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Anesth Analg 2009 109: 986-987.

EV D.51A

Overweight/Obesity and Gastric Fluid Characteristics in Pediatric Day Surgery: Implications for Fasting Guidelines and Pulmonary Aspiration Risk

Scott D. Cook-Sather, MD*, Paul R. Gallagher, MA, Lydia E. Kruge, BA*, Jonathan M. Beus, BSE*, Brian P. Ciampa, BS*, Kevin Conor Welch, MA*, Sina Shah-Hosseini, MSE*, Jieun S. Choi, MD*, Reshma Pachikara, BS*, Kim Minger, BSN, CNOR, Ronald S. Litman, DO*, and Mark S. Schreiner, MD*

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Anesth Analg 2009 109: 727-736.

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BACKGROUND: The safety of 2-h preoperative clear liquid fasts has not been established for overweight/obese pediatric day surgical patients. Healthy children and obese adults who fasted 2 h have small residual gastric fluid volumes (GFVs), which are thought to reflect low pulmonary aspiration risk. We sought to measure the prevalence of overweight/obesity in our day surgery population. We hypothesized that neither body mass index (BMI) percentile nor fasting duration would significantly affect GFV or gastric fluid pH. In children who were allowed clear liquids up until 2 h before surgery, we hypothesized that overweight/obese subjects would not have increased GFV over lean/normal subjects and that emesis/pulmonary aspiration events would be rare.

METHODS: Demographics, medical history, height, and weight were recorded for 1000 consecutive day surgery patients aged 2–12 yr. In addition, 1000 day surgery patients (age 2–12 yr) undergoing general endotracheal anesthesia were enrolled. After tracheal intubation, a 14–18F orogastric tube was inserted and gastric contents evacuated. Medications, fasting interval, GFV, pH, and emetic episodes were documented. Age- and gender-specific Center for Disease Control and Prevention growth charts (2000) were used to determine ideal body weight (IBW = 50th percentile) and to classify patients as lean/normal (BMI 25th–75th percentile), overweight (BMI 85th to <95th percentile), or obese (BMI 95th percentile).

RESULTS: Of all day surgery patients, 14.0% were overweight and 13.3% were obese. Obese children had lower GFV per total body weight ($P < 0.001$). When corrected for IBW, however, volumes GFV(IBW) were identical across all BMI categories (mean 0.96 mL/kg, sd 0.71; median 0.86 mL/kg, IQR 0.96). Preoperative

acetaminophen and midazolam contributed to increased GFV(IBW) ($P = 0.025$ and $P = 0.001$). Lower GFV(IBW) was associated with ASA physical status III ($P = 0.024$), male gender ($P = 0.012$), gastroesophageal reflux disease ($P = 0.049$), and proton pump inhibitor administration ($P = 0.018$). GFV(IBW) did not correlate with fasting duration or age. Decreased gastric fluid acidity was associated with younger age ($P = 0.005$), increased BMI percentile ($P = 0.036$), and African American race ($P = 0.033$). Emesis on induction occurred in eight patients (50% of whom were obese, $P = 0.052$, and 75% of whom had obstructive sleep apnea, $P = 0.061$). Emesis was associated with increased ASA physical status ($P = 0.006$) but not with fasting duration. There were no pulmonary aspiration events.

CONCLUSIONS: Twenty-seven percent of pediatric day surgery patients are overweight/obese. These children may be allowed clear liquids 2 h before surgery as GFV(IBW) averages 1 mL/kg regardless of BMI and fasting interval. Rare emetic episodes were not associated with shortened fasting intervals in this population.

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A Novel Skin-Traction Method Is Effective for Real-Time Ultrasound-Guided Internal Jugular Vein Catheterization in Infants and Neonates Weighing Less Than 5 Kilograms

Masato Morita, MD, Hiroshi Sasano, PhD, MD, Takafumi Azami, PhD, MD, Nobuko Sasano, PhD, MD, Yoshihito Fujita, PhD, MD, Shoji Ito, PhD, MD, Takeshi Sugiura, PhD, MD, and Kazuya Sobue, PhD, MD
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 Anesth Analg 2009 109: 754-759.

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BACKGROUND: Internal jugular vein (IJV) catheterization in pediatric patients is sometimes difficult because of the small sizes of veins and their collapse during catheterization. To facilitate IJV catheterization, we developed a novel skin-traction

method (STM), in which the point of puncture of the skin over the IJV is stretched upward with tape during catheterization. In this study, we examined whether the STM increases the cross-sectional area of the vein and thus facilitates catheterization.

METHODS: This was a prospective study conducted from December 2006 to June 2008. We enrolled 28 consecutive infants and neonates weighing <5 kg who underwent surgery for congenital heart disease. The patients were randomly assigned to a group in which STM was performed (STM group) or a group in which it was not performed (non-STM group). The cross-sectional area and diameter of the right IJV in the flat position and 10° Trendelenburg position with and without applying STM were measured. We determined time from first skin puncture to the following: (a) first blood back flow, (b) insertion of guidewire, and (c) insertion of catheter. Number of punctures, success rate, complications, and degree of IJV collapse during advancement of the needle (estimated as decrease of anteroposterior diameter during advancement of the needle compared with the diameter before advancement) were also examined.

RESULTS: STM significantly increased the cross-sectional area and the anteroposterior diameter of the IJV in both positions. The time required to insert the catheter was significantly shorter in the STM group, probably mainly due to a shorter guidewire insertion time. The degree of IJV collapse during advancement of the needle was much lower in the STM group.

CONCLUSIONS: STM facilitates IJV catheterization in infants and neonates weighing <5 kg by enlarging the IJV and preventing vein collapse.

Abstract

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Increasing the Duration of Isoflurane Anesthesia Decreases the Minimum Alveolar Anesthetic Concentration in 7-Day-Old but Not in 60-Day-Old Rats

Greg Stratmann, MD, PhD, Jeffrey W. Sall, MD, PhD, Edmond I. Eger, II, MD, Michael J. Laster, DVM, Joseph S. Bell, BA, Laura D. V. May, MA, Helge Eilers, MD, Martin Krause, MD, Frank v. d. Heusen, MD, and Heidi E. Gonzalez
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Anesth Analg 2009 109: 801-806.

