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Swiss Medical Weekly

Formerly: Schweizerische Medizinische Wochenschrift
An open access, online journal • www.smw.ch

Supplementum 213
ad Swiss Med Wkly
2015;145
October 29, 2015

Annual Meeting of the
Swiss Society for Anesthesiology and Resuscitation SGAR/SSAR
Swiss Society of Emergency and Rescue Medicine SSERM
Swiss Association of Paramedics
Swiss Association of Nurse Anesthesists

St. Gallen (Switzerland), November 12–14, 2015

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EMH Swiss Medical Publishers Ltd.
Swiss Medical Weekly
Farnsburgerstrassse 8
CH-4132 Muttenz, Switzerland
Phone +41 61 467 85 55
Fax +41 61 467 85 56
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ISSN printed version: 1424-7860
ISSN online version: 1424–3997

printed in switzerland

FM 1

Clinically relevant concentrations of ropivacaine and lidocaine block epithelial-mesenchymal transition of lung adenocarcinoma cells in vitro

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Background: Increasing evidence suggests the type of anesthesia administered to patients undergoing cancer surgery might influence the outcome [1]. Epithelial-mesenchymal transition (EMT) is crucial during metastasis of solid tumors: cells lose their epithelial character, cell-cell adhesions are loosened, cells are increasingly able to migrate and ultimately leave the epithelial tumor network and form distant metastatic sites. EMT is characterized by a loss of E-cadherin, a transmembraneous glycoprotein, and an antipodal increase in vimentin, an intermediate filament expressed by mesenchymal cells [2]. Signaling events leading to EMT depend on activation of Akt kinase (Akt), e.g. by transforming growth factor beta (TGFβ), as well as subsequent phosphorylation/activation of mechanistic target of rapamycin (mTOR), glycogensynthase-kinase-3 beta (GSKβ), Src tyrosine protein kinase (Src) and caveolin-1 (Cav-1) [3]. As we have previously shown that amide local anesthetics are able to block Akt activation [4], we hypothesized lidocaine and ropivacaine might as well attenuate TGFβ-induced EMT.
Methods: NCI-H838 lung cancer cells were either left untreated or incubated with TGFβ (2 ng/ml) for 48 hrs or 1 h in presence or absence of 10 µM lidocaine or 1 µM ropivacaine. Whole cell lysates were subjected to Western blot analysis probing for E-cadherin and vimentin at 48 hrs as well as for mTOR, phosphorylated at serine 2448, GSKβ, phosphorylated at serine 9, Src, phosphorylated at tyrosine 419 and Cav-1, phosphorylated at tyrosine 14 at 1 hour.
Results: Stimulation of NCI-H838 cells with TGFβ for 48 hours lead to a 51 ± 17% (mean ± SD) loss in E-cadherin and a 120 ± 68% increase in vimentin expression compared to untreated cells ($p < 0.01$). Co-incubation with lidocaine and ropivacaine completely abolished TGFβ-induced changes and brought values back to baseline ($p < 0.05$ for all respective treatments vs. TGFβ alone). At the 1-hour time-point significant increases in activation/phosphorylation of mTOR (245 ± 138%, $p < 0.05$), GSKβ (143 ± 110%, $p < 0.05$), Src (61 ± 23%, $p < 0.05$) as well as Cav-1 (110 ± 95%, $p < 0.05$) were noted in tumor cells treated with TGFβ. However, co-incubation with lidocaine or ropivacaine completely blocked the TGFβ-induced rise in phosphorylation for all proteins ($p < 0.05$ for all respective treatments vs. TGFβ alone).
Conclusions: Clinically relevant concentrations of lidocaine and ropivacaine completely blocked TGFβ-induced EMT in NCI-H838 lung cancer cells by attenuating crucial signaling events, thus prohibiting a loss of E-cadherin and an increase in vimentin as hallmarks of EMT. The current study therefore adds new insight into a potential mechanism by which local anesthetics might be able to attenuate metastasis.

References
1 Acta Anaesthesiol Scand. 2013;57:1211–29.
2 Nat Rev Cancer. 2002;2:442–54.
3 Curr Opin Cell Biol. 2014;31:56–66.
4 Eur J Anaesthesiol. 2014;31:e-Suppl 52.

FM 2

Hyperoxia worsens myocardial oxygenation and ventricular function in an animal model with severe coronary artery stenosis

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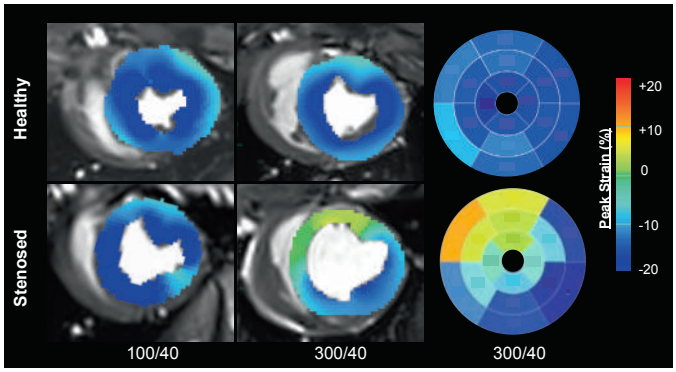
Background: Current guidelines limit the use of high oxygen tension after return of spontaneous circulation following cardiac arrest. These recommendations are based on neurological outcome and increased mortality, while little is known about the impact of hyperoxia on the ischemic heart. However, oxygen is frequently administered and is generally expected to be beneficial. High oxygen tensions are also usually present during general anaesthesia. This study assesses effects of hyperoxia on coronary blood flow and myocardial strain in swine with a coronary artery stenosis.
Methods: In 22 swine, a blood flow probe was attached to the left descending coronary artery (LAD) after a left-sided thoracotomy, and in 11 of these animals an LAD stenosis was induced. Arterial blood gases were targeted to a baseline with paO_2 of 100 mm Hg and a $paCO_2$ of 40 mm Hg. Three hyperoxia levels were reached with paO_2 >300 mm Hg, and a $paCO_2$ of 30, 40, or 50 mm Hg. At each level, coronary blood flow was measured and the entire heart was imaged with a magnetic resonance cine sequence at 3 Tesla from which left ventricular ejection fraction (EF) and myocardial peak circumferential strain were measured. Strain was assessed for global and regional changes of the LAD perfused myocardium and remote tissue. All observations at hyperoxia were compared to the normoxic baseline
Results: In control animals, hypo- and normocapnic hyperoxia decreased blood flow by 12.7 ± 2.3 and 13.3 ± 5% ($p < 0.01$), while hypercapnia neutralized this effect (+2.20 ± 5.5%, n.s.). In stenosed animals, all levels reduced flow by 13.1 ± 5.1 to 24.0 ± 4.5% ($p < 0.05$). For myocardial strain, no changes were observed in the control group, and at normoxia, stenosed animals did not differ from the controls. After increase in oxygen tension, the stenosed animals showed a significant strain reduction in the LAD territory (fig.). This was seen for all paO_2 levels. For ventricular function in the stenosed group, hyperoxia decreased EF to <42 ± 6% from the baseline level (48 ± 3%, $p < 0.05$), and no changes were observed in the controls (49–56%).
Conclusion: In the presence of severe coronary artery stenosis, hyperoxia reduces coronary blood flow, ventricular function and myocardial strain in an animal model. Further research is required and current clinical practice may have to be revisited as our results indicate that hyperoxia may exacerbate myocardial ischemia.



FM 3

TNFα-induced tumor cell proliferation is blocked by clinically relevant concentrations of ropivacaine in vitro

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Background: Retrospective analyses suggest the perioperative use of regional anesthesia/local anesthetics in patients undergoing cancer surgery might reduce cancer recurrence or metastasis [1]. Pro-inflammatory cytokines, such as tumor necrosis factor a (TNFα), are strong promoters of cancer growth and proliferation via the induction of certain inflammatory signaling cascades [3]. Based on previous findings showing that ropivacaine blocks TNFα-induced inflammatory signaling in lung adenocarcinoma cells [2], we hypothesized the drug might also affect proliferation of these cells.
Methods: NCI-H838 lung cancer cells (10^3 per well) were seeded into a 96-well culture plate and were either left untreated or incubated with TNFα (20 ng/ml) in absence or presence of ropivacaine at concentrations ranging from 1 nM to 100 µM. Cell proliferation and metabolic activity/viability were assessed at 72 and 120 hours by measuring incorporation of bromodeoxyuridine (BrdU) or reduction of the tetrazolium dye MTT, respectively. Statistical analysis was conducted using two-way ANOVA with Bonferoni *post hoc* testing.

Results: Stimulation of NCI-H838 cells with TNFα lead to a 58 ± 28% (mean ± SD) and 37 ± 15% increase in BrdU incorporation compared to untreated cells at 72 and 120 hours, respectively. TNFα-induced proliferation was significantly attenuated by 10 µM ropivacaine (77% reduction, p = 0.03) at 72 hours and by 1 µM ropivacaine at 120 hours (52% reduction, p = 0.03). Similar results were obtained from the MTT assay: Compared to untreated cells, TNFα increased MTT conversion by 37 ± 20% at 72 hours, which was completely diminished by 1 nM ropivacaine (p <0.001). The observed 36 ± 11% rise at 120 hours was also brought back to baseline values by 1 µM ropivacaine (p = 0.03).
Conclusions: Ropivacaine – at clinically relevant concentrations – attenuated TNFα-induced proliferation of NCI-H838 lung adenocarcinoma cells as assessed by BrdU incorporation. Similar results regarding cell viability obtained from the MTT assay indicate an anti-proliferative rather than a cytotoxic effect at the concentrations used. The current study therefore provides new experimental evidence for a potential beneficial effect of local anesthetics in patients undergoing cancer surgery and underlines the hypothesis that these effects might be related to the strong anti-inflammatory properties of these substances.

References
1 Acta Anaesthesiol Scand. 2013;57:1211–29.
2 Anesthesiology. 2012;117:548–59.
3 Exp Cell Res. 2008;14:509–29.

FM 4

Sevoflurane improves the cohesion of brain endothelial cells after hypoxia

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Introduction: Sevoflurane is a volatile anesthetic which has been shown to reduce brain injury and cerebral infarct size after ischemia, impacting on the blood brain barrier (BBB) [1]. The grade of brain edema correlates with the degree of BBB disruption and is an independent predictor of unfavorable outcome for patients after brain injury [2, 3]. The mechanism, how sevoflurane interacts with injured endothelial cells still remains unclear. In this study we analyzed the effects of sevoflurane on rat brain endothelial cells (RBE4) after hypoxic injury.
Methods: RBE4 cells were exposed for 24 hours to hypoxia 0.2% O_2, followed by a 4 hour reoxygenation with 21% O_2 with or without 2.2% sevoflurane. Cellular DNA content was measured. In order to assess permeability of the monolayer, RBE4 cells were cultured in Boyden chambers for 2–3 days and permeation of 40kD FITC dextran was determined. Immunostaining for ZO-1 and beta-Catenin was performed to identify tight and adherence junctions. One way ANOVA and Bonferroni's multiple comparisons test was used for statistical analysis. P <0.05 was considered significant.
Results: Hypoxia of 24 hours followed by a 4-hour reoxygenation reduced DNA content of RBE4 cells by 20% (p <0.0001), sevoflurane had no effect. Barrier function, determined by dextran permeability, was impaired after hypoxia reoxygenation. On average, permeability was then 150% higher compared to normoxia (p <0.0001) but only 60% higher when sevoflurane was present during reoxygenation (p <0.05). Accordingly, both ZO-1 and beta Catenin as tight and adherens junction components were shown to be better maintained in the cellular membrane under the influence of sevoflurane during reoxygenation.
Discussion: These data provide evidence for the first time that sevoflurane positively impacts on impaired endothelial barrier function. A possible mechanism might be stabilization of junction proteins through sevoflurane. Further studies are needed to test the effects of sevoflurane on the blood brain barrier *in vivo.*

References
1 Pape M, et al. Anesth Analg. 2006;103(1):173–9.
2 Donkin JJ, Vink R. Curr Opin Neurol. 2010;23(3):293–9.
3 Claassen J, et al. Stroke. 2002;33(5):1225–32.

FM 5

The primary sevoflurane metabolite hexafluoro-2-propanol attenuates hypoxia/reoxgenation injury in cardiomyocytes in vitro

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Introduction: Recent publications have shown that the primary sevoflurane metabolite hexafluoro-2-propanol (HFIP), a water-soluble substance, beneficially modulates inflammation in experimental sepsis [1, 2]. So far it is unknown whether HFIP also positively impacts in situations of ischemia/reperfusion injury similar to sevoflurane. In this study, we therefore evaluated the effects of HFIP and sevoflurane on cardiomyocytes in a hypoxia/reoxygenation (H/R) injury model.
Methods: Murine cardiomyocytes were cultured and exposed to hypoxia (0.2% O_2) for 6 h (cells grown under normoxic conditions served as a control). During reoxygenation (2 h), cells were exposed to room air, HFIP (4 mM), or sevoflurane (2.2 Vol%). Cytotoxicity was monitored measuring lactate dehydrogenase (LDH) release. Caspase-3/7 and 8 activity as a representative apoptosis marker, was determined using a selective fluorogenic caspase substrate. Intracellular formation of reactive oxygen species (ROS) was detected by oxidation of 2',7'-dichlorfluorescein-diacetate (= DCFH-DA) to the DCF. Cell viability and NADPH oxidase-related metabolic activity were measured in MTT assays. Linear mixed models were used for analyzing the data. P <0.05 was considered significant.
Results: Hypoxia/reoxygenation (H/R) provoked increased LDH release of cardiomyocytes by 72% (p <0.001), an 18% rise in caspase activity (p <0.001), and 38% elevated formation of intracellular ROS (p <0.001). MTT was attenuated by 11% (p = 0.006). HFIP or sevoflurane reduced H/R-induced LDH release (by 52% and 42%, both p ≤0.01). An attenuation of the rise in caspase activity and intracellular ROS formation was observed with HFIP or sevoflurane (both p <0.001). Lowered MTT levels almost regained levels of control values by sevoflurane (p = 0.514), but not by HFIP treatment.
Conclusion: The results suggest that a treatment with HFIP attenuates H/R-induced damage in cardiomyocytes – an effect, which is comparable to the effects sevoflurane in H/R injury. The protection might be mediated through an attenuation of intracellular ROS formation. HFIP might therefore be a promising intravenously applicable protective drug molecule in procedures such as percutaneous coronary revascularization in the near future.

