risk factors for persistent PDPH following an initial BP are currently unknown. The purpose of this study was to determine the incidence and risk factors for persistent PDPH following an initial BP in obstetric patients.
Materials and Methods: We used our quality database to retrieve obstetric patients having an anaesthetic procedure between 2001 and 2010. Data collected include pre, intra and postpartum patient and procedure-related information. It also includes information on patient satisfaction and possible post-anaesthesia related complications such as PDPH or nerve injuries, collected within 24 hrs after delivery by the anaesthetic team in charge. For our study we retrieved all patients who had an identified dural perforation (with a spinal or epidural needle, or a catheter) followed by typical PDPH treated with a BP. For all these patients we determined risk factors for recurrent PDPH by comparing patients and procedures characteristics of patients with or without recurrent symptoms after the BP. We used Chi-square, T-test and OR with 95% CI to compare groups.
Results: The database included 25 172 patients. We identified 141 patients (0.6%) with a typical PPDH who had at least one BP. Of these 87 (61.7%) had one BP and 27 (19%) had a failure of the initial BP.

Risk factors for recurrence were a low BMI (Mean 27 ± 4.4 vs. 33 ± 4.6 P = 0.2), a lower blood volume in the epidural catheter (Mean 10 vs. 21 ± 4.6 P = 0.05). Other factors such as size of the needle used, number of punctures performed, platelets count, coagulation tests seemed to have no impact on the likelihood of recurrence.
Discussion-Conclusion: Persistence of PDPH after an initial blood patch is not unusual. Particular attention should be used in patients with low BMI. Furthermore, the volume of the blood injected in the BP should be at least 20 ml, unless the patient complains of pain during injection.

P 13

A very low-cost method to find epidural space in obese parturient

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Introduction: Obesity during pregnancy could be a problem to obtain good skin landmarks for epidural analgesia resulting in increased attempts and sometimes in failed procedures. First use of Ultrasonography was found 30 year ago in literature for epidural space measurement. Recently, interest for ultrasound (US)use in spinal and epidural procedures was observed. We report an internal pilot experience in our hospital.
Methods: During 17 months, one anesthesiologist performed US exams and subsequent epidural procedure. US was used at beginning as a method to visualize epidural space, after one or more failed attempts. After successfull, we decided to use it as first line for each parturient where cutaneous landmarks were barely or no palpable. Measurements were obtained with a Sonosite Micromaxx US system, equipped with a 2–5 Mhz curved array probe (Sonosite Inc. USA). Skin was marked by dermographic pen to represent the lateral extremities and the middle of the probe once the best image of intervertebral space was visualized. Internal calliper was used to calculate the depth (UD) compared to needle depth (ND).
Results: 17 patients participated. Prepuncture US examination was used in first position in 10 cases, and as second line in 7 cases. The average maternal age was 29.5 ± 7 yr. 10 had pre-pregnancy BMI-level ≥30. 14 reached the WHO criteria for obesity at the end of pregnancy, with a mean BMI level at 35.8 (28-41). In this serie we used US landmarks, with a 88.23% success rate of insertion at the first "US assisted" attempt. We reach 100% success rate with second attempt. Epidural space depth (in cm) measured at US (UD = 5.51 ± 0.45) was very close to the depth measured by the needle insertion (ND = 5.57 ± 0.43)
Discussion: It has been showed that US use, decreased attempts, and intervertebral spaces punctured.In our cases, 58.8% of patients have poor bony surfaces landmarks, and in 41.2% we couldn't recognize any lumbar spinous process by palpation. It seems in despite of the small size of our cohort that a high percentage of success in this population could be reached.
Conclusion: US may have a place in obstetrical anesthesia, especially for obese women, It appears unnecessary to perform "US guided" epidural catheter insertion for presumed difficult access in these patients. Prepuncture US-assisted landmarks seem to be sufficient, and of course costless as in each delivery room an ultrasound with appropriate probe for lumbar screening is present.