Study Objective

Objective: To determine the effect of increasing the duration of isoflurane anesthesia on the minimum alveolar anesthetic concentration (MAC) in 7-day-old and 60-day-old rats. **Design:** Prospective, randomized, controlled study. **Setting:** University of California San Francisco, San Francisco, California. **Subjects:** 7-day-old and 60-day-old rats. **Interventions:** Isoflurane anesthesia (1 mg/kg/h) for 7 days or 60 days. **Measurements and Main Results:** MAC was determined in 7-day-old rats after 15 min of anesthesia (MAC_a 3.5%) and in 60-day-old rats after 15 min of anesthesia (MAC_b 1.3%). In 7-day-old rats, MAC decreased significantly after 4 hours of anesthesia (MAC_{4h} 1.5%) and after 5 hours of anesthesia (MAC_{5h} 1.3%). In 60-day-old rats, MAC did not change significantly after 4 hours of anesthesia (MAC_{4h} 1.5%) and after 5 hours of anesthesia (MAC_{5h} 1.3%). **Conclusions:** Increasing the duration of isoflurane anesthesia decreases the MAC in 7-day-old rats but not in 60-day-old rats.

10 patients after elective thoracic or abdominal surgery with general anesthesia. Electroencephalogram, BIS, state entropy (SE), response entropy (RE), and ERPs were recorded immediately after surgery in the intensive care unit at Richmond Agitation-Sedation Scale (RASS) scores of -5 (very deep sedation), -4 (deep sedation), -3 to -1 (moderate sedation), and 0 (awake) during decreasing target-controlled sedation with propofol and remifentanyl. Reference measurements for baseline levels were performed before or several days after the operation.

RESULTS: At baseline, RASS -5, RASS -4, RASS -3 to -1, and RASS 0, BIS was 94 [4] (median, IQR), 47 [15], 68 [9], 75 [10], and 88 [6]; SE was 87 [3], 46 [10], 60 [22], 74 [21], and 87 [5]; and RE was 97 [4], 48 [9], 71 [25], 81 [18], and 96 [3], respectively (all $P < 0.05$, Friedman Test). Both BIS and Entropy had high variabilities. When ERP N100 amplitudes were considered alone, ERPs did not differ significantly among sedation levels. Nevertheless, discriminant ERP analysis including two parameters of principal component analysis revealed a prediction probability P_K value of 0.89 for differentiating deep sedation, moderate sedation, and awake state. The corresponding P_K for RE, SE, and BIS was 0.88, 0.89, and 0.85, respectively.

BACKGROUND: Sedation protocols, including the use of sedation scales and regular sedation stops, help to reduce the length of mechanical ventilation and intensive care unit stay. Because clinical assessment of depth of sedation is labor-intensive, performed only intermittently, and interferes with sedation and sleep, processed electrophysiological signals from the brain have gained interest as surrogates. We hypothesized that auditory event-related potentials (ERPs), Bispectral Index® (BIS), and Entropy® can discriminate among clinically relevant sedation levels.

METHODS: We studied 10 patients after elective thoracic or abdominal surgery with general anesthesia. Electroencephalogram, BIS, state entropy (SE), response entropy (RE), and ERPs were recorded immediately after surgery in the intensive care unit at Richmond Agitation-Sedation Scale (RASS) scores of -5 (very deep sedation), -4 (deep sedation), -3 to -1 (moderate sedation), and 0 (awake) during decreasing target-controlled sedation with propofol and remifentanyl. Reference measurements for baseline levels were performed before or several days after the operation.

RESULTS: At baseline, RASS -5, RASS -4, RASS -3 to -1, and RASS 0, BIS was 94 [4] (median, IQR), 47 [15], 68 [9], 75 [10], and 88 [6]; SE was 87 [3], 46 [10], 60 [22], 74 [21], and 87 [5]; and RE was 97 [4], 48 [9], 71 [25], 81 [18], and 96 [3], respectively (all $P < 0.05$, Friedman Test). Both BIS and Entropy had high variabilities. When ERP N100 amplitudes were considered alone, ERPs did not differ significantly among sedation levels. Nevertheless, discriminant ERP analysis including two parameters of principal component analysis revealed a prediction probability P_K value of 0.89 for differentiating deep sedation, moderate sedation, and awake state. The corresponding P_K for RE, SE, and BIS was 0.88, 0.89, and 0.85, respectively.

CONCLUSIONS: Neither ERPs nor BIS or Entropy can replace clinical sedation assessment with standard scoring systems. Discrimination among very deep, deep to moderate, and no sedation after general anesthesia can be provided by ERPs and processed electroencephalograms, with similar P_{Ks} . The high inter- and intraindividual variability of Entropy and BIS precludes defining a target range of values to predict the sedation level in critically ill patients using these parameters. The variability of ERPs is unknown.

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D&L

Pressure Support Ventilation and Biphasic Positive Airway Pressure Improve Oxygenation by Redistribution of Pulmonary Blood Flow

Alysson R. Carvalho, PhD*, Peter M. Spieth, MD*, Paolo Pelosi, MD, PhD, Alessandro Beda, PhD*, Aginaldo J. Lopes, MD, DSc, Borianna Neykova, MD, Axel R. Heller, MD, PhD*, Thea Koch, MD, PhD*, and Marcelo Gama de Abreu, MD, MSc, PhD, DEAA*

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Anesth Analg 2009 109: 856-865.

Abstract

OBJECTIVE: BIPAP D&L

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BACKGROUND: Spontaneous breathing (SB) activity may improve gas exchange during mechanical ventilation mainly by the recruitment of previously collapsed regions. Pressure support ventilation (PSV) and biphasic positive airway pressure (BIPAP) are frequently used modes of SB, but little is known about the mechanisms of improvement of lung function during these modes of assisted mechanical ventilation. We evaluated the mechanisms behind the improvement of gas exchange with PSV and BIPAP.

METHODS: Five pigs (25–29.3 kg) were mechanically ventilated in supine position, and acute lung injury (ALI) was induced by surfactant depletion. After stabilization, BIPAP was initiated with lower continuous positive airway pressure equal to 5 cm H₂O and the higher continuous positive airway pressure titrated to achieve a tidal volume between 6 and 8 mL/kg. The depth of anesthesia was reduced, and when SB represented 20% of total minute ventilation, PSV and BIPAP + SB were each performed for 1 h (random sequence). Whole chest helical computed tomography was performed during end-expiratory pauses and functional variables were obtained. Pulmonary blood flow (PBF) was marked with IV administered fluorescent microspheres, and spatial cluster analysis was used to determine the effects of each ventilatory mode on the distribution of PBF.

RESULTS: ALI led to impairment of lung function and increase of poorly and nonaerated areas in dependent lung regions ($P < 0.05$). PSV and BIPAP + SB similarly improved oxygenation and reduced venous admixture compared with controlled mechanical ventilation ($P < 0.05$). Despite that, a significant increase of nonaerated areas in dependent regions with a concomitant decrease of normally aerated areas was observed during SB. In five of six lung clusters, redistribution of PBF from dependent to nondependent, better aerated lung regions were observed during PSV and BIPAP + SB.

CONCLUSIONS: In this model of ALI, the improvements of oxygenation and venous admixture obtained during assisted mechanical ventilation with PSV and BIPAP + SB were explained by the redistribution of PBF toward nondependent lung regions rather than recruitment of dependent zones.