References
1 Herrmann I, et al. PLoS One. 2013;8(8):e72057.
2 Urner M, et al. Clinical & Experimental Immunology. 2015. Epub ahead of print.

FM 6

Chronic postsurgical pain: risk factors and characteristics

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Background: Severe chronic post-surgical pain (CPSP) resulting in clinically relevant functional impairment is reported by 5–10% of the patients [1, 2]. It is considered as an iatrogenic chronic pain, thus, identification of mechanisms and risk factors are pivotal to develop strategies to prevent CPSP [1].
Methods: Prospective observational trial in 21 hospitals of 11 European countries, with 5 Swiss hospitals participating [3]. After ethics approval and informed consent patients undergoing elective surgery were enrolled in the registry PAIN OUT [4]. Outcome was evaluated on the first postoperative day (D1) using a validated questionnaire. Follow-ups at 6 and 12 month via email or telephone interview used the Brief Pain Inventory (BPI) and the DN4 (Douleur Neuropathique en 4 questions). Primary endpoint: incidence of at least moderate CPSP (NRS ≥3) at M12; secondary endpoints: role of neuropathic pain, risk factors for CPSP.
Statistics: Univariate analysis, multivariate logistic regression analysis; Hosmer-Lemeshow test; Odds Ratios (OR(95%-CI)).
Results: Complete data of 1044 and 889 patients could be analysed after 6 and 12 months. One year after surgery 9.6% (7.7–11.7) complained of moderate (NRS 3-5), 2.2% (1.2–3.3) of severe CPSP

(NRS ≥6). The DN4 revealed neuropathic pain in 35.4% and 57.1% of the patients with at least moderate CPSP at 6 and 12 months, respectively. Functional impact of pain on daily activities increased with severity of CPSP with median (quartiles) BPI score of 2.7 (1.6/4.0) and 5.4 (4.1/6.7) for moderate and severe CPSP (p <0.001). Multivariate analysis identified orthopaedic surgery (OR 1.86 [1.1–3.2]), preoperative chronic pain (1.89 [1.1–3.2]) and percentage of time in severe pain after surgery (OR 1.3 [1.2–1.5], as risk factors, whereas high postoperative pain scores were not associated (OR: 0.93 [0.83/1.05]). A 10% increase in percentage of time in severe pain on D1 was associated with a 30% increase of CPSP incidence at 12 months.
Conclusions: Neuropathic pain was prevalent in 57% of the patients with severe CPSP one year after surgery. In addition to some previously described variables, the percentage of time in severe pain during the first 24 hours after surgery was associated with CPSP. This underlines the importance of adequate pain management after surgery.

References
1 Haroutiunian S, et al. Pain. 2013;154:95.
2 Kehlet H, et al. Lancet. 2006;367:1618.
3 www.esahq.org/research/clinical-trial-network
4 www.pain-out.eu

FM 7

Intrathecal hyperbaric prilocaine 2% versus plain ropivacaine 0.4% for same day arthroscopic knee surgery: A prospective, randomized, double-blind, controlled study

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Background: Short duration spinal anesthesia is a good alternative for ambulatory day case surgery: Hyperbaric prilocaine 2% has a short onset time and a rapid recovery, and may therefore be well suited in this setting. The aim of the study was to compare the times to reach motor block, resolution, and discharge from the PACU, between hyperbaric prilocaine 2% and plain ropivacaine 0.4%.
Methods: In a prospective, randomized and double-blind design, 140 18–80 year old ASA I-II patients, scheduled for elective, unilateral, arthroscopic knee surgery lasting less than 45 min, were allocated to either the prilocaine 2% (60 mg/3 ml) or the plain ropivacaine 0.4% (12 mg/3 ml) group. Exclusion criteria were contraindications for spinal anesthesia, pregnancy, and known allergy to the study drugs. Complete recovery of motor block, time to reach discharge criteria, as well as side-effects up to 48 h after discharge, were recorded.
Results: Complete recovery from motor block was faster in the prilocaine 2% group: 195 ± 67 vs 225 ± 81 min. Time to reach discharge criteria was similar in both groups: 334 ± 55 and 346 ± 73 min for prilocaine 2% and ropivacaine 0.4%, respectively. The incidence of side effects was low and similar in both groups. No case of transient neurologic symptoms occurred in either group.
Conclusions: Recovery of motor block was faster after intrathecal application of hyperbaric prilocaine 2% compared to plain ropivacaine 0.4%. However, discharge time was similar. Both drugs showed a similar risk profile.

FM 8

Tramadol pharmacokinetics and genetic variants of the Organic Cation Tranporter OCT1

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Background: Genetic variants in the metabolizing enzyme CYP2D6 (cytochrome P450 2D6) are well known to affect pharmacokinetics and efficacy of tramadol. Recently, also genetic polymorphisms in the liver organic cation transporter OCT1 (solute carrier family 22 member 1; *SCL22A1*) were shown to affect plasma concentration of (+) *O*-desmethyltramadol ((+)ODT), the active metabolite of tramadol [1]. In this study the influence of OCT1 polymorphisms on tramadol analgesia and pharmacokinetics was analyzed in patients recovering from surgery.
Methods: After approval of the ethics committee and written informed consent 205 patients receiving tramadol via patient-controlled analgesia after surgery were enrolled. OCT1 genotypes (zero, one or two active alleles) and genotype dependent CYP2D6 activity scores representing no (PM), intermediate (IM), extensive (EM) or ultra-rapid metabolism (UM) were determined. Plasma concentrations of (+)ODT were measured by (mean AUC (95%-CI)). Primary endpoint: Tramadol consumption up to 48 hours after surgery depending on OCT1-genotype (repeated measures ANOVA).
Results: Zero, one and two active OCT1 alleles were carried by 19, 82 and 104 patients (age 57.3 ± 12.6 years). The average (+)ODT plasma concentrations (AUC) were 99.3 (53.9/144.7), 80.2 (65.1/95.3) and 64.5 (51.9/77.2) ng·h/ml in carriers of zero, one and two active OCT1 alleles (p = 0.03 for zero versus two active alleles). In line with this, the cumulative tramadol consumption was lowest in carriers of no active OCT1 allele (p = 0.025). This finding was confirmed in the subgroup of CYP2D6 EM (p = 0.01). OCT1 effects were most pronounced in CYP2D6 EM and UM, suggesting limiting effects of OCT1-mediated hepatic uptake only in the presence of active hepatic metabolism.
Conclusions: In addition to CYP2D6, OCT1 polymorphisms responsible for variance of carrier-mediated (+)ODT-uptake in the liver affect the efficacy and pharmacokinetics of tramadol in postoperative patients.

Reference
1 Tzvetkov MV, et al. Clin Pharmacol Ther. 2011;90:143–50.

FM 9

Extrafascial injection for interscalene block reduces respiratory complications compared to a subfascial injection: a randomized, controlled, double-blind trial

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Background and aims: Hemidiaphragmatic paresis after ultrasound-guided interscalene brachial plexus block (IS block) is reported to occur in up to 100% of patients. We tested the hypothesis that an injection lateral to the brachial plexus sheath reduces the rate of hemidiaphragmatic paresis compared to a classical approach while providing similar analgesia.
Methods: After ethics committee approval, 40 ASA I–III patients scheduled for elective shoulder surgery under general anaesthesia were randomized into two groups. An ultrasound-guided IS block was performed prior to surgery: 20 milliliters of bupivacaine 0.5% with epinephrine 1:200 000 were injected either between C5 and C6 within the interscalene groove (group subfascial, SF) or 4 mm lateral to the brachial plexus sheath (group extrafascial, EF). The primary outcome was rate of complete hemidiaphragmatic paresis (diaphragmatic movement reduction >75%), measured by M-mode ultrasonography, before and 30 min after the procedure. Secondary outcomes were forced expiratory volume, forced expiratory volume in 1 second, and peak expiratory flow. Other outcomes included intraoperative fentanyl consumption, time to first analgesic request, and oxycodone consumption at 24 h postoperatively.

Table 1
Respiratory-related outcomes. Data are presented as mean and 95% confidence interval. Group SF, group subfascial; Group EF, group extrafascial.

Outcomes	Group SF	Group EF	P value
Forced expiratory volume (L)	3.2 (2.7; 3.7)	3.8 (3.5; 4.2)	0.04
Forced expiratory volume in 1 second (L)	2.6 (2.1; 3.0)	3.1 (2.8; 3.4)	0.02
Peak expiratory flow (L/min)	6.0 (5.0; 7.0)	7.6 (6.7; 8.5)	0.02

Table 2
Acute pain-related outcomes. Data are presented as mean and 95% confidence interval. Group SF, group subfascial; Group EF, group extrafascial.

Outcomes	Group SF	Group EF	P value
Intraoperative fentanyl consumption (µg)	158 (142; 173)	161 (146; 177)	0.73
Time to first analgesic request (h)	14 (11; 17)	17 (14; 20)	0.11
Oxycodone consumption at 24 h postoperatively (mg)	15 (9; 20)	12 (7; 17)	0.42

Results: The rate of hemidiaphragmatic paresis was 95% in group SF and 25% in group EF (p <0.0001). Other respiratory outcomes were significantly preserved in group EF (table 1). Acute pain-related outcomes were similar between groups (table 2).
Conclusions: IS block with an extrafascial injection reduces respiratory complications and provides similar analgesia compared to a subfascial injection.

FM 10

Nociceptin receptor activation modulates toll-like receptor 2 expression in human peripheral blood

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Introduction: Nociceptin is an opioid-related peptide and may play a role in peripheral blood during inflammation and pain [1, 2]. Toll-like receptors (TLRs) are pattern-recognition receptors which play a key role during innate and adapted immune response. Cross-talk between opioids and TLRs has been discussed recently [3, 4]. However, no data on the influence between nociceptin and TLRs are available so far. The aim of this study was to investigate effects of nociceptin on TLR2 mRNA expression in human peripheral blood under inflammatory conditions.
Methods: After approval of the ethics committee and written informed consent, healthy blood donors were enrolled in this *ex vivo* study. Whole peripheral blood was cultured with or without nocicpetin 10^{-9} M or phorbol-12-myristate-13-acetate (PMA) 10 ng/ml for 6 and 24 hours. mRNA expression of PNoc and TLR2 was detected by quantitative RT-PCR. To investigate possible influences of nociceptin on TLR2 mRNA expression, blood was pretreated with UFP-101 100 nM, a specific antagonist of the nociceptin receptor, for 1 hour prior to co-culture with PMA 10 ng/ml. Nociceptin protein levels in culture supernatants were measured using fluorescent-enzyme immunoassay.
Statistics: Median (95% CI), Mann-Whitney U test and Wilcoxon signed-rank test with subsequent post hoc analysis.
Results: Exogenous nociceptin enhanced TLR2 mRNA expression in human blood leukocytes after 6 hours compared to the control without any stimuli (normalized ratio: 1.0 (0.6/2.3) vs. 0.7 (0.3/2.3), p = 0.007). Both PNoc and TLR2 mRNA were up-regulated in PMA-induced blood cells after 24 hours compared to the respective controls (PNoc: 1.7 (0.5/10.5) vs. 0.2 (0.0/0.7); TLR2: 1.3 (0.7/4.8) vs 0.7 (0.3/1.6), both p <0.0001). Nociceptin peptide levels were increased in supernatants of blood cultured with PMA compared to the control (8.3 (4.1/24.0) vs. 5.0 (2.5/9.1) pg/ml, p = 0.02). Pretreatment with UFP-101 partially prevented the up-regulating effects of PMA on TLR2 expression with its mRNA declining to 81.8 (36.8/135.0)% of the blood treated with PMA only (p <0.001).
Conclusions: Activation of the nociceptin-NOP system enhances TLR2 mRNA expression in human peripheral blood leukocytes. Elucidation of the function of nociceptin in human peripheral blood under inflammatory conditions could reveal new insights in the treatment of pain and inflammation.

References
1 Serrano-Gomez A, et al. Br J Anaesth. 2011;106:6–12.
2 Stamer UM, et al. Br J Anaesth 2011;106:566–572.
3 Hutchinson MR, et al. Brain, Behavior, and Immunity. 2010;24:83–95.
4 RS Sauer, et al. Mol Pain. 2014;6:10:10.

FM 11

Effect of prehospital intubation in patients with severe traumatic brain injury on outcome: a prospective cohort study

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Background: Severe traumatic brain injury (sTBI) is a silent epidemic. Secondary insults, e.g. hypoxemia and hypercapnia, are associated with bad outcome. It is recommended that patients with Glasgow Coma Scale (GCS) <9 should undergo prehospital intubation (PI). There is a controversy if this intervention is beneficial based on the available evidence; however, most studies have methodological limitations. The aim of this study was to estimate the effect of PI on short term outcome in patients after sTBI in Switzerland.
Methods: A multicenter, prospective cohort study was performed in dedicated trauma centers of Switzerland. Adults with sTBI (Abbreviated Injury Scale score of head region >3) were included. Outcome measures were death and impaired consciousness (GCS ≤13) at 14 days. The associations between risk factors and death were assessed with univariate and multivariate Cox models [using hazard ratio (HR) and 95% confidence interval (CI)]. The associations between risk factors and impaired consciousness were assessed using univariate and multivariate regression models. Potential risk factors were age, GCS on scene, pupil reaction, Injury Severity Score (ISS), PI, oxygen administration, type of admission to trauma center (direct/indirect), and qualification of the prehospital physician.
Results: 832 patients were included [median age 54 (IQR32-71), median GCS on scene 9 (IQR 4-14), abnormal pupil reaction 26%, median ISS 25 (IQR 21-34). 44% had a PI and 83% a direct admission to a trauma center. 577 of 832 patients survived until 14 days; 267 of 369 patients with GCS at 14 days were conscious. Age, GCS on scene <9, abnormal pupil reaction and ISS ≥25 were associated with mortality. There was a potential interaction in subgroups between ISS and PI and survival: a trend of an association with survival was identified in patients with ISS ≥25 and PI (HR 0.69 (95%CI 0.47–10.3) and in patients with ISS <25 without PI (HR 0.35 (95%CI 0.12–1.07). GCS on scene<9 and ISS ≥25 were associated with impaired consciousness; PI was not associated. All other investigated potential risk factors were not associated with both outcomes.
Conclusions: In this epidemiological study with patients suffering from sTBI, PI was overall not associated with short term mortality and consciousness. However, there was a potential interaction with PI and general major trauma estimated with ISS: patients with a higher ISS could benefit from PT, but not patient with a lower ISS.