P 14

Paravertebral block prolongued opioids sparing effect after breast surgery

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Background and aims: Thoracic paravertebral block (PVB) represents a very effective technique to provide both a dense regional anaesthesia and analgesia after breast surgery. Aim of this study is to investigate the duration of its opioids sparing effect in the postoperative period.
Methods: Two consecutive cohorts of patients undergoing mastectomy, quadrantectomy or breast reconstructive surgery under general anaesthesia (GA) with and without PVB were retrospectively studied with regard to postoperative analgesia during the first 72 hours. In particular postoperative pain level was assessed by numeric rating scale (NRS) and opioids consumption was calculated for each of the first 3 postoperative days as morphine equivalents total dose (MED). Data are given as mean ± standard deviation or medians. Statistical analysis was made with unpaired Student t-test for normally distributed data and Mann-Whitney test for non-parametric data; a p value <0.05 was considered statistically significant.
Results: 118 patients underwent GA (mean age 57.7 ± 14.4 years, mean weight 65.8 ± 14.1), while in 109 cases a PVB was performed injecting a mean volume of 5 ml ropivacaine 0.35 to 0.75 % per level to be blocked (mean age 58.0 ± 13.1 years, mean weight 62.0 ± 15.9). Postoperative pain was better controlled with PVB in each of the 3 first postoperative days (median NRS after AG: 6 vs median NRS after PVB: 0; p <0.001). Opioids requirement was reduced in the PVB for 72 hours (mean MED day 0: AG 6.2 ± 3.6 mg vs PVB 5.0 ± 5.4 mg, p <0.05; mean MED day 1: AG 7.3 ± 1.7 mg vs PVB 4.6 ± 7.4 mg, p <0.01; mean MED day 2: AG 8.3 ± 3.1 mg vs BPV 2.3 ± 3.6 mg, p <0.01).
Conclusions: PVB has a significant opioids sparing effect which exceeds the expected duration of the local anaesthetic effect, showing a preemptive analgesic effect after breast surgery.

P 15

Correlation between electrophysiological pain parameters and peritoneal fluid inflammatory cytokine concentrations in endometriosis patients with chronic pelvic pain

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Background: Chronic pelvic pain in endometriosis is associated with hypersensitivity of the central nervous system, and also with elevated concentrations of cytokines and growth factors in the peritoneal fluid. We tested the hypothesis that the concentrations of inflammatory cytokines in the peritoneal fluid (PF) correlate with electrophysiological parameters of central pain hypersensitivity in endometriosis patients with chronic pelvic pain.
Methods: Eleven patients with histological diagnosis of endometriosis and suffering from chronic pelvic pain were tested. During surgery, PF was aspirated quantitatively, clarified by centrifugation and stored at –35°C in aliquots. The concentrations of IL-8, tumor necrosis factor-α (TNF-α), pregnancy-associated plasma protein A (PAPP-A), glycodelin (PP14), RANTES, leptin, osteoprotegerin (OPG), midkine, macrophage colony stimulating factor-1 (MCP-1), IP-10, ficolin-2 lectin, defensin, human epididymal protein-4 (HE-4) and CA-125 were determined by single manual ELISA. The following electrophysiological tests were performed: (i) the size of reflex receptive fields (RRF) = area of the foot sole from which a reflex of the anterior tibial muscle could be elicited; (ii) the reflex threshold after single (RtSS) and (iii) repeated (RtRS) electrical stimulation of the sural nerve (current intensity that elicits a withdrawal reflex in hamstrings). Correlations were determined using Pearson's correlation. A p <0.05 was considered as significant.
Results: RRF area correlated positively with PP-14 (Pearson's rho p = 0.64, p <0.05) and with ficolin-2 (p = 0.72, p <0.05): the higher the concentration of PP-14 and ficolin-2, the larger the RRF area (meaning higher central pain sensitivity), and *vice versa*. IL-8 (p = 0.69, p <0.05), PP-14 (p = 0.78, p <0.01), MCP-1 (p = 0.69, p <0.05), and CA-125 (p = 0.67, p <0.05) displayed a positive correlation with RRF volume, indicating again an association between these cytokines and central pain sensitivity. RtRS correlated negatively with TNF-α (p = –0.80, p <0.01): the higher the TNF-α concentration, the lower the RtRS (meaning higher central pain sensitivity), and *vice versa*. No correlation was observed between RtSS and the concentration of any cytokine tested.
Conclusions: The observed correlations suggest that inflammatory mechanisms may be important in the pathophysiology of central pain hypersensitivity, and that cytokines produced in the environment of endometriosis could act as mediators in this function.