HEALTH

CO2

The Effect on Cerebral Tissue Oxygenation Index of Changes in the Concentrations of Inspired Oxygen and End-Tidal Carbon Dioxide in Healthy Adult Volunteers

Martin M. Tisdall, MD*, Christopher Taylor, FRCA*, Ilias Tachtsidis, PhD, Terence S. Leung, PhD, Clare E. Elwell, PhD, and Martin Smith, FRCA*

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Anesth Analg 2009 109: 906-913.

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BACKGROUND: Long-term exposure to opiates induces tolerance to the analgesic effect. The neurobiological mechanism of this phenomenon is not completely clear. In this study, we evaluated the effects of central administration of minocycline (a tetracycline derivative) and riluzole (an antiglutamatergic drug) on morphine-induced tolerance in rats.

METHODS: Groups of rats received daily morphine (10 mg/kg, IP) in combination with saline (10 µL/rat, intracerebroventricular [ICV]) or 1% Tween 80 (10 µL/rat, ICV) or minocycline (60, 120, and 240 µg/10 µL per rat, ICV) or riluzole (20, 40, 80 µg/10 µL per rat, ICV). Nociception was assessed using hotplate apparatus (55°C ± 0.5°C). Hotplate latency was recorded when the rat licked its hindpaw. Baseline latencies were determined once per day for each rat, then morphine (10 mg/kg) was injected. After 20 min, the above-mentioned drugs were administered and postdrug latency was measured 10 min after the injection of drugs or vehicles.

RESULTS: Results showed that ICV administration of minocycline and riluzole delayed morphine-induced tolerance. Morphine tolerance was complete after 8 days in the control groups but was complete in the groups treated with minocycline (120 µg/10 µL per rat) and riluzole (80 µg/10 µL per rat) on the 13th day. In addition, our results showed that minocycline and riluzole increased the total analgesic effect of morphine (area under the curve of the percentage of maximal possible effect values).

CONCLUSION: The effects of minocycline on nitric oxide and the glutamatergic system and the effect of riluzole on the glutamate system are potentially important mechanisms in delaying morphine-induced tolerance.

INDEX WORDS:

Nav1.7

IDA

A Peripherally Acting Nav_v1.7 Sodium Channel Blocker Reverses Hyperalgesia and Allodynia on Rat Models of Inflammatory and Neuropathic Pain

Erin McGowan, BS, Scott B. Hoyt, PhD, Xiaohua Li, BS, Kathryn A. Lyons, BS, and Catherine Abbadie, PhD

From the Merck Research Laboratories, Department of Pharmacology and Medicinal Chemistry Rahway, New Jersey.

Anesth Analg 2009 109: 951-958.

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BACKGROUND: Voltage-gated sodium channels (Na_v1) are expressed in primary sensory neurons where they influence excitability via their role in the generation and propagation of action potentials. Recently, human genetic data have shown that one sodium channel subtype, Na_v1.7, plays a major role in pain. We performed these studies to characterize the antinociceptive effects of *N*-[(*R*)-1-((*R*)-7-chloro-1-isopropyl-2-oxo-2,3,4,5-tetrahydro-1*H*-benzo[*b*]azepin-3-ylcarbamoyl)-2-(2-fluorophenyl)-ethyl]-4-fluoro-2-trifluoromethyl-benzamide (BZP), a non-central nervous system (CNS) penetrant small molecule with high affinity and preferential selectivity for Na_v1.7 over Na_v1.8 and Na_v1.5.

METHODS: BZP was evaluated in rat preclinical models of inflammatory and neuropathic pain and compared with standard analgesics. Two models were used: the complete Freund's adjuvant model of inflammatory pain and the spinal nerve ligation model of neuropathic pain. BZP was also evaluated in a motor coordination assay to assess its propensity for CNS side effects.

RESULTS: In preclinical models of chronic pain, BZP displayed efficacy comparable with that of leading analgesics. In the complete Freund's adjuvant model, BZP produced reversal of hyperalgesia comparable with nonsteroidal antiinflammatory drugs, and in the spinal nerve ligation model, BZP produced reversal of allodynia comparable with gabapentin and mexiletine. Unlike the CNS penetrant compounds gabapentin and mexiletine, BZP did not induce any impairment of motor coordination.

CONCLUSIONS: These data suggest that a peripherally acting sodium channel blocker, preferentially acting through Na_v1.7, could provide clinical relief of chronic pain without the CNS side effects typical of many existing pain treatments.

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Cytokine Gene Expression After Total Hip Arthroplasty: Surgical Site versus Circulating Neutrophil Response

Asokumar Buvanendran, MD*, Kendall Mitchell, PhD, Jeffrey S. Kroin, PhD*, and Michael J. Iadarola, PhD

From the *Department of Anesthesiology, Rush University Medical Center, Chicago, Illinois; and Neurobiology and Pain Therapeutics Section, National Institute of Dental and Craniofacial Research, NIH, Bethesda, Maryland.

Anesth Analg 2009 109: 959-964.

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BACKGROUND: After surgery, cytokines and chemokines are released at the surgical wound site, which can contribute to postoperative pain, local inflammation, and tissue repair. Multiple cell types are present that can release cytokines/chemokines at the wound site and, thus, the exact cellular source of these molecules is unclear. We sought to better understand the contribution of neutrophils to cytokine/chemokine gene expression at the surgical wound site during the initial postsurgery phase of total hip arthroplasty (THA).

METHODS: Hip drain fluid was collected at 24 h postsurgery from six patients undergoing standardized THA. In addition, venous blood was collected presurgery and 24 h postsurgery. Neutrophils were isolated, total RNA extracted, and a biotinylated cRNA probe generated. The probes were hybridized with a cDNA microarray containing approximately 100 oligonucleotide sequences representing various human cytokines/chemokines or receptor genes. Changes in gene expression seen in the microarray were verified by reverse transcription polymerase chain reaction.

RESULTS: In the microarray analysis of hip drain neutrophils, interleukin-1 receptor antagonist (IL1RN), interleukin-18 receptor 1 (IL18R1), macrophage migration inhibitory factor (MIF), and macrophage inflammatory protein 3 (CCL20) were upregulated, whereas interleukin-8 receptor β (IL8RB/CXCR2) was consistently downregulated, compared with presurgery blood neutrophils. All of these changes were confirmed by reverse transcription polymerase chain reaction.

CONCLUSION: There is a distinct cytokine gene expression profile in neutrophils at the THA surgical wound site at 24 h postsurgery when compared with that found in presurgery circulating neutrophils. Understanding these changes may allow us to knowledgeably manipulate neutrophil activity to reduce postoperative pain and inflammation without impairing wound healing.