FM 12

Night time in-hospital cardiac arrest impairs good neurological survival in a Swiss teaching hospital

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Introduction: Cardiac arrests (CA) occurring at night have been shown to be associated with lower survival rates for both out-of-hospital and in-hospital resuscitation. There is only scarce information available for Switzerland. We monitored "Rapid Response Team" (RRT) missions at our teaching hospital after implementation of the AHA 2010 guidelines. Survival data for in-hospital cardiac arrest (IHCA) were investigated depending whether the event occurred during the day or at night.
Methods: A standardized extended in-hospital Utstein data set of all RRT-interventions at the University Hospital Basel, Switzerland, from December 13, 2010 until March 31, 2015 was consecutively collected and recorded in Microsoft Excel (Microsoft Corp., USA). Data were analyzed using IBM SPSS Statistics 22.0 (IBM Corp., USA) and are presented as descriptive statistics.
Results: RRT was activated for 636 patients, with 459 having a life-threatening status (72%; 33 missing). 270 patients (59%) suffered IHCA. 92 CAs (34%) occurred during the night-shift (23:00 – 06:59), and 177 CAs (66%) occurred during day-shifts (07:00 – 22:59; 1 case with "time data" missing). Shockable rhythms and witnessed CA were found more often at day- compared with night-time: 34 (20%) vs. 8 (9%; p = 0.032) and 133 (77%) vs. 55 (62%; p = 0.009), respectively. There was no difference between day and night regarding first-responder chest compressions before RRT arrival. Patients whose IHCA occurred during the day showed more favorable neurological outcomes (Cerebral Performance Categories (CPC) of 1+2: 47 (28%) vs. 15 (17%; p = 0.048)). *Return of spontaneous circulation (*ROSC) and hospital discharge were not different. The time to reach the CA patient was not different (123 s for first responder, 245 s for the complete team).
Conclusions: IHCA occurring at night show a less favorable neurological outcome than during day time at a Swiss university hospital. A lower rate of shockable rhythms may be a sign of delayed recognition of CA during nighttime, which may be an explanation for the reduced CPC-score.

FM 13

Safety of Airtraq® vs. fiberoptic intubation in patients with an unstable cervical spine fracture: a neurophysiological study

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Introduction: Tracheal intubation in patients with an unstable cervical spine is challenging. The airway must be secured while the cervical spine is immobilized. Numerous airway devices and techniques exist and generate specific cervical spine movements with a potential for secondary injury. Fiberoptic intubation is described as the preferred technique by experienced anesthesiologists. The Airtraq® has been shown to perform well in patients with a simulated difficult airway. We compared the success rate, time and neurophysiologic modifications associated with tracheal intubation performed randomly by an Airtraq or a fibrescope in patients with a trauma related unstable cervical spine fracture immobilized by a cervical collar.
Methods: 38 patients were randomly assigned to tracheal intubation using the Airtraq or the fibrescope. Neurophysiological monitoring (somatosensory evoked potentials with amplitude and latency measures after median nerve stimulation) was performed before airway management (baseline), during ventilation, during and after intubation and after definitive patient positioning for surgery. A 50% reduction in amplitude or a 10% increase in latency were defined as significant to pose a threat to spinal cord function. Modifications of signals in relation to the baseline, as well as time, feasibility and number of attempts necessary for intubation were compared. The one-sided Wilcoxon rank-sum test was applied to detect differences in signal distribution as well as intubation times.
Results: There were no significant differences between the groups in patients' characteristics. All patients could be intubated. Face mask ventilation did not alter significantly somatosensory evoked potentials. During and after intubation, no clinical significant variations in amplitude or latency where found in either group. A 1.5% increase in latency for the left arm during intubation was found in the Airtraq group. Intubation times were significantly shorter when performed by an Airtraq (median [25^{th};75^{th}] 45 seconds [39;55]) than a fiberoptic bronchoscope (121 [86;154]), ($p < 0.001$).
Conclusions: Tracheal intubation with an Airtraq in patients with a cervical spine fracture following trauma and a neck immobilized by a cervical collar appears to be safe and is an option to fiberoptic intubation. All neurophysiological differences found were below clinical significances. Time necessary to secure an airway in these patients is significantly shorter with the Airtraq.

FM 14

The CASS simulator: first results with a new ultra-portable iPad™ based flexible bronchoscopy simulator

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Introduction: Fiberscopy is widely used by anaesthetists. Virtual reality simulation is an effective and safe method to teach bronchoscopic skills. Few high-fidelity bronchoscopy simulators exist; they are large and cumbersome and their prices exceed US$ 25'000. We developed an ultra-portable high reality iPad™-based bronchoscopy simulator and report of its first use by anaesthesiologists.
Methods: The CASS simulator (Computer Airway Simulation System) consists of a proxy bronchoscope and a basic robotic device, wirelessly connected to an iPad™. The robotic interface tracks proxy motions and provides haptic feedback while the iPad displays a specifically developed three-dimensional high quality graphic model of human airways. An optional roadmap indicates the position of the bronchoscope. The system automatically records the duration of the procedure, number and sequence of bronchial segments inspected, and number of collisions with tracheobronchial wall. Anaesthetists attending a Swiss difficult airway course were recruited to assess the CASS. Objective performances were assessed with participants performing a bronchoscopy from mouth to the right superior lobar bronchus (RSLB). We used an assessment tool of bronchoscopic performance [1], combining number of wall collisions, ease of pass through vocal cords, image centering and "red-out time" (0 = bad to 8 = very good). Subjective criteria (bronchoscope proxy handling, graphic quality of the model, anatomy fidelity, reactivity of the system and usefulness for teaching) were assessed using a Likert scale (1 = bad to 5 = very good).
Results: 22 physicians were enrolled (5 residents (22.7%), 2 fellows (9.1%) and 15 senior specialists (68.2%)). Seventeen (77.3%) had >10 years of clinical experience and 13 (59.1%) had performed >50 bronchoscopies. Mean time to reach the RSLB was 92 ± 35 sec, mean number of wall collisions during procedure were 12 ± 15. Bronchoscopic performance was 4.7 ± 2.5. Scores of subjective assessment were as follow: bronchoscope proxy handling 4.0 ± 0.7; graphic quality 4.7 ± 0.5; anatomy fidelity 4.5 ± 0.6; reactivity of system 3.6 ± 1.1, usefulness for teaching 4.9 ± 0.3 and ease of use 4.3 ± 0.8.
Conclusion: Subjective assessment by participants of the simulator was excellent, especially as a tool for teaching and with regards to the graphic quality. Reactivity of the system should be improved in future. Bronchoscopic performance of participants was acceptable.

Reference
1 Graeser K, et al. Eur J Anaesthesiol. 2014;31(3):125–30.

FM 15

The impact of a near-infrared spectroscopy based protocol on the neurobehavioral outcome after shoulder surgery in beach chair

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Background: Cerebral hypoperfusion related to beach chair position and to the often performed controlled hypotension has been suggested by case reports describing poor neurological outcomes in patients without high risk for cerebrovascular events. Near-infrared spectroscopy (NIRS) offers the potential for cerebral perfusion monitoring. Previous studies have shown that regional anesthesia might offer advantages concerning cerebral perfusion and oxygenation ($rScO_2$) with positive impact on postoperative cognitive dysfunction. We performed this study to introduce a treatment algorithm based on $rScO_2$ for general anesthesia and to compare the impact on neurological and neurobehavioral outcome compared to regional anesthesia.
Methods: Eighty ASA I-III patients scheduled for shoulder surgery were divided according to our clinical standard in 2 groups: 40 patients in the regional anesthesia (R-) group with interscalene catheter (ISC) and 40 patients in the general anesthesia (G-) group with propofol / remifentanil TCI and ISC for postoperative analgesia. Anesthesiologists in the R-group were blinded to the $rScO_2$ values. Baseline data the day before surgery included neurological and neurobehavioral tests repeated the first day after surgery. The baseline data for NIRS / bispectral index (BIS) / CO_2, non-invasive blood pressure at heart level and correction for brain level and non-invasive cardiac output monitoring (esCCO Technology) were taken prior anesthesia, after induction, after beach chair positioning and all 20 minutes after start of surgery until discharge to the PACU. A $rScO_2$-based treatment protocol for the G-group including corrections for head position, SaO_2, et CO_2, mean arterial pressure, hemoglobin level and cardiac function was applied.
Results: (Preliminary, study ongoing) Patients in the R-group showed more stable values of $rScO_2$, and blood pressure with similar neurobehavioral test results after surgery compared to baseline. In the G-group the treatment protocol was effective correcting $rScO_2$ levels compared to baseline values leading to similar results in the neurobehavioral tests the first day after surgery compared to the R-group.
Conclusions: Regional anesthesia offers more stable cardiovascular conditions for shoulder surgery in beach chair position compared to general anesthesia. However, a $rScO_2$-based treatment protocol allows for cerebral oxygenation correction leading to similar results in the postoperative cognitive function tests.

FM 16

Which anesthesia regimen is best to reduce morbidity and mortality in lung surgery? A multicentre randomized controlled trial

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Background: One-lung ventilation (OLV) allows isolation of the individual lungs under anesthesia; however, it is associated with hypoxia-reoxygenation injury in the deflated and subsequently re-ventilated lung. Numerous studies have reported beneficial effects of volatile anesthetics on inflammatory mediators in this type of injury model. If volatile anesthetics are potent enough to impact not only on surrogate biomarkers, but also on clinical outcome still has to be determined. Therefore, a multicenter randomized controlled trial (RCT) was designed comparing propofol with desflurane anesthesia in patients undergoing lung resection surgery with OLV to detect major complications.
Methods: Five centers in Switzerland (University Hospitals of Zurich, Bern and Basel and the Kantonsspital of St. Gallen and Munsterlingen) participated in the RCT. Patients scheduled for elective lung surgery were randomly assigned to receive either propofol or desflurane as general anesthetic with pre-stratification for study site, major diseases (coronary heart disease, COPD, diabetes, chronic kidney disease) as well as pneumonectomy. Major complications according to the Clavien-Dindo score were defined as primary (hospitalization) or secondary (6 month follow up) endpoint comprising of re-interventions without (grade III_A) or with anesthesia (grade III_B), single-organ (grade IV_A) or multi-organ failure (grade IV_B) as well as all-cause mortality (grade V). Cox regression model was used, adjusting results for study site, age, pneumonectomy and major diseases.
Results: 486 patients were enrolled (6 drop outs, n = 230 for each arm, randomized and analyzed). Demographics were similar in both groups. 111 patients (48%) had major surgery (thoracotomy, pneumonectomy) in the propofol, and 97 (42%) in the desflurane group. Duration of OLV, anesthesia and surgery were comparable in both groups. Incidence of major complications during hospitalization was 16.5% in the propofol while 13.0% in the desflurane group (HR for desflurane 0.75, 95%CI 0.46–1.22, p = 0.24). Incidence of major complications within six months from surgery was 40.4% in the propofol while 39.6% in the desflurane group (HR for desflurane 0.95, 95%CI 0.71–1.28, p = 0.71).
Conclusions: This is the first adequately powered multicenter RCT addressing the effect of volatile anesthetics on major complications after lung surgery. No significant difference between the two anesthesia regimens could be observed.

FM 17

Sevoflurane postconditioning might reduce severity of cardiac and non-cardiac complications after elective cardiac valve surgery. Results of a 6 month follow up

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Introduction: Anesthetic conditioning with volatile anesthetics has reduced ischemia-reperfusion injuries in various settings, reflected by a significant decrease of surrogate markers. However, it is still less clear if changes in biomarkers can be translated into a clinical benefit for the patient. In a recent randomized controlled trial from our center, including 102 patients undergoing elective cardiac surgery, we were able to show lower troponin levels on the first postoperative day after 4 hours of sedation with sevoflurane in comparison to propofol in the intensive care unit [1]. In order to assess the clinical long-term implications of these findings, we performed a 6-month follow up, focusing on cardiac and non-cardiac events.
Methods: All patients who successfully completed the postconditioning trial were included into this follow-up study. Primary and secondary endpoints were assessment of cardiac events (dysrhythmias, congestive heart failure and cardiac ischemia) and non-cardiac events (pulmonary embolism, bleeding, infection, cerebral events and chronic kidney failure) resulting in diagnostic or therapeutic interventions. Statistical analysis was performed in R (R Foundation for Statistical Computing). Mixed linear models with propofol as reference group were chosen.
Results: Ninety-four of the 102 patients from the primary study were evaluated in this 6-month follow-up. Sixteen out of 41(39%) patients in the sevoflurane and 19 patients out of 53 (36%) in the propofol group suffered from one or several cardiac events during the first 6 months after participating in the primary study (p = 0.75). In 4 (9%) patients treated with sevoflurane vs. 9 (17%) patients treated with propofol non-cardiac events were reported (p = 0.61). Therapeutic or medical intervention was required only in 12 patients in the sevoflurane compared to 20 patients in the propofol group (OR: 0.24, CI: 0.040–1.43, p = 0.12). Eight patients in the propofol arm compared to only 2 patients in the sevoflurane group were re-admitted to the hospital due to complications (OR 0.233, CI: 0.042–1.293, p = 0.01).
Conclusion: We document a similar number of adverse events in patients treated with sevoflurane compared to propofol. Despite not reaching statistical significance, we observed less severe complications in the sevoflurane group (less need for treatment, fewer admissions to the hospital).

Reference
1 Steurer MP, et al. Crit Care. 2012 14;16(5).