P 16

Expansion of nociceptive reflex receptive fields in patients with low back and neck pain

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Background and aims: Expansion of receptive fields of spinal cord neurons may be one of the mechanisms underlying central hypersensitivity, and can be measured in humans with a new method involving nociceptive reflexes. We tested the hypothesis that patients with low back pain and neck pain display an expansion of nociceptive reflex receptive fields.
Methods: 40 patients with chronic low back pain, 40 with chronic neck pain and 14 with acute low back pain (data collection is running) were tested and compared with a cohort of 300 pain-free subjects. All subjects were tested by the same investigator (A.N.). Electrical stimuli were applied to 10 sites of the foot sole to evoke reflexes in the tibialis

anterior muscle. The reflex receptive field area was defined as the area of the foot sole (expressed as fraction of the foot sole) from which a muscle contraction was evoked by the electrical stimulus. The groups were compared by Kruskal-Wallis ANOVA on ranks and Multiple Comparisons versus control group.
Results: All three patient groups displayed significantly larger RRF area, compared with pain-free subjects. Medians (25 and 75 percentiles, p-value compared to controls) were: acute low back pain 0.46 (0.33–0.52, p = 0.004), chronic low back pain 0.39 (0.26–0.55, p = 0.047), chronic neck pain 0.40 (0.29–0.48, p = 0.006) and control group 0.30 (0.18–0.44). No significant differences between patients were observed.
Conclusions. This study provides the first evidence for widespread expansion of reflex receptive fields in acute and chronic musculoskeletal pain.
Key words: reflex receptive fields, central sensitization, acute low back pain, chronic low back pain, and chronic neck pain.

P 17

Reliability of quantitative sensory testing in a low back pain population

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Background and aims: Reliability is an essential condition for using quantitative sensory tests (QST) in research and clinical practice, but information on chronic pain patients is sparse. The aim of this study is to evaluate the reliability of different QST assessments in chronic low back pain patients.
Methods: The first 19 patients were included in this preliminary analysis. Patients received QST on two different sessions: pressure, electrical, heat and cold stimulation, and conditioned pain modulation using ice water (CPM). The data were analyzed with Pearson product moment correlation.
Results: The correlation coefficients (p-values) were: pressure pain detection threshold 0.75 (0.0002), pressure pain tolerance threshold 0.75 (0.0002), electric pain single stimulation threshold 0.49 (0.0337), electric pain temporal summation threshold 0.32 (0.189), NRS at supra-threshold electric temporal summation 0.75 (0.0002), heat pain detection threshold 0.33 (0.168), heat pain tolerance threshold 0.72 (0.0006), cold pain detection threshold 0.51 (0.0271), time to reach NRS 7 in ice-water 0.89 (0.0000), CPM on pressure pain tolerance 0.45 (0.0512), CPM on electric pain 0.53 (0.021).
Conclusions: Most QST were reliable. In this preliminary analysis, low reliability of some tests may partly be due to lack of statistical power.

P 18

Conditioned pain modulation in patients with low back and neck pain

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Background and aims: Conditioned pain modulation (CPM) is an endogenous pain modulatory mechanism that occurs when response to a painful test stimulus is inhibited by an additional conditioning painful stimulus. Disturbed CPM is assumed in chronic pain patients and may be one of the mechanisms underlying central hypersensitivity. We tested whether patients with low back and neck pain display altered CPM.
Methods: In a running study, we analyzed 34 patients with chronic low back, 40 with acute low back, 36 with chronic neck pain and 21 healthy controls. Test-stimulus was pressure pain tolerance threshold (PPt, expressed in kPa) at the the 2nd toe, measured before and immediately after conditioning stimulus at the hand (ice water test). PPt was defined as the point at which the subject felt the pain as intolerable. CPM was calculated as absolute difference between PPt after and PPt before ice water test. Mean differences were compared by Kruskal-Wallis ANOVA on ranks and multiple comparisons versus control group.
Results: All groups displayed significantly higher PPt after cold water test, i.e. a CPM effect (p <0.001). The mean differences (95% confidence intervals) of PPt after – before ice water test were: 161 (93 – 228) in chronic low back, 164 (120 – 207) in acute low back, 88 (49 – 126) in chronic neck pain and 141 (89 – 193) in controls. There were no statistically significant differences among groups.
Conclusions: In this preliminary analysis, we did not observe alterations of CPM in acute or chronic low back pain, and in chronic neck pain.
Key words: conditioned pain modulation, acute low back pain, chronic low back pain, chronic neck pain.