41%

Regional Anesthesia for Vascular Access Surgery

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From the Department of Anesthesiology, Duke University Medical Center, Duke University School of Medicine, Durham, North Carolina.

Anesth Analg 2009 109: 976-980.

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BACKGROUND: Approximately 25% of initial arteriovenous fistula (AVF) placements will fail as a result of thrombosis or failure to develop adequate vessel size and blood flow. Fistula maturation is impacted by patient characteristics and surgical technique, but both increased vein diameter and high fistula blood flow rates are the most important predictors of successful AVFs. Anesthetic techniques used in vascular access surgery (monitored anesthesia care, regional blocks, and general anesthesia) may affect these characteristics and fistula failure.

METHODS: We performed a literature search using key words in the PubMed/ MEDLINE database. Seven articles that related to the effects of anesthesia on AVF construction, including sympathetic block, vein dilation, blood flow, adverse outcomes, or patency rates, comprised the sources for this review.

RESULTS: Significant vasodilation after regional block administration is seen in both the cephalic and basilic veins. These vasodilatory properties may assist with AVF site selection. In the intraoperative and postoperative periods, use of a regional block, compared with other anesthetic techniques, resulted in significantly increased fistula blood flow. The greater sympathetic block contributed to vessel dilation and reduced vasospasm. Use of regional techniques in AVF construction yielded shorter maturation times, lower failure rates, and higher patency rates.

CONCLUSION: Use of regional blocks may improve the success of vascular access procedures by producing significant vasodilatation, greater fistula blood flow, sympathectomy-like effects, and decreased maturation time. However, a large-scale, prospective, clinical trial comparing the different anesthetic techniques is still needed to verify these findings.

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Petit et al.

An Anatomical Study of the Transversus Abdominis Plane Block: Location of the Lumbar Triangle of Petit and Adjacent Nerves

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[STAIC]) and the modified Yale Preoperative Anxiety Scale. Children's pain, parents' anxiety, and parents' proxy report of children's anxiety were evaluated using VAS.

RESULTS: The correlation between STAIC and VAS-anxiety was significant on the day of discharge. Moreover, changes over time were not significant with STAIC, whereas VAS-anxiety was significantly sensitive to changes over time in the two groups of age (7-11 yr and 12-16 yr). A receiver operating characteristic curve, using modified Yale Preoperative Anxiety Scale as reference, determined a VAS-anxiety cutoff at 30 to identify high-anxiety groups. Pain levels were significantly higher when children were anxious (VAS ≥ 30) in the postoperative period. Moreover, children's anxiety and pain were higher when parents were anxious.

CONCLUSION: VAS-anxiety is a useful and valid tool to assess perioperative anxiety in children aged 7-16 yr. The influence of children's and parents' anxiety on children's postoperative pain suggests that VAS-anxiety should be recommended routinely for postoperative clinical practice to optimize anxiety and pain management.

DuMmw

Routine use of nasogastric tubes does not reduce postoperative nausea and vomiting.

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176 patients with or without intraoperative NG tube use. The incidences of PONV in the intraoperative group were 44.4% vs 41.5% ($P=0.35$) with and without tube use, respectively, and 27.8% vs 31.3% ($P=0.61$) in the perioperative group. Our results provide evidence that routine use of a NG tube does not reduce the incidence of PONV.

Routine use of a nasogastric (NG) tube has been suggested to prevent postoperative nausea and vomiting (PONV) despite conflicting data. Accordingly, we tested the hypothesis that routine use of a NG tube does not reduce PONV. Our work is based on data from a large trial of 4055 patients initially designed to quantify the effectiveness of combinations of antiemetic treatments for the prevention of PONV. This analysis uses propensity scores for case matching to ensure group comparability on baseline factors. Intraoperative NG tube use patients and perioperative NG tube use patients were respectively matched to nonuse patients on all available potential confounders. Matched-pairs were identified using propensity scores for 1032 patients with or without intraoperative NG tube use and 176 patients with or without perioperative NG tube use. The incidences of PONV in the intraoperative group were 44.4% vs 41.5% ($P = 0.35$) with and without tube use, respectively, and 27.8% vs 31.3% ($P = 0.61$) in the perioperative group. Our results provide evidence that routine use of a NG tube does not reduce the incidence of PONV.

Should dosing of rocuronium in obese patients be based on ideal or corrected body weight?

Christian S. Meyhoff, MD, PhD*, Jørgen Lund, MD, Morten T. Jenstrup, MD, Casper Claudius, MD, PhD*, Anne M. Sørensen, MD, PhD*, Jørgen Viby-Mogensen, MD, DMSc*, and Lars S. Rasmussen, MD, PhD, DMSc*
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Anesth Analg. 2009 109:787-92.

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BACKGROUND: Accuracy of upper lip bite test (ULBT) has been compared with the Mallampati classification. In this study, we investigated whether the combination of the ULBT classification with sternomental distance (SMD), thyromental distance (TMD), and interincisor distance (IID) or a composite score can improve the ability to predict easy laryngoscopy and intubation compared with each test alone.

METHODS: In a prospective study, 380 patients who were scheduled for elective surgery were selected randomly and enrolled in the study. Before inducing anesthesia, the airways were assessed, and ULBT class, SMD, TMD, and IID determined. Laryngoscopic view according to the Cormack and Lehané grading system was determined after induction of anesthesia and Grades 3 and 4 defined as "difficult intubation." By using receiver operating characteristic analysis, the best cutoff points of the tests were calculated. Finally, sensitivity, specificity, positive and negative predictive values and accuracy of these tests and their combinations with the ULBT were calculated.

RESULTS: The prevalence of difficult intubation was 5% (n = 19). Class III ULBT, IID <4.5 cm, TMD <6.5 cm, and SMD <13 cm were defined as predictors of difficult intubation. There was no significant difference regarding difficult intubation based on gender (P < 0.05), whereas there were significant differences between the older tests and laryngeal view (P < 0.05, Mc-Nemar test). Specificity and accuracy of the ULBT were significantly higher than TMD, SMD, and IID individually (specificity was 91.69%, 82.27%, 70.64%, and 82.27%, respectively, and accuracy was 91.05%, 71.32%, 81.84%, and 76.58%, respectively). The combination of the ULBT with SMD provided the highest sensitivity.

CONCLUSION: We conclude that the specificity and accuracy of the ULBT is significantly higher than the other tests and is more accurate in airway assessment. However, the ULBT in conjunction with the other tests could more reliably predict easy laryngoscopy or intubation.

The Practice of and Documentation on Withholding and Withdrawing Life Support: A Retrospective Study in Two Dutch Intensive Care Units

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Anesth Analg 2009 109: 841-846

OBJECTIVE:

We determined how often life support was withheld or withdrawn in patients who died in the intensive care unit (ICU) or early after ICU discharge and evaluated documentation on decisions regarding these changes in life support orders.