FM 18

Glucose-insulin-potassium reduces the incidence of major complications in patients undergoing open cardiac surgery

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Background: Cardiac surgery with cardiopulmonary bypass (CPB) may result in myocardial injury associated with major adverse cardiac events (MACE) and non-cardiac complications. Besides the classic cardioplegic solution, pretreatment with intravenous glucose-insulin-potassium (GIK) is a potentially useful adjunct to myocardial protection. This study was designed to assess the effects of GIK infusion in patients undergoing cardiac surgery with cardiopulmonary bypass (CPB) and aortic cross-clamping.
Methods: In this single-center, double-blind, randomised, placebo-controlled trial, patients undergoing valve replacement or coronary bypass surgery with evidence of left ventricular hypertrophy or with a Bernstein-Parsonnet score >4 were randomly assigned to GIK or placebo. After anaesthesia induction and before the start of CPB, a 60 ml solution containing either 2 g of glucose, 10 UI of regular insulin and 40 mEq of potassium (GIK group) or normal saline (placebo group) was administered over 45–60 min. The primary outcome was incidence of MACE including low cardiac output syndrome, myocardial infarction and arrhythmias requiring treatment. Secondary endpoints were requirement for inotropic support, peak serum troponin-I concentration, incidence of non-cardiac complications, length of stay (LOS), and in-hospital mortality.
Results: Over a 6-year period, 225 patients were randomised to GIK solution (n = 111) or placebo (n = 114). Patient characteristics were similar in both groups, except for a lower preoperative left ventricular ejection fraction in the GIK group (43+9% vs. 47+10%, p = 0.005). Pretreatment with GIK was associated with reduced incidence of MACE (52 patients [46.8%] vs. 100 patients [87.7%], p <0.001), lower requirement for inotropic support during weaning from CPB (28.8% vs. 64.0%, p <0.001) and in the intensive care unit (21.6% vs. 59.6%, p <0.001), reduced peak serum troponin-I concentration (median 2.9 ng/L, [interquartile range 1.6–6.2] vs. 4.3 ng/L [2.4–8.4], p = 0.038), reduced incidence of respiratory complications (42.3% vs. 70.2%, p <0.001), reduced LOS (median 14 days [IQR 11–18] vs. 16 days [13–23], p = 0.014), and lower in-hospital mortality (0.0% vs. 8.7%, p = 0.002).
Conclusion: In patients undergoing cardiac surgery with CPB, addition of GIK solution to standard myocardial protective treatments results in improved clinical outcome.

FM 19

High Sensitivity Troponin T and its Association with Mortality and Morbidity after On-Pump Cardiac Surgery at 12 Months

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Background: Troponin is a predictor of cardiac morbidity and mortality after cardiac surgery with most data examining 4th generational troponin assays. We hypothesize that the higher of the two concentrations of high sensitivity troponin T (hsTnT) on the first and second postoperative day is also an independent predictor of mortality and morbidity.

Methods: In this preliminary analysis of prospectively collected data, we included all patients undergoing on-pump cardiac surgery from 02/2010 to 03/2012 with measurements of hsTNT, which were recorded at 6 am of both the first and second postoperative day. Our primary endpoint was all-cause mortality and/or major adverse cardiac events (MACE) defined as acute coronary syndrome, cardiac arrest, congestive heart failure, or revascularization at 12 months. The secondary endpoint was all-cause mortality alone at 12 months. The optimal cut-offs were determined using a receiver operating characteristics (ROC) curve with a 1:1 weight of sensitivity and specificity. Using a Cox regression model, we adjusted the association of the higher of the two hsTnT concentrations with adverse events for the EuroSCORE II.
Results: We included 1123 of 1153 potentially eligible patients (75% male; mean age 66 ± 11 years) and observed and 175 (15.6%) composite events including 94 (8.4%) deaths. The cut-offs determined by the ROC curve were 0.889 µg/L for mortality and/or MACE with an AUC of 0.723 (95%CI 0.680–0.766) and 0.667 µg/L for mortality alone with an AUC of 0.741 (95%CI 0.685–0.798). In total, 302 (26.9%) and 397 (35.4%) patients were above these cut-offs, respectively. After adjusting for the EuroSCORE II, an increase in hsTnT by 0.1 µg/L was associated with a hazard ratio of 1.017 (95% CI: 1.014–1.020; p <0.001) for mortality and/or MACE and a hazard ratio of 1.013 (95% CI: 1.010–1.017; p <0.001) for mortality alone.
Conclusion: This preliminary analysis suggests that higher postoperative hsTnT concentrations are associated with higher mortality and morbidity rates in patients undergoing on-pump cardiac surgery. This association was independent of the preoperative risk assessment as embodied by the EuroSCORE II.

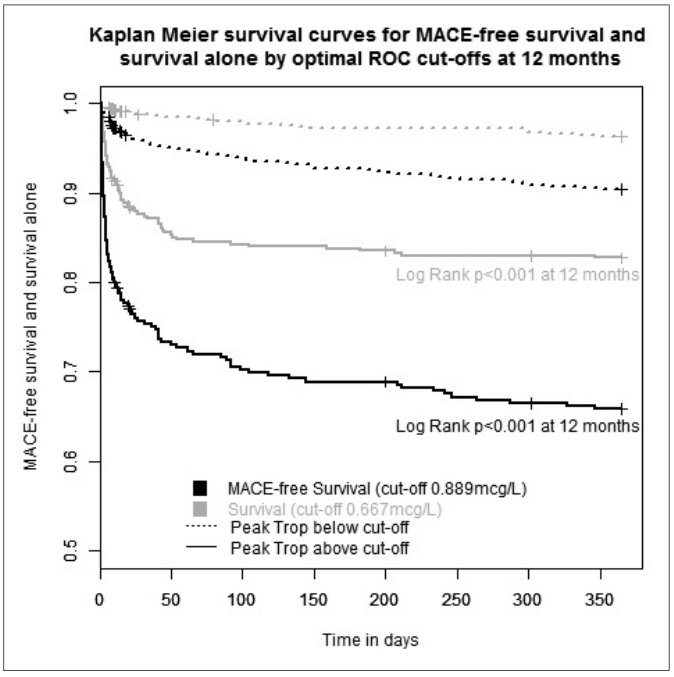

Figure 1
MACE-free survival and survival alone by optimal ROC cut-offs at 12 months.

FM 20

Inferior vena cava ultrasound-guided volume repletion to prevent hypotension after spinal anesthesia. A randomized, case-control, prospective trial

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Background: Spinal anaesthesia causes a decrease in systemic vascular resistances with consequent frequent arterial hypotension, commonly treated via an empiric fluid replacement [1–3]. Aim of the study is to determine whether Inferior Vena Cava analysis performed by trans-thoracic ultrasound (IVCUS) is a good method to guide titrated fluid repletion, to decrease post procedural significant hypotension rate andavoid fluid overload in spinal anesthesia.
Materials and Methods: This prospective, randomized, case-control trial compares post-spinal anesthesia hypotension rate to patients undergoing elective surgery, with or without preoperative IVCUS-guided titrated volume repletion. Primary outcome is a reduction in arterial hypotension rate after spinal anesthesia. The secondary outcomes are the rate of vasoactive drugs administered and the total amount of fluids required throughout the procedure. We randomized consecutive ASA 1 to 3 patients into two groups with blind allocation (fig. 1). The spinal technique was standardized according to institution guidelines. The *control group* received the standard treatment. Patients allocated to *echocardiography group* were assessed preoperatively by IVCUS and, if found fluid-responsive (established as IVC-breathing collapse more than 36%), they received a fluid repletion with a 500 ml of crystalloids after which the IVC diameter variation was rechecked. All procedures were described and registered before the starting of the study.
Results: Of 185 patients enrolled, a total of 160 patients were randomized (half for each group). The global rate of arterial hypotension after spinal anesthesia was 35%; a statistically significant difference rate of post-spinal hypotension was observed (fig. 2), with a lower incidence in the IVCUS group (42.5% vs 27.5%, p = 0.044). All patients received only crystalloids, with more total volume given to the IVCUS group (350 vs 665 ml); the need of vasoactive drugs used were significantly lower in the IVCUS group (13.5 vs 6.5%, p = 0.015).
Conclusions: IVCUS is a non-invasive, safe and quick method to check fluid responsiveness in mechanically ventilated patients. We showed that IVCUS in spontaneous breathing patients can be effectively used not only to guide volume repletion in critical care patients, but also to perform a selective and tailored preventive fluid administration. This in order to optimize surgical patients' volemic status, reducing the need of vasoactive drugs and the risk of complications after spinal anesthesia.

Trial Registry: The trial is registered on www.clinicaltrials.gov (NCT02271477) [4].

References

1 Carpenter RL, Caplan RA, Brown DL, Stephenson C, Wu R. Incidence and risk factors for side effects of spinal anesthesia. Anesthesiology. 1992;76(6):906–16.
2 Kim HJ, Kim JS. A cardiovascular collapse following vigorous cough during spinal anesthesia. Korean J Anesthesiol. 2013;65(6 Suppl):S49–50.
3 Jabalameli M, Soltani HA, Hashemi J, Behdad S, Soleimani B. Prevention of post-spinal hypotension using crystalloid, colloid and ephedrine with three different combinations: A double blind randomized study. Adv Biomed Res. 2012;1:36
4 Ceruti S, Peruzzo M, De Vivo S, Anselmi L, Saporito A. Can vena cava ultrasound guided volume Repletion Prevent Spinal Induced Significant Hypotension in Elective Patients?. NCT02271477 – www.clinicaltrial.gov

P 1

Temporal changes in lung function following haemodilution under stable hemodynamic conditions in pigs

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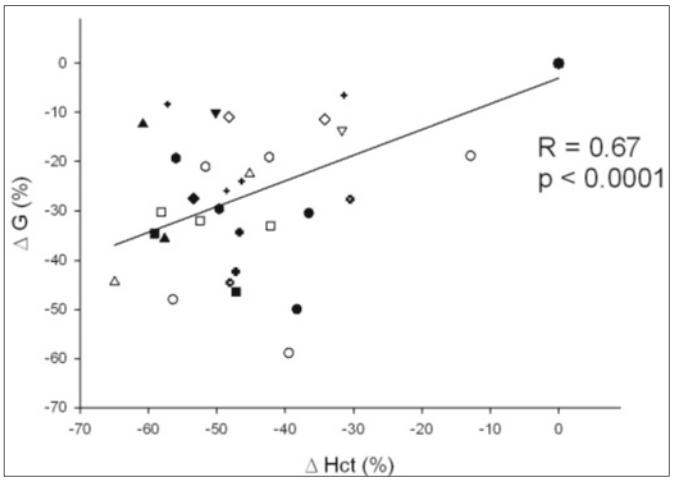
Since little is known about the effect of decreased haematocrit (Hct) on lung function, we assessed the acute effects of haemodilution during stable haemodynamic condition on respiratory mechanical parameters and lung volume changes on anaesthetized intubated minipigs (n = 8). After control condition, stepwise 10 ml/kg blood withdrawals were compensated with 30 ml/kg of crystalloid to maintain stable haemodynamics. Forced oscillation technique was used to measure airway resistance (Raw), respiratory tissue damping (G) and elastance (H). Effective lung volume (ELV) was measured from the CO_2 elimination traces. Extravascular lung water (EVLW) was determined by thermodilution. Respiratory and haemodynamic measurements were made before and following each step of haemodilution. Haemodilution led to an increase in Raw (up to 20%) and decrease in G (up to –40%), with significant correlations with Hct levels (R = –0.67 and 0.67 for Raw and G respectively, p <0.0001). ELV decreased in parallel with a slight but significant increase in H (r = 0.66, p <0.0001) and EVLW.



Our data suggest that haemodilution affects the lung function and these changes correlate with the Hct values. The increase in EVLW indicates that this regimen leads to overcompensation, which may explain the increases in Raw and the loss of ELV. The decreases in G with Hct may be due to the altered blood rheology affecting the lung tissue viscoelasticity.

P 3

Are miRNAs involved in HLA-DR expression on the cell surface? – a miRNA screen

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Introduction: MHC class II molecules (MHC-II) help to present antigenic fragments on the cell surface of antigen-presenting cells (APC's) like B-cells, dendritic cells or macrophages to T-helper cells enabling immune responses, and are strongly linked to autoimmune diseases. Cell surface expression of peptide-loaded MHC-II (HLA-DR) is not yet completely understood and is regulated by transcriptional regulators and the intracellular storage/transport that finally leads to cell surface expression. Clinical studies revealed that cell surface-expression of HLA-DR is down-regulated in patients undergoing surgery what is thought to indicate a suppression of the immune system. Especially, in critical conditions such as severe sepsis, the amount of HLA-DR available for presenting antigen to T-cells is a crucial factor for the probability of survival and, therefore, plays an important role.
Objectives: A better understanding of HLA-DR surface expression is of importance to possibly interfere with perioperative HLA DR downregulation. The question whether miRNAs are involved in CLIP-loaded- and peptide-loaded MHC-II expression shall be unraveled.
Method: A flow cytometric based high throughput screen with miRNA mimics was done. The most important miRNAs (2048) were transfected into a melanoma cell line (MelJuSo) and analyzed by flow cytometry using the monoclonal antibodies CerCLIP to detect CLIP-loaded MHC-II molecules and L243 for detection of HLA-DR molecules on the cell surface.
Results: The High Throughput Screen identified 45 miRNAs that lead to an up-regulation of HLA-DR surface expression, and 7 miRNAs that are involved in down-regulation of HLA-DR surface expression. 16 selected miRNAs with strongest impact on HLA-DR surface expression were verified successfully. No screened miRNA did change the amount of CLIP loaded MHC-II molecules on the cell surface. Current research investigates the mechanism how these miRNAs lead to changes in HLA-DR surface expression.
Conclusion: miRNAs seem to have no influence on incorrect peptide loading of MHC-II molecules but strongly impact HLA-DR surface expression. Understanding the mechanisms behind could help to define new possible methods to tune the immune system in critically ill patients.