P 19

Lack of efficacy of intravenous tropisetron on modulation of pain and central hypersensitivity in chronic low back pain patients

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Background and aims: The activation of 5-HT-3 receptors may be one mediator of widespread central hypersensitivity, leading to exaggerated pain responses. The analgesic effects of 5-HT-3 receptor antagonists have been proven in patients with fibromyalgia. To our knowledge, no data on the efficacy of 5-HT-3 receptor antagonists in low back pain are available. This randomized, double-blind, placebo-controlled cross-over study was undertaken to test the hypothesis that the 5-HT-3 receptor antagonist tropisetron attenuates pain and central hypersensitivity in patients with chronic low back pain.
Methods: We studied thirty patients with chronic low back pain, 15 were women (age 53 ± 14) and 15 men (age 48 ± 14). A single intravenous injection of 0.9% saline solution, tropisetron 2 mg and tropisetron 5 mg was administrated in three different sessions, in a double blind crossover manner. The main outcome was the pain VAS score before, 15, 30, 60 and 90 minutes after drug administration. Secondary outcomes were nociceptive withdrawal reflexes to single and repeated electrical stimulation, reflex receptive fields, pressure pain detection and tolerance thresholds at 2nd toe and pain drawing area. The data were analyzed by panel multiple regression.
Results: All three medication reduced VAS scores. However, there was no statistically significant difference between tropisetron and placebo in VAS scores. No effect of tropisetron compared to placebo on any secondary outcome was detected.
Conclusions: A single dose intravenous administration of tropisetron in patients with chronic low back pain had no significant specific effect on intensity of pain and parameters of central hypersensitivity.
Key words: 5-HT-3 receptor antagonists, tropisetron, central sensitization, randomized, placebo-controlled, chronic low back pain.

P 20

Neuropathic pain induced by peripheral nerve injury is associated with glial modifications in emotion-related brain regions

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Psychiatric symptoms are highly prevalent in neuropathic pain (arising from nerve injury), amplifying its socioeconomic burden and impeding the proper compliance to treatments. In psychiatric disorders, converging evidences point at the involvement of cortical and sub-cortical glial cells. Therefore, in the present work we asked whether limbic glia (astrocytes and microglia) undergo modifications following peripheral nerve lesion induced by spared nerve injury (SNI), in mice and rats. An marked anxiety-like behavior (marble burying test) is detected from 6 weeks post-lesion in painful mice. Western-blot analysis shows a significant upregualtion of the astrocytic protein GFAP at 7 days post lesion, but not after 6 weeks, with no other detectable glial changes. In rats, we report increases in glial glutamate transporters EAAT-1 and EAAT-2 in the hippocampus, as well as an increase in the GABA transporter GAT-3 in the amygdala 7 days post-surgery. Immunofluorescence shows significant increases of microglial density in the infralimbic cortex and s100β positive astrocytes in the amygdala (basolateral and central regions). In addition, significant morphological modifications in astrocytic GFAP were found in the prelimbic cortex and hippocampus. Together, our data show that cortical and limbic glia respond to peripheral neuropathic injury, with an intricate pattern of cellular reactions. This might pave the way for a better understanding the connection between neuropathic pain and its psychiatric symptoms.

P 21

Effects of GABAa-agonists on pain modulation: An experimental study in healthy volunteers

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Background and aims: Neuropathic and inflammatory pain are associated with plastic changes of the central nervous system, leading to reduced glycinergic and GABAergic inhibitory control within the spinal cord. This diminished inhibitory control can be modulated by GABA-agonists, producing anti-nociception in animal models. The aim of this study was to explore GABA-agonists using a multimodal experimental testing procedure. Positive findings would encourage further development in the field of GABA-modulation.
Methods: Sixteen healthy male volunteers were tested in a double-blind, crossover, placebo-controlled study. Each volunteer randomly received 3 drugs on 3 different sessions: tolterodine (active placebo), clonazepam (typical GABA-agonist for neuropathic pain) and clobazam (less sedative GABA-agonist). Experimental pain tests were: area of secondary hyperalgesia induced by capsaicin, electrical stimulation of sural nerve and tibialis anterior muscle, pressure algometry on the second toe, ischemic cuff algometry, conditioned pain modulation with ice-water stimulus as conditioning stimulus and pressure algometry as test stimulus.
Results: In a preliminary analysis clonazepam, but not clobazam, produced higher pain threshold to muscular repeated electrical stimulation, compared to placebo. The analyses for all the other quantitative pain measurements failed to show statistically significant differences between clobazam or clonazepam and placebo.
Conclusions: Based on preliminary analyses, we detected an analgesic action of clonazepam in only one of the experimental models used. Clobazam did not display analgesic action in any model. Because pharmacogenomic and pharmakocinetic analyses are pending, these results have to be considered as preliminary.