METHODS:

This was a retrospective study in a university hospital and a general teaching hospital. Charts of patients who died during ICU stay or within 7 days after ICU discharge in 2005 were reviewed.

RESULTS:

Of 2578 admitted patients, 356 patients (14%) died either in the ICU or within 7 days after ICU discharge. For 9 patients data were missing, leaving 347 patients for analysis. Seventy-seven patients (22%) died with full life support, 85 (25%) died while treatment was being withheld, and 185 (53%) patients died while treatment was being withdrawn. One or more changes in life support orders were noted in 266 patients (77%). Only 8% of the patients were recorded to be incapacitated at the time of the change. Patients' preferences regarding life support were documented in less than one-quarter of cases. In approximately one third of cases, it was not documented which member(s) of the ICU team were involved in an end-of-life decision. In the documented cases, end-of-life decisions were made along with the patient (7%) or with the patient's representatives (59%).

Of 2578 admitted patients, 356 patients (14%) died either in the ICU or within 7 days after ICU discharge.

For 9 patients data were missing, leaving 347 patients for analysis.

Seventy-seven patients (22%) died with full life support, 85 (25%) died while treatment was being withheld, and 185 (53%) patients died while treatment was being withdrawn.

One or more changes in life support orders were noted in 266 patients (77%).

Only 8% of the patients were recorded to be incapacitated at the time of the change.

Patients' preferences regarding life support were documented in less than one-quarter of cases.

In approximately one third of cases, it was not documented which member(s) of the ICU team were involved in an end-of-life decision.

In the documented cases, end-of-life decisions were made along with the patient (7%) or with the patient's representatives (59%).

surgical airway, during approximately 32,000 attempts (0.1%). Unanticipated difficult upper airway anatomy was the leading reason for a surgical airway. Four of the 31 patients died of their injuries but none as the result of failed intubation.

CONCLUSIONS: In the hands of experienced anesthesiologists, rapid sequence intubation followed by direct laryngoscopy is a remarkably effective approach to emergency airway management. An algorithm designed around this approach can achieve very high levels of success.

Abstract **FMLP**
Long-Acting Local Anesthetics Attenuate FMLP-induced Acute Lung Injury in Rats

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From the *Department of Anaesthesiology and Operative Intensive Care Medicine, Kantonsspital, Lucerne, Switzerland; Department of Anaesthesiology and Intensive Care Medicine, University of Heidelberg, Heidelberg, Germany; and Department of Anaesthesiology, University of Mainz, Mainz, Germany.

Anesth Analg 2009 109: 880-885.

Background: Endothelin-1 (ET-1) is a mediator of lung diseases and a potent pulmonary vasoconstrictor. In addition to thromboxane A₂, it participates in the formation of lung edema. Both lidocaine and mepivacaine attenuate the increase of pulmonary arterial pressure (PAP) and lung edema development. We examined the effects of procaine, bupivacaine, and ropivacaine on experimentally evoked PAP increase and ET-1 release.

Methods: Rats were divided into four groups: control (n=8), ET-1 (n=8), ET-1 + lidocaine (n=8), and ET-1 + bupivacaine (n=8). ET-1 (10 μg/kg) was administered intravenously. PAP and lung wet/dry weight ratio were measured. Statistical significance was determined by ANOVA (P < 0.05).

Results: ET-1 administration significantly increased PAP and lung wet/dry weight ratio. Lidocaine and bupivacaine significantly attenuated the increase in PAP and lung wet/dry weight ratio compared to the ET-1 group.

Conclusion: Long-acting local anesthetics (lidocaine and bupivacaine) attenuate ET-1-induced acute lung injury in rats by reducing PAP and lung edema development.

BACKGROUND: Endothelin-1 (ET-1) is a mediator of lung diseases and a potent pulmonary vasoconstrictor. In addition to thromboxane A₂, it participates in the formation of lung edema. Both lidocaine and mepivacaine attenuate the increase of pulmonary arterial pressure (PAP) and lung edema development. We examined the effects of procaine, bupivacaine, and ropivacaine on experimentally evoked PAP increase and ET-1 release.

M, 2 +/- 1; P < 0.05; X=IC, 8% +/- 9%; RT, 55% +/- 19%; RT-M, 27% +/- 16%; P < 0.05). CA1 Iba1 (P = 0.15) (P < 0.01) IC RT RT-M

INTRODUCTION: Conventional resuscitation of exsanguination cardiac arrest (CA) victims is generally unsuccessful. Emergency preservation and resuscitation is a novel approach that uses an aortic flush to induce deep hypothermia during CA, followed by delayed resuscitation with cardiopulmonary bypass. Minocycline has been shown to be neuroprotective across a number of brain injury models via attenuating microglial activation. We hypothesized that deep hypothermia and minocycline would attenuate neuronal death and microglial activation and improve outcome after exsanguination CA in rats.

METHODS: Using isoflurane anesthesia, rats were subjected to a lethal hemorrhagic shock. After 5 min of no flow, hypothermia was induced with an aortic flush. Three groups were studied: ice-cold (IC) flush, room-temperature (RT) flush, and RT flush followed by minocycline treatment (RT-M). After 20 min of CA, resuscitation was achieved via cardiopulmonary bypass. Survival, Overall Performance Category (1 = normal, 5 = death), Neurologic Deficit Score (0%-10% = normal, 100% = max deficit), neuronal death (Fluoro-Jade C), and microglial proliferation (Iba1 immunostaining) in hippocampus were assessed at 72 h.

RESULTS: Rats in the IC group had lower tympanic temperature during CA versus other groups (IC, 20.9 degrees C +/- 1.3 degrees C; RT, 28.4 degrees C +/- 0.6 degrees C; RT-M, 28.3 degrees C +/- 0.7 degrees C; P < 0.001). Although survival was similar in all groups (RT, 6/9; IC, 6/7; RT-M, 6/11), neurological outcome was better in the IC group versus other groups (Overall Performance Category: IC, 1 +/- 1; RT, 3 +/- 1; RT-M, 2 +/- 1; P < 0.05; Neurologic Deficit Score: IC, 8% +/- 9%; RT, 55% +/- 19%; RT-M, 27% +/- 16%; P < 0.05). Histological damage assessed in survivors showed selective neuronal death in CA1 and dentate gyrus, similar in all groups (P = 0.15). In contrast, microglial proliferation was attenuated in the IC group versus all other groups (P < 0.01).

CONCLUSIONS: Deeper levels of hypothermia induced by the IC versus RT flush resulted in better neurological outcome in survivors. Surprisingly, deep hypothermia attenuated microglial activation but not hippocampal neuronal death. Minocycline had modest benefit on neurologic outcome in survivors but did not attenuate microglial activation in brain. Our findings suggest a novel effect of deep hypothermia on microglial proliferation during exsanguination CA.