P 4

Functional analysis of beta-defensin 2 gene copy number variations in peripheral blood mononuclear cells

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Background: Beta-defensins are cationic antimicrobial peptides which also display immunomodulating effects by activating other immune cells. Beta-defensins are mainly expressed in skin and mucosa and can be strongly induced by invasive pathogens. The 8p23 beta-defensin genes (DEFBs) are affected by copy number variations (CNVs). The gene copy number (CN) is variable from 2 to 12. This study is aimed at investigating the impact of beta-defensin 2 gene CNV on expression in peripheral blood mononuclear cells (PBMC).
Methods: DEFB CN will be screened in 1000 healthy blood donors by paralog ratio test (PRT) and 10 donors for each CN group will be selected (totally around 100 donors). DEFB CN for these 100 donors will be accurately quantified by Multiplex Ligation-dependent probe amplification (MLPA). PBMC from these 100 donors will be cultured with lipopolysaccharides (LPS) or lipoteichoic acid (LTA) or beta-glucan. Beta-defensin 2 mRNA in PBMC will be quantified by real-time PCR. Beta-defensin 2 protein in supernatant from PBMC cultures will be quantified by ELISA. The correlation between beta-defensin 2 gene CN and mRNA and protein levels will be analyzed.
Results: The pilot study using a whole blood culture model showed beta-defensin 2 was not expressed in leucocytes without stimulation and only can be induced by LPS in a time- and dose-dependent manner. In addition, the mRNA levels varied largely among 6 individuals after 24 hours stimulation with 100 ng/ml LPS.
Conclusion: Beta-defensin 2 gene CNV may have an impact on expression in leucocytes.

P 5

Neutrophil extracellular trap (NET) formation in the perioperative setting – A pilot-study

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Neutrophilic granulocytes can release Neutrophil Extracellular Traps (NETs) after stimulation. These traps are comprised of networks of DNA and antimicrobial peptides and may, therefore, influence the innate immune response by immobilization of different pathogens such as e.g. Staphylococcus aureus. Moreover, this formation might be involved in the formation of deep vein thrombosis. Imbalance of this effector of the innate immunity might contribute to perioperative complications. The mechanisms of NET formation and the meaning of the involved factors are not well understood. This project was designed as a pilot study to investigate the influence of a surgical trauma on the capability of neutrophilic granulocytes to form NET-structures in vitro after stimulation with or without PMA. After ethical approval, seven "Trans Catheter Aortic Valve Replacement" (TAVI, mild surgical trauma) and nine "Aortic Coronary Bypass" (ACB, severe surgical trauma) patients were included. Blood was collected before, during, 24 h and 48 h after surgery and granulocytes were isolated by gradient centrifugation and stimulated in vitro with 50 nMol PMA for 2 h. NET-formation rate was examined by microscopical procedures and number of HLA-DR surface molecules on monocytes was determined to define general changes in the immune status. The patients' perioperative characteristics did not differed significantly with regard to ASA category but with regard to gender and age. The ACB group contained more males and patients were younger 66.3 ± 8.1 years (mean ± Standard deviation) versus 81.1 ± 5.0 years. HLA-DR levels on monocytes did not significantly change over time in the TAVI-group but number of molecules was significantly down regulated at 24 and 48 h after surgery in the ACB group. This indicates that there is, as expected, a stronger immune modulation in the ACB group. In contrast, no significant difference could be observed for the induction of NETs for samples stimulated with PMA at all timepoints. Rate of NET-formation in non-stimulated granulocytes did not change in the TAVI group. Interestingly, there was a significant down regulation of NET-formation rate in non-stimulated granulocytes from ACB-patients at 24 and 48 h after surgery.
Conclusion: Surgical trauma seems to influence the basal NET-formation rates in patients. However, the NET-formation following PMA stimulation showed no differences between patients with a mild or severe surgical trauma.

P 6

High copy number of the 8p23 beta-defensin gene cluster is associated with mortality of severe sepsis due to respiratory tract infection in Caucasian males

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Background: Sepsis is a systemic inflammatory response after infection. Beta-defensins are a group of small cationic antimicrobial peptides which are effective against bacteria, fungi, and enveloped virus. They are mainly expressed in skin and mucosa and they are strongly inducible by invasive pathogens. In addition, beta-defensins have cytokine-like effects to modulate immune response. 8p23 beta-defensin genes (DEFB) were found to be variable in copy number (2 to 12 per diploid genome) which impact function of the genes. Thus, the gene copy number (CN) was reported to be proportional to *DEFB4* mRNA expression in a variety of cells. Significant association between higher DEFB CN and risk of psoriasis were reported. This study investigates the association between DEFB CN and the predisposition to and the clinical course of severe sepsis.
Method: A case-control study containing 721 patients with severe sepsis and 283 healthy controls was performed. DEFB copy number (CN) was determined by Multiplex Ligation-dependent Probe Amplification (MLPA). The association of DEFB CN with the susceptibility to and the outcome of severe sepsis before and after stratification by gender and source of infection was analyzed.
Result: DEFB CN is not associated with the incidence of severe sepsis. Increased DEFB CN is associated with mortality in male patients with severe sepsis due to respiratory tract infection (P = 0.0049). Furthermore, a linear regression between DEFB CN and mortality was established ($r^2 = 0.76$, $P = 0.023$), which suggests that each increase by 1 copy from 2 copies adds 11.27% (95% confidence interval: 2.55–19.99%) to the mortality rate. Logistic regression analysis also showed DEFB CN to be an independent factor for non-survival (odds ratio [OR], 1.57 [95% CI, 1.19–2.06], $P = 0.001$, for each copy increase of DEFB CN). In addition, increased DEFB CN is very likely associated with death in male patients with severe sepsis due to intra-abdominal infection. However, DEFB CN is not associated with the outcome of severe sepsis in female patients.
Conclusion: High DEFB CN is associated with increased risk of death from severe sepsis due to respiratory tract infection in Caucasian males. DEFB CN could be used as a genetic marker to predict outcome of severe sepsis in male but not in female patients.

P 7

Oro-tracheal laryngoscopy and intubation with hypnosis as a sole anesthesia: feasibility study

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Introduction: Hypnosis has been shown as a valuable adjunct to pharmacological anesthesia and is commonly used for specific operating room procedures. Awake intubation is an established procedure to manage difficult intubation, while patients have been described uncomfortable and anxious. Numerous pharmacological regimens have been used to render awake intubation supportable. We conducted a pilot study, aimed at assessing the feasibility of awake intubation with hypnosis as a sole anesthetic.
Methods: The information was given at the anesthesia consultation and 10 willing adult patients were included if planned for an elective ENT or neurosurgical procedure, ASA 1-3 and had no criteria of difficult airway. Oral and written explanations about hypnosis were given. On the day of the operation, patients were induced into hypnotic status by the same anesthesiologist trained in hypnosis. Two video-laryngoscopies under hypnosis were allowed by the senior airway anesthetist. Intubation was considered if laryngoscopy and patient condition allowed it. The first endpoint was the success of laryngoscopy. Second endpoints were feasibility of intubation, ease of the procedure for the intubator (0 = extremely uneasy, 10 = very easy), and comfort of the patients (0 = extremely uncomfortable, 10 = very comfortable) as assessed by a standardized questionnaire one hour after arrival in recovery room and 24 hours post procedure. Questions about satisfaction and if they would reconsider or recommend the technique were also asked.
Results: Six female and 4 male patients were included. Hypnotic status was reached in 8 patients and laryngoscopy was possible in all cases. 3 intubations could be attempted, but tracheal tube insertion was unsuccessful. Ease (median [25^{th};75^{th} percentile]) for the intubator was 8 [8;9] during intubation. Comfort was assessed by patients as 8.5 [8;9] before operating room entry, 3 [2;7] during laryngoscopy, 8 [7.3;9] at recovery room arrival. Anxiety before and after the procedure were 3 [2;4.8] vs. 2 [0;3.5]. 8 patients were satisfied with the experience while 10 would go through the same procedure again and would encourage their relatives to experience this kind of laryngoscopy under hypnosis technique.
Conclusion: Laryngoscopy is possible in patients under hypnosis as a sole anesthetic agent. Patients assessed the procedure as comfortable and satisfaction with the procedure was high.

P 8

Anesthesia during Nepal earthquake: Immediate lessons

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An Earthquake magnitude 7.8 hit Nepal on Saturday 25 April 11:56 local time. Epicenter was close to the city of Gorkha. Quickly more than 6000 victims were counted and more than 15000 wounded expected. The Swiss Agency for Development and Cooperation deployed a Foreign Medical Team type 2 "Mother&Child" with the goal of mainly treating pediatric, surgical and obstetric patients. Five days after the earthquake, the team with anesthesiologists and basic material to perform spinal and ketamine anesthesia arrived in the District Hospital Gorkha. The local resources and structure of this regional hospital were assessed by a Swiss engineer, one of the two operating rooms available was declared safe for surgical procedure. Available to us at our arrival was functional anesthesia machine, halothane, oxygen in tank and monitoring. Because of the heavy destruction, the usual recovery room was occupied by many surgical hospitalized patients. During the first week, we encountered many patients that had travelled long distances with signs and symptoms of exhaustion, pain, infection, dehydration and anemia. During the first week, 43 surgical interventions were performed mainly related to the earthquake including open fracture of the limbs associated with infected wounds. Ten patients were operated within the 48 hours and then re-operated several times during the next following days. Nine of the first 10 patient receive blood transfusion. Three cesarean sections and two laparotomies were also operated. During an episode of severe aftershock, the surgical team evacuated the operating room but due to halothane mask anesthesia, the patient and the anesthesiologist had to remain. Thanks to a precautionary measure of having the 70 kilos oxygen tank lying on the ground horizontally, major complications were avoided. During such severe aftershock it was apparent that evacuating a patient with regional anesthesia would be simpler than a patient under general anesthesia. Eleven ultrasound axillary blocks and 9 spinal anesthesia were successfully performed. Due to the shortage of halothane, we were only able to induce by mask a limited number of children. Thereafter ketamine was used for general anesthesia. Patient recovery was better with balanced general anesthesia than ketamine anesthesia. We did not have any major complication from anesthesia. Our concerns during such earthquake were as follow, team and patient safety during aftershock and blood transfusion in an anemic population.

P 9

Measuring knowledge transfer in nursing practice following an e-learning training on pain management

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Introduction: Pain assessment is an ongoing challenge for nursing practice. At the University Hospital of Lausanne, an e-learning training on pain management consisting of 21 audio-commented videos was created and deployed for the 3700 nurses. In a constructivist pedagogical perspective for skill development, the measurement of knowledge transfer into clinical practice is a major issue rarely addressed. This inquiry was achieved in a 66-beds geriatric rehabilitation unit and assessed the e-learning according to 3 dimensions: knowledge increase, participant satisfaction and knowledge transfer into nursing clinical practice regarding pain screening and assessment.
Objectives: To evaluate knowledge transfer into nursing clinical practice following an e-learning training about pain management.
Description & Method: This inquiry ran over 3 phases and used a pre-post audit strategy. The audits included 4 clinical indicators of best practice recommended by the Registered Nursing Association of Ontario (RNAO) and the Joanna Briggs Institute (JBI). This project used questionnaires, focus groups and collection retrospective data from nursing clinical documentation.
Results: In total, 47 nurses followed the training. Despite significant increase in knowledge (M068% vs M085%, p = 0.000) and great participant satisfaction rate among e-learning training program (up to 80%), data collected from nursing clinical documentation showed opportunities for clinical improvements towards pain assessment, with no statistical significan differences (pBased on a quiz pre-post, knowledge increased from 68% to 85% (p = 0.000). Satisfaction with the content and method of training was high (participation rate: n = 16; 34%). Datas from nursing files showed a gap with good clinical recommendations about pain screening and assessment practices with no significant changes pre-post training. During focus groups, 10 participants identified several barriers and facilitating factors towards knowledge transfer and pain management.
Conclusion: Pain assessment is a continuous challenge for patients and healthcare providers. Strategies must be developed and tested to promote evidence based practice and lead to better quality of care.

P 10

A simple model to justify the use of Sugammadex economically in daily practice

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Introduction: Deep muscle relaxation is often required through out an entire surgical procedure (e.g. minimal invasive orthopedic or laparoscopic procedures). Also a complete reversion of deep muscular blockade is a safety feature in the care of patient's postoperatively. With the use of the new but expensive drug Sugammadex (117.– CHF per 2 ml vial) even deep blockades can be reversed in due time. A simple model was developed to allow an economical and clinical reasonable use of this drug.
Materials and Methods: Efficiency can be defined as the net gains due to better processes and the deduction of the costs for the reversal drug. Cost savings are realized by saving time and the generation of new opportunities for a next case or the avoidance of overtime. Cost savings can be calculated by multiplying the expected saving of time with the known costs per anesthesia hour with respect to a factor of opportunity as a variable. These calculations generate a value of the possible saving of time. For the calculations the following formula was applied:
$Eff = (t_{ohne} - t_{mit})*KAnä*FOpp - KSugammadex$. Eff: net gain of efficiency; K: costs; Anä: Anesthesia; F_{opp}: Factor of opportunity; KSugammadex: drug costs.
Results: Typical values for FOpp are between 1-2 and the costs per anesthesia hour vary between 350–450 CHF at our institution. With the developed nomograms a net gain of efficiency can easily be identified. For example applying the above values justify the use of 2 ml Sugammadex at best after gain of process time of 8–20 minutes. Side effects such as a better performance of surgical departments by a better degree of capacity utilization are not taken into account
Conclusions: Despite the costs for Sugammadex, its use is economically justified under the prerequisite that the costs per anesthesia hour and the drug costs are known.