P 22

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

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

P 23

A novel radiofrequency denervation method for cervical zygapophyseal joint pain based on ultrasound localisation of the nerves

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Background and aims: In several studies, radiofrequency neurotomy of the cervical facet joint nerves has provided complete pain relief in 60–70% of the patients for about 9 months. The main disadvantages are procedural times of 2–4 hours, because several lesions need to be made due to the variable nerve course. Ultrasound imaging enables localisation of these nerves. This information could be used in order to reduce the amount of thermal lesions performed per nerve. We tested the hypothesis, that a shortened radiofrequency procedure based on ultrasound localization of the nerves would reach the benchmark of at least 80% pain relief in 80% of patients for a median duration of 35 weeks.
Methods: We studied 15 consecutive patients with cervical facet joint pain. They were treated using a shortened radiofrequency procedure under fluoroscopic control, based on ultrasound localisation of the joint supplying nerves, with only two lesions performed per nerve. Successful treatment was defined as at least 80% pain relief in the VAS.
Results: 14 of the 15 patients were successfully treated (93%, 95% CI 80–100%) with a median time of pain relief of 44 weeks. At 6 and 12 months, 13 (87%, 95% CI 70–100%) and 6 patients (40%, 95% CI 15–65%) reported successful treatment, respectively. The median duration of the procedure was 35 minutes (interquartile range 27–48 minutes).
Conclusion: In patients suffering from chronic cervical facet joint pain, radiofrequency denervation according to a shortened protocol based on ultrasound localisation of the nerves reached the benchmark of the standard technique.

P 24

Cleaning Blood: Extracorporeal Device for Blood Purification using Ultra-strong Metal Nanomagnets

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Nanomagnets with metal core have recently been shown to be promising candidates for magnetic drug delivery and hyperthermia due to superior magnetic properties compared to commonly used metal oxide beads. This presentation will discuss the direct removal of harmful substances from human whole blood by the use of functionalized magnetic nanoparticles. The applicability of the concept is demonstrated utilizing three examples: The removal of a heavy metal (lead), a steroid drug (digoxin) and whole proteins (Interleukin-6 and Interleukin-1β) was achieved by spiking human whole blood with the contaminant and applying appropriately functionalized magnetic beads for the detoxification. The contaminant concentration in intoxicated whole blood could be significantly decreased in a dose-dependent manner using magnetic separation-based blood purification. As successful application strongly relies on a safe implementation, a particular focus is put on possible interactions of nanomagnets with the vascular compartment. The integrity of the blood was not affected by the process as depicted by monitoring a series of clinically important parameters. The implementation of the technology into an extracorporeal blood purification device (*ex vivo* test) and further steps in the direction of a clinical application of the concept will be discussed in detail. Using magnetic blood purification, previously inaccessible higher molecular weight compounds can be removed selectively and swiftly compared to conventional dialysis. Potential future applications of this young technology reside in the treatment of sepsis by extracting endo/exotoxins and/or inflammatory mediators.

P 25

Implementation of a multidisciplinary surgical safety checklist and a "team time out" to improve patient safety at Inselspital Bern

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Background: Wrong site, wrong procedure and wrong person surgeries are sentinel events with serious consequences for the patient, the medical staff and the hospital. The World Health Organization advise the adoption of a chirurgical safety checklist and to pause for a moment (time out) immediately before starting the procedure. The Inselspital Bern consents to this universal iniative.
Methods: An interdisciplinary and interprofessional task force designed an adap-ted version of the WHO-checklist. The originated "checklist Inselspital Bern" is a tool of questions, specially tailored to the particular needs of individual units and separated in three parts: first the pre-operative verification, second the period be-fore induction of anesthesia and third the "time out" previous to skin incision.
The implementation follows a defined schedule. Before the official beginning the check-list was undergoing pilot site evaluation. Hereby first difficulties could be verified and addressed. From January 2011 onwards all involved departments seize the opportunity to introduce the checklist and to familiarize with this new tool. On February 1st, 2011, the start of the current six-monthly introductory phase, the implementation takes place in all operative divisions. We attach great importance to structuered staff-training. To brief the directly involved persons we specially produced an educational film wich instructs about the accurate use of the checklist and the performance of the team time out.
Results: The interim results demonstrate a good acceptance by the medical staff. The interdisciplinary as well as interprofessional approach to implement and per-form the checklist appears to be successful. Part two and three of the checklist reach high rates of completion. Physicians and nurses contribute to the perfor-mance equally. Case reports of near miss errors of identification are sampled in a systematic manner.
Conclusion: The introduction of a change of processes implying interruption of established procedures poses a great challenge for the ongoing hospital operations. Succesful implementation of new safety measures depends upon the quality of staff-briefing and education sincere commitment of hospital leaders. The checklist represent an essential contribution for team-formation, awareness and improve-ment of communication within the hospital resulting in a better quality of patient care.