The Effect of a Peripheral Block on Inflammation-Induced Prostaglandin E2 and Cyclooxygenase Expression in Rats

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From the Departments of *Anesthesiology and Pathology, São Paulo State University—UNESP, Botucatu/SP; Department of Preventive and Social Medicine, Campinas State University—UNICAMP, Campinas/SP; and Albert Einstein Hospital, São Paulo/SP, Brazil.
 Anesth Analg 2009 109: 965-971

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BACKGROUND: As a result of amitriptyline's vast array of actions, it could potentially be used as an intraspinal adjuvant in neuraxial anesthesia and/or in the treatment of refractory neuropathic pain. None of the previous studies examining the safety profile of intraspinal single doses of amitriptyline found signs of toxicity at concentrations below 15.4 mM/L (0.5%) and the current hypothesis regarding the pathophysiology of amitriptyline toxicity suggests it might be safe at low concentrations while still having relevant clinical effects. Hence, we conducted this study to assess the clinical and histological toxicity of intraspinal amitriptyline at the lowest dosages previously known to be effective.

METHODS: Twenty-one dogs were randomized to receive a 1-mL single intraspinal dose of one of the three solutions: saline (0.9%), amitriptyline (0.15%), or amitriptyline (0.3%). The dogs were evaluated clinically 1 h after awakening from anesthesia and 21 days later. At 21 days, all animals were killed, and histological sections of the spinal cord and surrounding meninges were retrieved for analysis.

RESULTS: All dogs recovered motor function, anal sphincter tone and sensibility. With the exception of one dog in the 0.15% amitriptyline group, all animals in both amitriptyline groups had marked adhesive arachnoiditis, which was absent in the control group. No evidence of direct neural damage was found on histological sections stained by glial fibrillary acidic protein technique in any of the study animals.

CONCLUSION: The intraspinal administration of amitriptyline to dogs even in low concentrations is strongly associated with the development of intense meningeal adhesive arachnoiditis and is not safe even at low concentrations for which there was no previous evidence of toxicity.

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The Reduced Anticoagulant Effect of Fondaparinux at Low Antithrombin Levels

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From the *I. Department of Medicine, and Institute for Clinical Chemistry, University Medical Centre Mannheim, Mannheim, Germany.

Anesth Analg 2009; 109:712-716

OBJECTIVE: To determine the effect of fondaparinux on heparin-induced anticoagulation in patients with normal and low antithrombin levels.

DESIGN: Prospective, randomized, controlled study.

SETTING: University Medical Centre Mannheim, Mannheim, Germany.

PATIENTS: 47 patients with normal antithrombin levels ($n = 25$) and 22 patients with low antithrombin levels ($n = 22$).

MEASUREMENTS AND MAIN RESULTS: The Heptest clotting time was significantly shorter in the low antithrombin group compared to the normal antithrombin group at all tested fondaparinux concentrations (10, 20, 40, 60, 80, 100, 120, 140, 160, 180, 200 $\mu\text{g/mL}$). The effect of fondaparinux was more pronounced in the low antithrombin group. The effect of fondaparinux was similar in both groups at a concentration of 10 $\mu\text{g/mL}$.

CONCLUSIONS: The anticoagulant effect of fondaparinux is reduced in patients with low antithrombin levels. The effect of fondaparinux is similar in both groups at a concentration of 10 $\mu\text{g/mL}$.

BACKGROUND: Low antithrombin levels may compromise the anticoagulant effect of heparin and heparin-related compounds, such as fondaparinux.

METHODS: We compared the anticoagulant effect of 10 concentrations of fondaparinux added to plasma samples with normal range ($n = 25$, antithrombin $95.4\% \pm 9.2\%$) and low antithrombin ($n = 22$, antithrombin $45.5\% \pm 13.2\%$) levels, using the Heptest coagulation assay.

RESULTS: Heptest clotting time was shorter at any given fondaparinux concentration in the antithrombin-deficient samples, indicating less anticoagulant effect than in the group with normal antithrombin levels. At a high fondaparinux concentration, a saturation effect is observed with no further increase in Heptest clotting time. Addition of antithrombin concentrates results in a shift of the dose-response curve. When antithrombin concentrate was added, Heptest clotting time increased up to a fondaparinux concentration of 10 $\mu\text{g/mL}$.

CONCLUSIONS: In the conventional prophylactic and therapeutic dose range, not only treatment with antithrombin concentrates but also an increase in fondaparinux dose normalizes the anticoagulant effect. A saturation effect is observed at high fondaparinux concentrations. Higher levels of antithrombin lead to an exaggerated effect of fondaparinux on Heptest.

5M4EJ

A Comparison of Dexmedetomidine with Propofol for Magnetic Resonance Imaging Sleep Studies in Children

Mohamed Mahmoud, MD*, Joel Gunter, MD*, Lane F. Donnelly, MD, Yu Wang, MS, Todd G. Nick, PhD, and Senthilkumar Sadhasivam, MD, MPH*

ARM (RESP) (20% 30% 40% 50% 60% 70%; P=10) (0.1, 0.2, 0.3 $\mu\text{g} \cdot \text{mL}^{-1} \cdot \text{min}^{-1}$, $n = 11$)
 Ce (4) ARM (E) Ce (Q) 6 *P Ce
 U=Zt/SgêL4se/i11P0
 [7] i1OAA/S=H1âCg+µ11
 [7] Ce 1µE7 [7] Ce Urh1ê1ê
 °Cp #1y=11 [7] ARM 1â [7] Ce 1#G [7]
 °y(nG°BIS #1 OAA/S 1#1111
 4ZS1NONMEM #ê11=4MS11 [7] Ce [7]
 BIS G [7] ARM 11P [7] BIS/Ce #11
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 [7] Ce₅₀ [7] 1.73 (95% [7] 1.55–2.10) $\mu\text{g}/\text{mL}$ [7] BIS₅₀ [7] 75
 (71.3–77) [7] ARM [7] OAA/S₅₀ [7] 12.5/20 (12–13.4) [7] BIS [7] Ce [7]
 1MS [7] $P_{\text{BIS}/\text{Ce}}$ [7] 63% [7] BIS [7] [7]
 19âC [7] ARM R1B1117 [7]
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 <B [7] ARM 4E111â111 [7]
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BACKGROUND: In previous studies, we showed that failure to respond to automated responsiveness monitor (ARM) precedes potentially serious sedation-related adversities associated with loss of responsiveness, and that the ARM was not susceptible to false-positive responses. It remains unknown, however, whether loss and return of response to the ARM occur at similar sedation levels. We hypothesized that loss and return of response to the ARM occur at similar sedation levels in individual subjects, independent of the propofol effect titration scheme.