P 11

Confounders of NT-pro-BNP and BNP as a pre-operative cardiac risk marker in a University Anaesthesiology Clinic – a pilot study

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Introduction: Ventricular cardiomyocytes secrete brain natriuretic peptide (BNP) into the blood in response to atrial or ventricular wall stretch or myocardial ischemia. Recent investigations showed that BNP is a powerful predictor of death/major adverse cardiovascular events in patients with stable coronary artery disease, acute coronary symptoms, and congestive heart failure. The preoperative BNP plasma concentration is a good predictor of cardiovascular events in the first 30 days after noncardiac surgery. The measurement of BNP plasma levels preoperatively should be considered especially in cardiac patients undergoing noncardic surgery to assess the perioperative cardiac risk. Different nucleotide polymorphisms were worldwide detected and are partly associated with de- or increased BNP/ NT-Pro-BNP plasma levels.
Objectives: This pilot study evaluates the haplotype organization of the BNP gene in a Suisse cohort of preoperative patients. Preoperative BNP and NT-Pro-BNP plasma levels will be evaluated based on haplotype.
Methods: The prospective cohort study includes 215 patients with ASA 1/2 and 220 with ASA 3/4 classification. A blood sample was withdrawn by induction of anaesthesia and NT-Pro-BNP and BNP

plasma concentrations were measured in the clinical chemistry laboratory. Blood samples were genotyped for two described single nucleotid polymorphisms: rs198389 and rs198358. Statistical analysis was done with GraphPadPrism using t-Test and Kruskal-Wallis test with Dunn's multiple comparison test.
Results: Preoperative BNP respectively NT-Pro-BNP levels were significantly different (p >0.0001) between ASA1/2 (15 ± 18 pg/ml resp. 40 ± 43 pg/ml) and the ASA3/4 group (48 ± 131 pg/ml resp .146 ± 775 pg/ml). Allele frequency for rs198389 and rs198358 were as expected from data in the HapMap database for the European Population (n = 226). No differences were observed for different haplotypes of rs198358 and BNP and NT-Pro-BNP plasma concentrations. In contrast, the CC allele of rs198389 in the ASA1/2 group did correlate with higher plasma BNP concentrations (p <0.05) compared to CT or TT carriers and CC carriers of the ASA3/4 group had higher plasma BNP concentrations (p <0.05) compared to TT carriers. There was no genotype specific influence on the NT-pro-BNP plasma concentration.
Conclusion: Single nucleotide polymorphisms can influence BNP expression levels. Additional polymorphisms need to be analysed to determine the impact of haplotypes on BNP and NT-Pro-BNP plasma levels.

P 12

Anaesthesiologic management of urgent emergency ceasaren sections

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Introduction: Urgent caesarean delivery (CD) can be time critical, which can be an argument in favour of general anaesthesia (GA). Regional anaesthesia (RA) avoids the potentially difficult airway and is associated with less bleeding, better postoperative pain control and leads to a better bonding of the mother with the neonate (1). The policy of our hospital is (i) to establish epidural analgesia in high-risk pregnancies and (ii) to perform a time-out in the operating room to confirm – or reclassify – urgency of unplanned CD. We classify CD into elective, unplanned and urgent. The target decision to delivery time in unplanned and urgent CD is 30 and 10 minutes, respectively. The aim of this quality control was to analyse urgent CD in terms of frequency, mode of anaesthesia (GA vs. RA) and neonatal outcome.
Methods: We selected all CD from 1st until December 31th 2014. These patient records were screened for urgency of CD (elective, unplanned, urgent) and mode of anaesthesia. Those with urgent CD were further analysed for the reason of CD, umbilical cord pH and APGAR scores.
Results: There were 887 CD, 529 (40.4%) were elective, 301 (33.9%) unplanned and 57 (6.4%) urgent. Overall there were 866 (97.6%) were performed in RA. Of the 57 urgent CD 49 (85%) were in RA (20 spinal, 29 epidural). Of these, 4 RA (8%) were insufficient (1 spinal and 3 epidural) and converted to GA. Primary GA was performed in 8 patients (14%). Two of these had satisfactory epidural labour analgesia. Difficult intubation (>3 attempts) occurred in 2 women. Analysis of umbilical cord pH and APGAR is ongoing.
Conclusion: In our hospital the vast majority of SD in 2014 was performed under RA. This was also true for urgent CD. Primary GA was rare. Our policy to establish epidural analgesia in high-risk parturient seems to work, as epidural analgesia was in place in more than half of the urgent CD. That two of these had primary GA due to time pressure has to be further analysed with a focus on indication and speed of conversion from analgesia to anaesthesia.

Reference
1 Hawkins JL. Excess in Moderation, Anesth & Analg. 2015;120(6):1175–7.

P 13

Multichannel near-infrared spectroscopy monitoring: feasibility during cardiac and thoracic aortic surgery

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Introduction: Near-infrared spectroscopy (NIRS) monitoring of frontal cerebral tissue oxygen saturation is a useful tool for cardiac and thoracic aortic surgery [1]. However, restricted spacial resolution is a major limitation of commercially available two-channel NIRS devices. Aim of the study was to show feasibitliy of multichannel NIRS measurements in the operation room.
Patients and Methods: We measured chronological changes in oxygenated and deoxygenated hemoglobin concentrations using the multi-channel NIRS device FOIRE-3000, Shimadzu, Japan. We used 16 transmitter-receiver pairs resulting in 31 NIRS channels at optode spacings of 30 (n = 11) and 42 mm (n = 20) [2]. Measurements were continuously displayed on a computer screen and stored electronically. After surgery, data were processed to generate temporo-spatial maps including animated video sequences.
Results: Multichannel-NIRS readings were obtained in three patients (coronary artery bypass grafting, n = 2; hemiarch replacement with hypothermic circulatory arrest and cerebral perfusion, n = 1). Record time varied between 100 and 180 minutes. Measurements were technically uneventfull in all cases. Movement artifacts occurred in some cases, however, could easily be identified. Abrupte changes in hemoglobin concentrations (e.g.; hemodilution; hypothermic circulatory arrest; antegrade cerebral perfusion) were reliablely detected. One episode of a short-lasting cerebral deoxygenation during cerebral perfusion could be detected in right-sided temporo-parietal channels, while the other channels indicated acceptable cerebral oxygenation in the rest of the monitored brain during this episode. Beside light and rapidly reversible cutaneous impressions no adverse events were monitored.
Conclusions: Multichannel-NIRS measurement in the cardiac theater is feasible and safe. Signal quality is stable and artifacts are easily identified. Hemoglobin concentration changes can be continuously displayed as a topographical cortical map on a computer screen, allowing for rapid recognition of temporo-spatial deoxygenation during surgery. However, further studies are needed to assess diagnostic accuracy of multichannel NIRS measurements during cardiac and thoracic aortic surgery.

References
1 Neuromonitoring in der Kardioanästhesie. Anästh Intensivmed. 2014;55:2–19.
2 Monitoring cerebral oxygenation during balloon occlusion with multichannel NIRS. J Cereb Blood Flow Metab. 2013;(Dec):1–10.

P 14

The inflammatory response after transcatheter aortic or surgical valve replacement: a comparison between current treatment modalities

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Objectives: The periprocedural inflammatory response in patients with transcatheter (TAVR) aortic valve replacement or isolated aortic valve stenosis undergoing surgical (SAVR) was investigated.
Methods: Patients were prospectively allocated to one of the following treatment modalities: SAVR using minimized extracorporeal circulation (MECC) or conventional extracorporeal circulation (CECC) or TAVR using the transfemoral (TF) or transapical (TA) access route. Following exclusion criteria included were defined: emergency treatment, participation in another study, intake of immunosuppressive or antibiotic drugs and infection. We investigated HLA-DR, CRP and sCD62L and the cytokine IL-6, IL-8, IL-10 levels before the procedure and at 4, 24, and 48 h after aortic valve replacement.
Results: 101 of 718 patients undergoing SAVR or TAVR during the study period were eligible for the study. IL-6 showed increased intraprocedural concentration and the highest peak with TA-TAVR (p = 0.01). CECC was accompanied by the highest levels of IL-8, IL-10 and CRP (p = 0.017, 0.08, and 0.007, respectively). Only small changes in the inflammatory markers were observed in TF-TAVR. HLA-DR molecules on monocytes were significantly down regulated at 4, 24 and 48 h compared to the time before procedure, except for TF-TAVR where the intensity of HLA-DR surface expression recovered after 48 h.
Conclusion: The degree of inflammatory modulation is depending on the current treatment strategies for aortic valve replacement. Extracorporeal circulation is associated with the highest impact on the release of pro-inflammatory markers; however, factors such as the pre-treatment patient condition and the extent of myocardial injury also could significantly affect the biomarker course. Neither the pro-inflammatory state before the procedure nor the peri-procedural course of the investigated inflammatory markers was found to be in correlation with clinical outcome.

P 15

Gasping is a valid predictor of ROSC and hospital discharge for in-hospital cardiac arrest occurring on the ward

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Introduction: Agonal respiration has been shown to be commonly associated with witnessed events, ventricular fibrillation, and increased survival during out-of-hospital cardiac arrest. There is little information on incidence of gasping for in-hospital cardiac arrest (IHCA). Our "Rapid Response Team" (RRT) missions were monitored between December 2010 and March 2015, and the prevalence of gasping and survival data for IHCA were investigated.
Methods: A standardized extended in-hospital Utstein data set of all RRT-interventions occurring at the University Hospital Basel, Switzerland, from December 13, 2010 until March 31, 2015 was consecutively collected and recorded in Microsoft Excel (Microsoft Corp., USA). Data were analyzed using IBM SPSS Statistics 22.0 (IBM Corp., USA), and are presented as descriptive statistics.
Results: The RRT was activated for 636 patients, with 459 having a life-threatening status (72%; 33 missing). 270 patients (59%) suffered IHCA. Ventricular fibrillation or pulseless ventricular tachycardia occurred in 42 patients (16% of CA) and were associated with improved return of spontaneous circulation (ROSC) (36 (97%) vs. 143 (67%; p <0.001)), hospital discharge (25 (68%) vs. 48 (23%; p <0.001)), and discharge with good neurological outcome (Cerebral Performance Categories of 1 or 2 (CPC) (21 (55%) vs. 41 (19%; p <0.001)). Gasping was seen in 128 patients (57% of CA; 46 missing) and was associated with an overall improved ROSC (99 (78%) vs. 55 (59%; p = 0.003)). In CAs occurring on the ward (154, 57% of all CAs), gasping was associated with a higher proportion of shockable rhythms (11 (16%) vs. 2 (3%; p = 0.019)), improved ROSC (62 (90%) vs. 34 (55%; p <0.001)), and hospital discharge (21 (32%) vs. 7 (11%; p = 0.006)). Gasping was not associated with neurological outcome.
Conclusions: Gasping was frequently observed accompanying IHCA. The faster in-hospital patient access is probably the reason for the higher prevalence compared to the prehospital setting. For CA on the ward without continuous monitoring, gasping correlates with increased shockable rhythms, ROSC, and hospital discharge.

P 16

Performance of a rural ambulance service without physician support

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Introduction: With regard to the impending installation of a prehospital emergency physician system in the Canton Fribourg we investigated the performance of a rural ambulance service, which operates under medical delegation from an emergency physican, but without physician presence on-scene.
Material and Methods: Retrospective, descriptive study of interventions NACA 4 to 7 of the year 2012 (n = 390, representing 19.5% from a total of 2000 interventions/year). Six tracer diagnoses were defined (ACS, cerebral events, respiratory insufficiency, head trauma, intoxication, allergic reaction). A subset of data (n = 169) was studied, that fit into the pre-defined categories, and for which a discharge letter could be obtained.We present data concerning intervention times, medical outcome of prehospital measures, and theoretical necessity for on-scene support by an emergency physician. Medical outcome was measured using the Mainz Emergency Evaluation Score (MEES).
Results:

Times are given as Median	on-scene time	transport time	total invervention time
ACS	25	17	50
cerebral events	20	19	49
respiratory insufficiency	13	18	41
head trauma	22	17	52
intoxicaton	22	17	50
allergic/anaphylactic reaction	19	15	46

	n	worsened	stabilized	improved
ACS	36	8%	33%	58%
cerebral events	54	11%	54%	35%
respiratory insuficciency	28	4%	36%	61%
head trauma	23	4%	48%	48%
intoxication	24	4%	63%	33%
allergic/anaphylactic reaction	4	0%	50%	50%

In 20 cases (12%) the on-scene support of an emergency physician could have been of additional benefit. Only 5 of these cases would have involved advanced airway support. In 15 cases additional diagnostic background and/or advanced drug management skills would have been warranted.
Conclusions: A rural ambulance service with a well-organized system of delegation and controlling of medical competences is able to manage patients NACA 4 and above with a wide range of medical problems satisfactorily in the absence of a prehospital emergency physician system. Physician support is of limited benefit (12% of cases NACA 4 and above or approx. 2.5% of all interventions of an ambulance service) and concerns mainly diagnostic and/or therapeutic skills and experience. This last point is of interest, as many of these skills might in the future be brought on-scene via advanced telemetric technology.

P 17

Electroencephalographic evidence for altered conditioned pain modulation in patients with acute low back pain

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Aim of investigation: Altered endogenous pain modulation is one of the possible mechanisms underlying pain conditions. Conditioned pain modulation (CPM) is a method to assess endogenous pain modulation in humans, based on the attenuation of a painful test stimulus by an additional painful conditioning stimulus. To date, little is known on the efficiency of CPM in acute low back pain patients. In this work, we have used somatosensory-evoked potentials (SEP) to study CPM in an acute low back pain population.
Methods: Eleven patients with acute low back pain (LBP group) of less than 4 weeks duration, without history of chronic low back pain, and having a pain intensity of at least 3 (numerical rating scale 0–10) were matched to eleven healthy volunteers (CTRL group). As test stimuli, bursts of five 1-ms electrical pulses with an intensity 1.5 times above pain threshold were applied percutaneously every 5 seconds onto the median nerve of the left hand for 10 minutes (baseline). Then subjects immersed their right hand in ice water (conditioning stimulus), while the same electrical stimulation was applied for the next 10 minutes to investigate CPM. SEP in response to electrical stimulation were measured before and during ice water stimulation using 128-chanel electroencephalography sampled at 2 kHz. The first long latency negative component of the SEP responses from the vertex were analyzed after the 1st (N_1) and the 5th (N_1r) pulse in each burst. Data are presented as means ± SD. Mixed-model ANOVA was used for analysis.
Results: For the N_1, patients had significantly shorter SEP latencies compared with controls (p = 0.002). There was no significant effect of condition (baseline vs. ice water) (p = 0.954), and no interaction between condition and group (p = 0.642). For the N_1r, patients had significantly shorter latencies than controls (p = 0.013), condition ice water (p = 0.009), and the interaction between condition and group was significant, (p = 0.001). Post hoc analysis revealed significantly longer latencies in the control group compared to the LBP group during ice-water stimulation (p = 0.003).
Conclusions: To our knowledge, this is the first study showing altered CPM in patients with acute low back pain. Patients' EEG demonstrated shorter SEP latencies during ice water stimulation. Further studies are needed to investigate if CPM deficiencies in acute low back pain patients translate into a risk factor to develop chronic low back pain.