P 26

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

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Background: Implementation of an intra-operative checklist has been associated with lower death rates and complications in a heterogeneous population. High-risk surgical patients may get the highest benefit from this measure. The aim of this study was to assess the efficiency of an intra-operative checklist in high-risk surgical patients living in a high-income country.
Methods: Design: prospective cohort study of pre- (I) and post-implementation (II + III) periods (II: immediate, III: 9 months after implementation); duration: 3 x 3 months. Inclusion criteria: >16 years, ASA >2. Exclusion: low risk surgery, obstetrical/gynaecologic surgery, vital surgery. Main outcomes: unplanned returns to operating theatre (OT), unplanned admissions to intensive care unit (ICU), death, and overall complications within 30 days. Changes in outcomes through checklist implementation were evaluated by calculating absolute risk reduction (ARR) and 95% confidence intervals (CI).
Results: 609 patients were included before and 1110 after implementation (552 in period II, 558 in III). Demographics were not statistically different between the groups (age, sex, BMI, ASA, surgery). Sixty-four percent had a completed checklist in II and 63% in III. No wrong patient or wrong site operation was observed during these periods. Unplanned return to OT was observed in 45 patients (7.4%) before and in 67 (6.0%) after implementation (ARR 1.4% (95% CI –1.2; 3.9)). Return related to surgical site infection (SSI) was found in 18 (3.0%) before and in 18 (1.6%) after implementation (ARR 1.3% (95% CI –0.2; 2.9)). Unplanned admission to ICU was observed in 17 (2.8%) before and in 31 (2.8%) after implementation (ARR 0 (95% CI –1.5; 1.7)). Main reason for unplanned readmission to ICU was respiratory failure (1.5% before and 1.1% after implementation; ARR 0.4 (95% CI –0.7; 1.5)). In-hospital death occurred in 26 (4.3%) before and in 68 (6.1%) after implementation (ARR –1.9% (95% CI –4.0; 0.3)). The number of overall complications was 81 (13.3%) before and 146 (13.2%) after implementation (ARR 0.2 (95% CI –3.2; 3.5)).
Conclusion: Implementation of the intra-operative checklist was not associated with significant effects in high-risk surgical patients when living in a high-income country. However, a trend towards decreased unplanned returns to OT for SSI was observed.

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Evaluation and implementation of an anaesthesia information management system

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The shortcomings of manually compiled anaesthetic records have been recognized over 20 years ago. Electronic health records (EHR) can improve the quality of documentation. Insurance companies, quality managers and medical associations increasingly demand validated perioperative data. Therefore, hospitals have started to introduce EHRs. However, many clinicians and administrators are still reluctant to implement EHRs with concerns regarding malpractice liability, complexity, or financial aspects. The evaluation and introduction of an anaesthesia information management system (AIMS) with limited resources poses several risks. We report on our experience with the introduction of an AIMS in a Swiss university clinic. One great advantage with the introduction of an AIMS is to question old habits in the patient process and it's documentation. Most clinicians are unaware of the financial consequences of poor perioperative documentation. However, the largest end-user of an AIMS may be the billing office. Many clinicians focus on ease of documentation. However, a return on investment is only possible if the documented data can easily be evaluated. Therefore, the goals of an AIMS go beyond documentation, are based on complete use-cases and include specifications for IT interfaces and data evaluation. Thus, an administrator of the billing office with extensive knowledge in handling of electronic data must join the evaluation team. Detailed bidding documentation is indispensable for proper evaluation and implementation. The AIMS team needs an extensive network within the hospital for communication with partners and implementation of interfaces with IT systems, such as hospital information system, laboratory or research. The amount for human resources must not be underestimated. Insufficient resources will delay the project, as IT partner applications, clinical requirements or the AIMS team may change over time. Finally, there is not one single perfect AIMS for all hospitals. A possibly suitable system for a specific institution depends on a variety of parameters and great caution must be taken to extrapolate a good performance of an AIMS from one hospital to another. The good functioning depends on many parameters not under the control of the anaesthesiologist and may include partner IT systems, financial and human resources. These must be taken into consideration when comparing AIM systems.