METHODS: Twenty-one healthy volunteers aged 20–45 yr underwent propofol sedation using an effect-site target-controlled infusion system and two different dosing protocol schemes. In all, we increased propofol effect-site concentration (Ce) until loss of response to the ARM occurred. Subsequently, the propofol Ce was decreased either by a fixed percentage (20%, 30%, 40%, 50%, 60%, and 70%; fixed percentage protocol, $n = 10$) or by a linear deramping ($0.1, 0.2, \text{ and } 0.3 \mu\text{g} \cdot \text{mL}^{-1} \cdot \text{min}^{-1}$; deramping protocol, $n = 11$) until the ARM response returned. Consequently, the propofol Ce was maintained at the new target for a 6-min interval (Ce plateau) during which arterial samples for propofol determination were obtained, and a clinical assessment of sedation (Observer’s Assessment of Alertness/Sedation [OAA/S] score) performed. Each participant in the two protocols experienced each percentage or deramping rate of Ce decrease in random order. The assumption of steady state was tested by plotting the limits of agreement between the starting and ending plasma concentration (Cp) at each Ce plateau. The probability of response to the ARM as a function of propofol Ce, Bispectral Index (BIS) of the electroencephalogram, and OAA/S score was estimated, whereas the effect of the protocol type on these estimates was evaluated using the nested model approach (NONMEM). The combined effect of propofol Ce and BIS on the probability for ARM response was also evaluated using a fractional probability model ($P_{\text{BIS}/\text{Ce}}$).

RESULTS: The measured propofol Cp at the beginning and the end of the Ce plateau was almost identical. The Ce₅₀ of propofol for responding to the ARM was 1.73 (95% confidence interval: 1.55–2.10) $\mu\text{g}/\text{mL}$, whereas the corresponding BIS₅₀ was 75 (71.3–77). The OAA/S₅₀ probability for ARM response was 12.5/20 (12–13.4). A

fractional probability ($P_{BIS/Ce}$) model for the combined effect of BIS and Ce fitted the data best, with an estimated contribution for BIS of 63%. Loss and return of ARM response occurred at similar sedation levels in individual subjects.

CONCLUSIONS: Reproducible ARM dynamics in individual subjects compares favorably with clinical and electroencephalogram sedation end points and suggests that the ARM could be used as an independent instrumental guide of drug effect during propofol-only sedation.

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Th1

Ketamine Inhibits Maturation of Bone Marrow-Derived Dendritic Cells and Priming of the Th1-Type Immune Response

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From the Intensive Care Unit, Osaka University Hospital, Osaka, Japan.

Anesth Analg 2009; 109:793-800

SDCs

T

© 2009

4

IL-4

IL

4

CD40CD80

CD86

IL-12p40

T

CD40CD80

IL-12p40

IL-12p40

IL-12p40

CD4+T

CD4+T

CD4+T

Th1

Th1

BACKGROUND: Dendritic cells (DCs) play a key role as antigen-presenting cells and growing evidence suggests that DCs influence T-cell activation and regulate the polarity of the immune response. Ketamine has been reported to have immunomodulatory properties that affect immune cells, including macrophages and natural killer cells. However, the effect of ketamine on DCs has not been characterized. We examined the immunomodulation of DCs by ketamine.

METHODS: We used bone marrow-derived DCs induced by granulocyte–monocyte-colony stimulating factor and interleukin (IL)-4 from bone marrow and analyzed the expression of costimulatory molecules (CD40, CD80, and CD86), major histocompatibility complex class II molecules, and secretion of IL-12p40.

Furthermore, we evaluated the immune response in mixed cell cultures of DCs and T cells and the contact hypersensitivity response in a whole animal.

RESULTS: Ketamine suppressed the expression of CD40, CD80, and major histocompatibility complex class II molecules in DCs. DCs treated with ketamine also secreted less IL-12p40 and displayed greater endocytosis. In mixed cell cultures with CD4⁺ T cells and DCs, ketamine-treated DCs showed less propensity to stimulate the proliferation of CD4⁺ T cells and the secretion of interferon from CD4⁺ T cells. Furthermore, ketamine-treated DCs impaired the induction of a cell-mediated immune response.

CONCLUSION: Our findings suggest that ketamine inhibits the functional maturation of DCs and interferes with DC induction of Th1 immunity in the whole animal. These novel findings provide new insight into the immunopharmacological role of ketamine.

44700 Macintosh 4014

A Macintosh Laryngoscope Blade for Videolaryngoscopy Reduces Stylet Use in Patients with Normal Airways

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Anesth Analg 2009; 109:825-831

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BACKGROUND: Although most tracheal intubations with direct laryngoscopy are not performed with a styletted endotracheal tube, it is recommended that a stylet can be used with indirect videolaryngoscopy. Recently, there were several reports of complications associated with styletted endotracheal tubes and videolaryngoscopy. In this study, we compared three videolaryngoscopes (VLSs) in patients undergoing tracheal intubation for elective surgery: the GlideScope® Ranger™ (GlideScope, Bothell, WA), the V-MAC™ Storz® Berci DCI® (Karl Storz, Tuttlingen, Germany), and the McGrath® (McGrath series 5, Aircraft medical, Edinburgh, UK) and tested whether it is feasible to intubate the trachea of patients with indirect videolaryngoscopy without using a stylet.

METHODS: Four hundred fifty consecutive adults (ASA PS I–II) undergoing tracheal intubation for elective surgery were randomly allocated for airway management with one of the three devices. Anesthesia induction for tracheal intubation consisted of fentanyl-propofol-rocuronium. An independent anesthesiologist used the Cormack-Lehane grading system to score an initial direct laryngoscopic view using a classic metal Macintosh blade. After subsequent positive-pressure ventilation using a face mask and an oxygen-sevoflurane mixture for 1 min, the trachea was intubated using one of the three VLSs. During intubation, the following data were collected: intubation time, number of intubation attempts, use of extra tools to facilitate intubation, and overall satisfaction score of the intubation conditions.

RESULTS: The trachea of every patient was intubated using the VLSs, and none of the patients required conversion to the classic Macintosh laryngoscope. All three VLSs offered equal or better view of the glottis as assessed by the mean Cormack-Lehane grade, compared with the traditional Macintosh laryngoscopy, including a larger viewing angle of the glottic entrance. The average intubation time was 34 ± 20 s for the GlideScope, 18 ± 12 s for the V-MAC Storz, and 38 ± 23 s for the McGrath VLS. Intubation with the Storz was faster ($P < 0.05$) than the other two VLS tested and necessitated fewer additional tools ($P < 0.01$), resulting in a higher first-pass successful intubation rate. A stylet had to be used in 7% of the patients in the Storz group versus about 50% of the patients when the other two VLS were used.