P 18

CANTADO is useful for ambulatory anterior cruciate ligament reconstruction

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Background and aims: Anterior cruciate ligament reconstruction (ACLR) is often an ambulatory procedure and postoperative complication rate is the same for out- and inpatients [1]. ACLR is associated to severe pain [2] and continuous femoral nerve block provides a significant analgesia [3, 4]. In our hospital, no procedure exists for postoperative pain treatment with a perineural home catheter. The aims of the study were to assess the safety and effectiveness of this technique on ACLR's outpatients through a homecare program (Cathéter ANTAlgique à DOmicile [5]).
Methods: 37 consecutive patients undergoing elective ACLR were assessed for CANTADO according to surgery and anesthesia criteria. CANTADO's stages were: 1) postoperative perineural femoral catheter (PNFC) was connected to the PCA elastomeric pump filled with ropivacaïne 0.2% (basal infusion 4 to 6 ml/h, bolus dose 5 ml, bolus lockout 30 min.). Paracetamol and NSAID were included in treatment (tramadol as backup). Postoperative knee brace was placed. 2) 24h postoperative care nurse visit at home. 3) 48h knee dressing changing, PNFC ablation and physiotherapy treatment at hospital. The anesthetist consultant could be called on phone by the patients and homecare nurses 24h/24 during CANTADO. Patient's safety sense, analgesia effectiveness (NRS <4) and patient satisfaction were assessed by phone call 2–4 days after PNCF ablation.
Results: 33 of 37 patients were enrolled (4 patients don't meet eligibility criteria). Patient's mean age was 30 years (range 15 to 52) and 37% were female. 3 patients complain about pain. No neurological dysfunction was present after 2 months.

Rate of patients satisfied with CANTADO [%]				
Safety sense	**Medical and nurse care**	**Overall program satisfaction**		
		Totally	**Largely**	**No *and* little**
100	100	64	36	0

Postoperative pain at rest without bolus, NRS [mean ± SD]		Rate of patients with pain relief from bolus [%]
At 24h	At 48h	97
3 ± 3	3 ± 2	

Conclusions: Our study suggests that CANTADO provides a safe and useful program for ACPR's outpatients. It can be used for other operations, i.e., hand and ankle surgery. Moreover, it could contribute to cost saving by a same-day discharge.

References
1 Andrés-Cano P, et al. Rev Esp Cir Ortop Traumatol. 2015.
2 Jansseen KJM, et al. Anesth Analg. 2008.
3 Svediene S, et al. Knee Surg Sports Traumatol Arthrosc. 2013.
4 Choi S, et al. The J of Arthrosc & Rel Surg. 2010; 5www.cantado.ch

P 19

Pain intensity after visceral surgery: a prospective observational study

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Background: Acute postoperative pain management remains a serious concern. Enhanced recovery after surgery (ERAS) pathways include multimodal pain therapy; however, assessment of patients' pain scores is not routinely performed and is not mandatory of the ERAS concept. Therefore, the purpose of this study was to prospectively assess pain and satisfaction scores after ERAS and non-ERAS visceral surgery procedures.
Methods: 1308 patients from the Department of Visceral Surgery at the University Hospital in Lausanne were included in the analysis. We analyzed pain at rest or in motion, reported by nurses using a verbal rating scale (VRS), 0–10, from the departure of the recovery room until the 4th postoperative day. Patient satisfaction score (0–10) was assessed at the end of stay.
Results: 10 different procedures (colorectal, bariatric, upper gastro-intestinal, liver, pancreatic, hernia, abdominal wall, (para)thyroid surgeries, cholecystectomy and lymphadenectomy) were included. Overall, median VRS at rest was 0 (interquartile range [IQR], 0-2) during the whole stay. In motion, the median score was 1 (IQR, 1-3) until 2 hours following the recovery room and 2 (IQR, 0-4) until the end of stay. Comparing the different procedures at 24 hours postoperatively, median VRS at rest was 0 (IQR, 0-2) for all surgeries except upper gastro-intestinal and pancreatic (1, IQR 0-4 and 0-3 respectively) and bariatric (2, IQR 0-3). In motion, median VRS ranged from 0-4 with the highest score for colorectal and upper gastro-intestinal (3, IQR 0-4 and 0-5 respectively) and bariatric (4, IQR 1-5) surgeries. 160 open colorectal operations were performed versus 139 laparoscopic procedures. At rest, median VRS after laparotomy was 0 (IQR, 0-3) and after laparoscopy 0 to 1 at most at 24 hours (IQR 0-3) postoperatively. In motion, median VRS was similar after laparotomy and laparoscopy (2) with a maximal value of 3 (IQR, 1-4) at 24 hours for minimal-invasive surgeries. At the end of stay, 77.4% of patients indicated a satisfaction score between 8 and 10. 1.3% ranged from 0–4 while 21.4% from 5–7.
Conclusion: In our cohort, pain was rather well controlled during the first 4 postoperative days with a high patient satisfaction score. Bariatric surgery seemed to be associated with the highest postoperative pain level. Finally, laparoscopic surgery was controlled as well as open surgery, reconsidering epidural anesthesia in favor of alternative treatment.

P 20

Analgesic effects of oxytocin receptor modulation in healthy volunteers

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Background and aims: Oxytocin, a hypothalamic neuro-hormone involved in parturition and breastfeeding, may also play a role in pain modulation via descending neuronal circuits projecting to lamina I-II of the spinal cord. Activation of glutamatergic and GABAergic interneurons at this level may cause pain inhibition. Additionally to GABAergic modulation, oxytocin can selectively block A-delta and C-fibers. Intrathecally administered oxytocin prevents long-term potentiation, an important mechanism of enhanced central pain processing. The present study evaluates the analgesic effects of the oxytocin agonist carbetocin by multimodal pain testing.
Methods: This is a randomized double-blinded placebo-controlled crossover study in 25 healthy male volunteers testing 0.1 mg intravenous carbetocin. The primary endpoint was intramuscular temporal summation threshold using electrical train-of-five stimulation at the tibialis anterior muscle. Secondary endpoints were different pain test modalities. This preliminary analysis shows results for the primary endpoint and for the area of secondary allodynia after intradermal capsaicin, analyzed by two-way RM ANOVA (with Bonferroni correction).
Results: For the primary endpoint, there was no significant difference between carbetocin and placebo at any time (interaction $p = 0.6$). The area of secondary allodynia was significantly lower with carbetocin, compared to placebo (joint $p < 0.001$).
Conclusions: This preliminary analysis failed to demonstrate an analgesic effect of carbetocin on the primary endpoint, but is highly suggestive for an anti-allodynic effect of this compound.

P 21

T-cell infiltration in the spinal cord in the spared nerve injury model of neuropathic pain: a time course study

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Background and aims: Participation of the immune system in the pathophysiology of neuropathic pain has been described. In particular, T-lymphocytes infiltration of the spinal cord following peripheral nerve injury was shown to contribute to sensory hypersensitivity. We previously observed with a PCR array that T-lymphocytes attracting chemokines were upregulated after SNI (spared nerved injury) in rat spinal cord. The timecourse and specific cell type of these infiltrating

cells have not been characterized. In order to better understand the mechanisms of development of neuropathic pain it is important to be described.
Methods: SNI (spared nerve injury) surgery was performed on Sprague Dawley adult male rats. This is one of the experimental models of neuropathic pain, inducing hypersensitivity in the sural territory. BrdU injection and staining for proliferation and immunohistochemistry with antibodies to mark respectively microglia (Iba1), astrocytes (GFAP), T-lymphocytes (CD2) and cytotoxic T-lymphocytes (CD8) were performed. mRNA expression of Iba1 was also measured. A spinal cord injury model was used as a positive control for T-cell infiltration.
Results: In the dorsal horn ipsilateral to SNI, Iba1 and BrdU stainings revealed the microglial activation and proliferation respectively, attesting neuroinflammation with various timecourse depending on the parameter analyzed. Iba1 expression peaked at D4 and D7 respectively at the mRNA and protein level. Proliferation occurred almost only in Iba1 positive cells and peaked at D2. We found no increase in GFAP signaling. There were very few CD2 or CD8 positive cells in contradiction to some published data. We therefore had to exclude a technical problem and used a spinal cord injury model as positive control for lymphocyte infiltration. We observed a pronounced infiltration of both CD2 and CD8 positive T-cells in that model validating our negative result after SNI.
Conclusions: Although we show neuroinflammation following SNI with Iba1 and BrdU, we were unable to detect a clear T-lymphocyte infiltration in the spinal cord. SNI seems not to trigger a T-lymphocyte infiltration in the spinal cord in our hands. We emphasize that various reactions of microglia are observed after SNI with different timecourse and therefore the term “activation” without specific description should be used with caution.

P 22

Impact of early per-operative use of polymyxin-B hemoperfusion in septic patients undergoing emergency abdominal surgery

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Background: Polymyxin-B hemoperfusion (Toraymyxin®) reduces blood endotoxin levels in abdominal sepsis. When used in intensive care unit in abdominal sepsis, it improved hemodynamics, organ dysfunction and clinical outcomes [1].
Aims: To evaluate the efficacy of endotoxin removal using a polymyxin-B adsorbing device during the per-operative setting of patients operated for abdominal sepsis, and to compare hemodynamic stability, fluid balance, vasoactive drugs use and outcome per- and post-operatively.
Methods: A prospective, single center, open, randomized controlled trial. Twenty-eight adults with severe sepsis or septic shock from abdominal origin and requiring emergent surgery were randomly assigned into two groups: the CONTROL group received conventional therapy, the PMX group received at least 2-hr per-operative session of polymyxin-B hemoperfusion plus conventional therapy.
Results: Variables are expressed as mean ± SD or median (min-max) as appropriate. Demographics data are presented in table 1. Norepinephrine requirement decreased during the surgery in the PMX group (0.3 (0.2–0.6) mg/h to 0.1 (0–0.4) mg/h, p = 0.022) but not in the control group (0.3 (0–0.8) mg/h to 0.3 (0–0.7)). The PaO_2/FiO_2 ratio increased in the PMX group (36 ± 20 to 45 ± 23 kPa, p = 0.024), while it tended to decrease in the control group (43 ± 20 to 33 ± 12 kPa, p = 0.067). As a result, at the end of the surgery, only 20% of the PMX patients versus 69% of the control patients were admitted in the intensive care unit (p = 0.02). 28-day and 90-day mortality was not different between the two groups.
Conclusion: In this pilot study, per-operative session of polymyxin-B hemoperfusion significantly decreased norepinephrine requirement during surgery in patients with severe sepsis or septic shock from abdominal origin, was associated with better per-operative hemodynamic stability, and decreased ICU admission.
Keywords: polymyxin hemoperfusion; abdominal sepsis; per-operative setting.

Reference
1 DN.Cruz, et al. Early use of polymyxin B hemoperfusion in abdominal septic shock: the EUPHAS randomized controlled trial. JAMA. 2009;301:2445–52.

Table 1

	PMX group n = 15	CONTROL group n = 13	p value
Demographics			
Age (yrs)	74 ± 11	70 ± 18	NS
Gender (M/F)	6/9	9/4	NS
SAPS II score (points)	49 ± 21	53 ± 30	NS
APACHE II score (points)	17 ± 8	16 ± 11	NS
Outcome			
Admission in ICU, n (%)	3 (20%)	9 (69%)	0.02
Total norepinephrine in mg at 6 hours	2.6 ± 4.3	5.1 ± 8.7	NS
Total volume infused in ml at 6 hours	4791 ± 1532	4367 ± 2652	NS
NS = non significant			

P 23

Optimal number of injections for ultrasound-guided brachial plexus block: a systematic review and meta-analysis

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Background and aims: In a busy operating theatre, rapid procedure time and high success rates are critical to efficient care. This meta-analysis aimed to evaluate the optimal number of injections for ultrasound-guided brachial plexus block to ensure both efficient procedure time and high success rate.
Methods: This meta-analysis was performed according to the PRISMA statement guidelines. The primary outcome was block success rate, analysed according to the technique of injection (single versus multiple injections). Secondary outcomes included procedure time, onset time of action, rate of paraesthesia during the procedure and persistent neurological deficit (>24h).
Results: Nine controlled trials, including 859 patients were identified. The overall success rate of brachial plexus block was 92%. A single injection technique is equivalent to a multiple injection technique (p = 0.77), in all subgroups except the supraclavicular group (p = 0.03) (fig. 1). However, when a random effects model was applied to the supraclavicular subgroup, where I^2 value was 56%, no statistically significant difference was observed (p = 0.21). Procedure time was shorter in the single-injection group (mean difference: –2 min; 95%CI: –3, –1; p <0.00001) with equivalent onset time of action (mean difference: 2 min; 95%CI: -1, 5; p = 0.14). The lower number of needle passes (mean difference: -2; 95%CI:-4,-1; p <0.0001) was associated with fewer episodes of paraesthesia (risk ratio: 0.6; 95%CI: 0.4, 1.0; p = 0.004), but without difference in persistent neurological deficit (risk ratio: 0.7; 95%CI: 0.2, 2.3; p = 0.39).
Conclusions: During ultrasound-guided brachial plexus block, a single-injection technique provides an equivalent success rate to a multiple-injection technique, but with reduced procedure times and fewer paraesthesias.

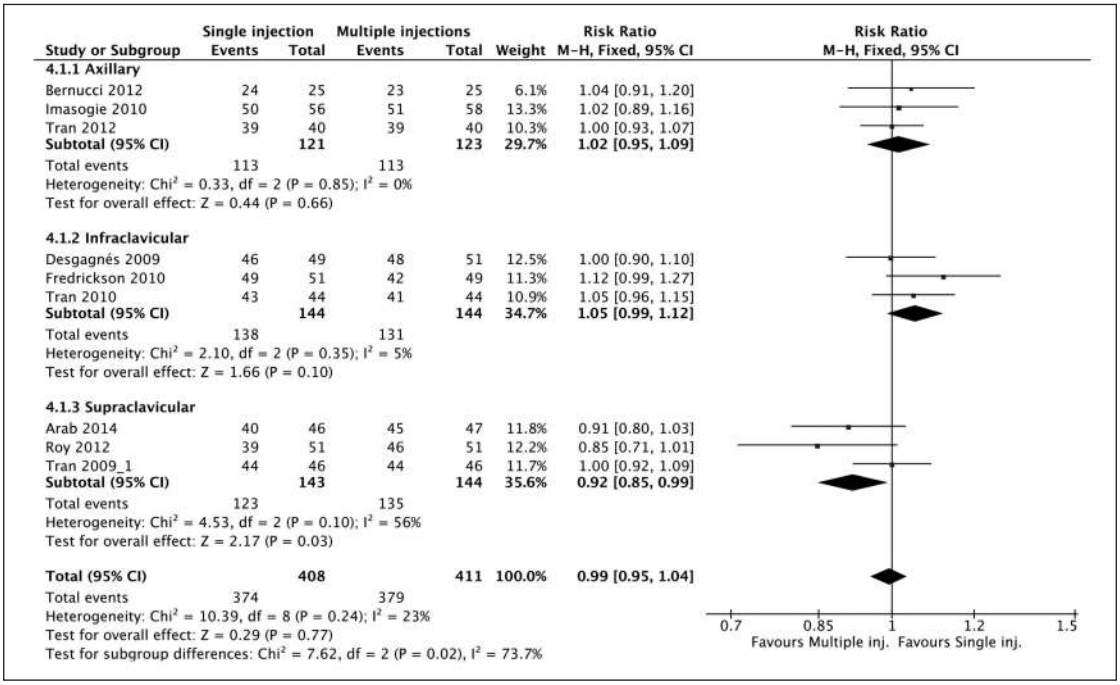

Figure 1
Success rate according to the number of injections.

P 24

Continuous femoral nerve block does not worsen functional outcomes after anterior cruciate ligament reconstruction: a randomized, controlled, simple-blind trial

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Background and aims: Continuous femoral nerve block (CFNB) after anterior cruciate ligament reconstruction (ACLR) may result in femoral nerve injury, in turn worsening functional outcomes. This RCT compared electrophysiological and functional outcomes after ACLR where analgesia was provided with CFNB or intravenous patient-controlled analgesia (IVPCA) of morphine.

Methods: After ethics committee approval, 54 patients scheduled for ACLR were randomized to receive either a CFNB placed prior to surgery, followed by an infusion of ropivacaine for 2 days with oxycodone or IVPCA of morphine. The primary outcome was compound muscle action potential (CMAP) area from the quadriceps muscle measured at 6 weeks postoperatively. Secondary outcomes were range of active flexion, quadriceps muscle power, and distance walked. Other outcomes included total equivalent intravenous morphine consumption, pain scores, and rate of PONV at 24 and 48 h postoperatively.

Table 1
Functional outcomes. Data are presented as mean and 95% confidence interval.

	Group CFNB	Group IVPCA	P Value
Active flexion (°)			
POD 1	67.2 (59.7;74.8)	57.2 (49.2;65.1)	0.06
POD 2	75.1 (69.6;80.7)	72.1 (65.0;79.3)	0.49
POD 3	76.2 (67.7;84.7)	78.8 (68.2;89.3)	0.69
Quadriceps muscle strength (subjective scale 1–5)			
POD 1	2.1 (1.8;2.4)	2.5 (2.3;2.7)	0.04
POD 2	2.5 (2.3;2.8)	2.8 (2.5;3.0)	0.22
POD 3	2.7 (2.4;3.1)	3.0 (3.0;3.0)	0.10
Distance walked (m)			
POD 1	46.6 (34.5;58.7)	55.3 (36.4;74.2)	0.42
POD 2	86.0 (68.9;103.1)	88.0 (62.6;113.4)	0.89
POD 3	124.0 (91.0;157.0)	124.5 (85.7;163.4)	0.98

Table 2
Pain related outcomes. Data are presented as mean and 95% confidence interval.

	Group CFNB	Group IVPCA	P Value
Cumulative IV morphine equivalent (mg)			
0–24 hours	18.6 (13.5;23.7)	35.9 (25.8;46.0)	0.003
24–48 hours	5.2 (1.2;9.2)	11.8 (5.8;17.8)	0.07
Pain (VRS, 0-10)			
POD 1	1.3 (0.6;2.0)	1.6 (0.8;2.3)	0.65
POD 2	0.8 (0.3;1.2)	0.7 (0.2;1.3)	0.88
POD 3	0.7 (0.1;1.2)	0.5 (0.4;1.4)	0.70
Incidence of PONV			
POD 1	10%	15%	0.67
POD 2	4%	17%	0.28
POD 3	0%	0%	0

Results: CMAP area at 6 weeks was equivalent in both groups (group CFNB:47[41; 54]mV*ms;group PCA:51[42;60]mV*ms; p = 0.50). While no statistically significant differences were detected between groups in functional (table 1) or pain outcomes, morphine consumption at 24h was reduced by CFNB (table 2).

Conclusions: Despite prior contrary findings, CFNB in this study did not result in femoral nerve injury or worsen functional outcomes after ACLR. Analgesia was not improved beyond 24 postoperative hours although this secondary outcome should be interpreted with caution.

P 25

The analgesic efficacy of sciatic nerve block in addition to femoral nerve block in patients undergoing total knee arthroplasty. A systematic review and meta-analysis

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Background: A previous review on the analgesic contribution of sciatic nerve block (SNB) in patients undergoing total knee arthroplasty (TKA) with femoral nerve block (FNB) remained inconclusive, but was not based on formal statistical evaluation [1]. We undertook a meta-analysis to assess the postoperative analgesic efficacy of SNB in addition to FNB after TKA.
Method: The primary outcome of this meta-analysis was cumulative iv morphine consumption at 12h postoperatively, analysed according to the type of block: FNB+SNB (single-shot injection or continuous SNB) vs FNB only. Secondary outcomes were iv morphine consumption at 24h and 48h postoperatively, pain scores at rest and on movement at 12, 24 and 24h postoperatively and rate of PONV at 24h postoperatively.

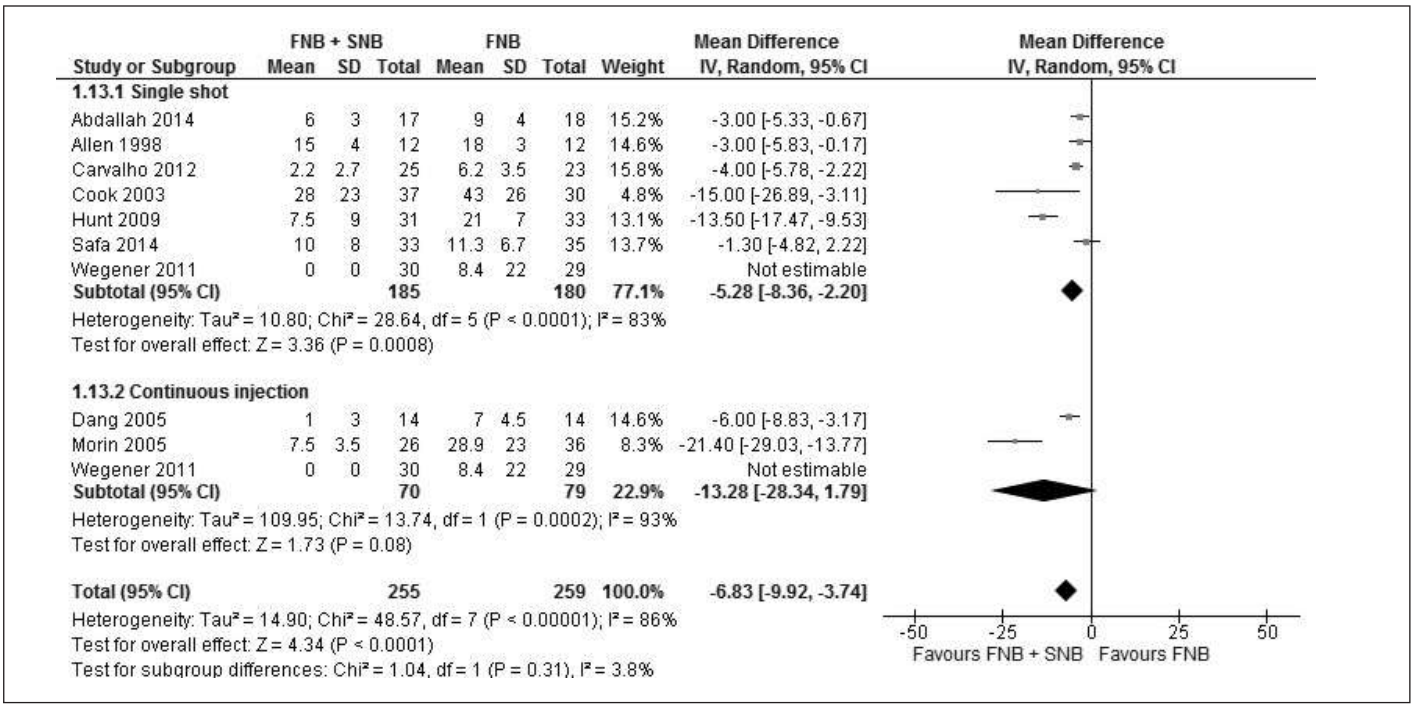

Figure 1
Cumulative iv morphine consumption at 12h postop (mg).

Table 1
Secondary endpoints. * denotes significant results

			Total number of patients or number of patients with outcome/total number of patients (%)					
Outcomes	**Number of trials**	**SNB+FNB**	**FNB**	**RR (95% CI)**	**Mean difference (95% CI)**	**I^2 (%)**	**Test for heterogeneity (p)**	**Test for overall effect (p)**
IV morphine consumption (mg) 24h postop	5	157	146	–	–6 (–5, –7)	97	<0.00001	<0.00001*
IV morphine consumption (mg) 48h postop	3	98	106	–	2 (3, 0)	93	<0.00001	0.01*
Pain scores (VAS, VRS or NRS, 0–100) at rest 12h postop	8	229	223	–	–6 (–4, –7)	89	<0.00001	<0.00001*
Pain scores (VAS, VRS or NRS, 0–100) on movement 12h postop	3	75	76	–	–5 (–2, –8)	45	0.16	0.0003*
Pain scores (VAS, VRS or NRS, 0–100) at rest 24h postop	9	255	259	–	2 (4, 1)	83	<0.00001	<0.0001*
Pain scores (VAS, VRS or NRS, 0–100) on movement 24h postop	6	173	182	–	3 (5, 0.1)	71	0.002	0.04*

Pain scores (VAS, VRS or NRS, 0–100) at rest 48h postop	7	218	224	–	1 (2, 0.2)	45	0.08	0.02*
Pain scores (VAS, VRS or NRS, 0–100) on movement 48h postop	5	145	155	–	5 (7, 2)	52	0.07	0.0003*
PONV 24h postop	3	12/44 (27%)	22/43 (51%)	0.36 (0.15, 0.89)	–	–	0.04	0.03*

Results: 11 controlled trials were identified including 514 patients. When added to FNB, SNB significantly reduced cumulative iv morphine consumption at 12h postoperatively, with a mean difference of 7 mg (95%CI: –10; -4; p <0.0001; fig. 1). All secondary outcomes were also significantly reduced (table 1).
Conclusion: SNB confers additional postoperative analgesia in patients undergoing TKA with FNB.

Reference
1 Abdallah FW. Is sciatic nerve block advantageous when combined with femoral nerve block for postoperative analgesia following total knee arthroplasty? A systematic review. Reg Anesth Pain Med. 2011;36(5):493–8.

P 26

Efficacy of perioperative intravenous administration of lidocaine on postoperave pain: a systematic review and meta-analysis

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Background and aims: Intravenous (IV) lidocaine has been reported to improve pain outcomes after bowel surgery. A myriad of trials examining other types of surgery have also been published recently. This meta-analysis aimed to evaluate whether the perioperative administration of IV lidocaine reduces postoperative pain after all types of surgery.

Methods: This meta-analysis was performed according to the PRISMA statement guidelines. The primary outcome was cumulative IV morphine consumption at 24h postoperatively, analysed according to the type of surgery (bowel surgery, urologic surgery, gynaecologic surgery, orthopaedic surgery, miscellaneous). Secondary outcomes included IV morphine consumption at 2h and 12h postoperatively, pain scores at rest at 2h, 12h and 24h postoperatively, rate of postoperative nausea and vomiting, hospital length of stay, and lidocaine-related side-effects (drowsiness, sedation, arrhythmias).
Results: Forty controlled trials, including 2,205 patients were identified. Administration of IV lidocaine reduced cumulative IV morphine consumption at 24h postoperatively by 5 mg (95%CI: –8, –2.0 mg; p = 0.0005) (fig. 1). Subgroup analysis revealed statistically significant reductions in all subgroups except orthopaedic surgery and miscellaneous. All secondary outcomes were similarly improved in the lidocaine group (table 1). No differences were observed in the rates of the lidocaine related side-effects (table 2).
Conclusions: Intravenous lidocaine improves postoperative pain in bowel, urologic, and gynaecologic surgery, without side-effects. The reduction in hospital length of stay observed should be confirmed by prospective trials as it was a secondary outcome of this investigation.

Table 1
Secondary outcomes.

		Number of patients				
Outcomes	**Number of trials**	**Lidocaine**	**Placebo**	**Mean difference**	**I^2 (%)**	**Test for overall effect (p)**
Time to first analgesic request (hours)	9	224	227	12.1 [0.3, 23.9]	96	0.04
IV morphine consumption at 2h postoperatively (mg)	22	569	564	–3.4 [–5.5, –1.3]	97	0.002
IV morphine consumption at 12h postoperatively (mg)	5	156	212	–3.6 [–5.0, –2.2]	0	<0.00001
Early pain scores at rest (VAS, VRS or NRS, 0–100)	24	681	673	–6.9 [–9.5, –4.4]	75	<0.00001
Intermediate pain scores at rest (VAS, VRS or NRS, 0–100)	22	601	599	–5.7 [–7.6, –3.7]	66	<0.00001
Late pain scores at rest (VAS, VRS or NRS, 0–100)	31	849	843	–2.72 [–4.9, –0.6]	82	0.01
Rate of PONV	28	773	827	0.8 [0.7, 0.9]	0	0.003
Hospital length of stay (day)	21	604	600	–0.3 [–0.8, 0.1]	81	<0.00001

The numbers refer to the pages of this supplement.