CONCLUSIONS: The trachea of a large proportion of patients with normal airways can be intubated successfully with certain VLS blades without using a stylet, although the three studied VLSs clearly differ in outcome. The Storz VLS displaces soft tissues in the fashion of a classic Macintosh scope, affording room for tracheal tube insertion and limiting the need for stylet use compared with the other two scopes. Although

VLSs offer several advantages, including better visualization of the glottic entrance and intubation conditions, a good laryngeal view does not guarantee easy or successful tracheal tube insertion. We recommend that the geometry of VLSs, including blade design, should be studied in more detail.

Correspondence:

Nasogastric Tube Insertion Using Different Techniques in Anesthetized Patients: A Prospective, Randomized Study

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Anesth Analg 2009; 109:832-835

Summary:

Background:

Objective:

Methods:

Results:

Conclusion:

Student's *t*-test

Keywords:

Introduction:

Discussion:

References:

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BACKGROUND: It is often difficult to correctly place nasogastric (NG) tubes under anesthesia. We hypothesized that simple modifications in technique of NG tube insertion will improve the success rate.

METHODS: Two hundred patients were enrolled into the study. The patients were randomized into four groups: control, guidewire, slit endotracheal tube, and neck flexion with lateral neck pressure. The starting point of the procedure was the time when NG tube insertion was begun through the selected nostril. The end point was the time when there was either a successful insertion of the NG tube or a failure after two attempts. The success rate of the technique, duration of insertion procedure, and the occurrence of complications (bleeding, coiling, kinking, and knotting, etc.) were noted. ², analysis of variance, and Student's *t*-test were used to analyze the data.

RESULTS: Success rates were higher in all intervention groups compared with the control group. The time necessary to insert the NG tube was significantly longer in the slit endotracheal tube group. Kinking of the NG tube and bleeding were the most common complications.

CONCLUSION: The success rate of NG tube insertion can be increased by using a ureteral guidewire as stylet, a slit endotracheal tube as an introducer, or head flexion with lateral neck pressure. Head flexion with lateral neck pressure is the easiest technique that has a high success rate and fewest complications.

Introduction:

Low Tidal Volume Ventilation in a Porcine Model of Acute Lung Injury Improves Cerebral Tissue Oxygenation

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Anesth Analg 2009; 109:847-855

OBJECTIVE: To investigate the effects of different tidal volumes on cerebral tissue oxygenation and cerebral metabolism in a porcine model of acute lung injury (ALI). We hypothesized that mechanical ventilation with low tidal (LT) volumes improves cerebral tissue oxygenation and metabolism after experimentally induced ALI.

DESIGN: Prospective, randomized, controlled study.

SETTING: Experimental laboratory.

PARTICIPANTS: 10 female pigs.

INTERVENTIONS: Mechanical ventilation with low tidal (LT) volume (6 mL/kg body weight) or high tidal (HT) volume (12 mL/kg body weight).

MEASUREMENTS AND MAIN RESULTS: After induction of ALI, data were collected at 2, 4, and 8 h. The primary end point was the change in $p_{ti}O_2$. For group comparisons, a *t*-test was used. A value of <0.05 was considered to indicate statistical significance.

CONCLUSIONS: At baseline and after induction of ALI, no differences between groups were found in $p_{ti}O_2$; however, $p_{ti}O_2$ was significantly lower in the HT group after 4 and 8 h. P_{aO_2} and P_{aCO_2} showed no significant differences between the groups at all timepoints. Regarding cerebral microdialysis, a significantly higher level of extracellular lactate could be demonstrated after 2, 4, and 8 h in the HT group. The release of cytokines resulted in higher values for interleukin-6 and interleukin-8 in the HT group.

KEY WORDS: acute lung injury, cerebral tissue oxygenation, cerebral metabolism, low tidal volume ventilation, high tidal volume ventilation.

INTRODUCTION: Acute lung injury (ALI) is a common cause of acute respiratory distress syndrome (ARDS) and is associated with high mortality. Mechanical ventilation is a cornerstone of treatment, but it can also cause ventilator-induced lung injury (VILI). Low tidal volume ventilation (LT) is thought to reduce VILI and improve outcomes in patients with ALI/ARDS. However, the effects of LT on cerebral tissue oxygenation and metabolism are not well understood. This study investigated the effects of different tidal volumes on cerebral tissue oxygenation and cerebral metabolism in a porcine model of ALI.

BACKGROUND: In study, we investigated the effects of different tidal volumes on cerebral tissue oxygenation and cerebral metabolism in a porcine model of acute lung injury (ALI). We hypothesized that mechanical ventilation with low tidal (LT) volumes improves cerebral tissue oxygenation and metabolism after experimentally induced ALI.

METHODS: After inducing experimental ALI by surfactant depletion, we studied two conditions in 10 female pigs: 1) LT volume ventilation with 6 mL/kg body weight, and 2) high tidal (HT) volume ventilation with 12 mL/kg body weight. Variables of gas exchange, hemodynamic, continuous cerebral tissue oxygen tension ($p_{ti}O_2$), cerebral microdialysis, and systemic cytokines were analyzed. After induction of ALI, data were collected at 2, 4, and 8 h. The primary end point was the change in $p_{ti}O_2$. For group comparisons, a *t*-test was used. A value of <0.05 was considered to indicate statistical significance.

RESULTS: At baseline and after induction of ALI, no differences between groups were found in $p_{ti}O_2$; however, $p_{ti}O_2$ was significantly lower in the HT group after 4 and 8 h. P_{aO_2} and P_{aCO_2} showed no significant differences between the groups at all timepoints. Regarding cerebral microdialysis, a significantly higher level of extracellular lactate could be demonstrated after 2, 4, and 8 h in the HT group. The release of cytokines resulted in higher values for interleukin-6 and interleukin-8 in the HT group.

CONCLUSION: Protective ventilation with LT yielded a significant improvement in cerebral tissue oxygenation and metabolism compared to HT ventilation in a porcine model of ALI. There was dissociation between arterial and cerebral tissue oxygenation. Cerebral oxygenation and metabolism might have possibly been impaired by a more distinctive inflammatory response in the HT group.

ABSTRACT

INTRODUCTION

The Effects of Endotracheal Suctioning on the Accuracy of Oxygen Consumption and Carbon Dioxide Production Measurements and Pulmonary Mechanics Calculated by a Compact Metabolic Monitor

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Anesth Analg 2009; 109:873-879

OBJECTIVE

DESIGN

SETTING ETS in ICU

MEASUREMENTS AND MAIN RESULTS

RESULTS

CONCLUSIONS

ETS (VO₂)

VCO₂

ETS (VO₂)

ETS (VCO₂)

ETS (VO₂)

50 min

1-min

ETS (VO₂)

ETS (VCO₂)

ETS (VO₂)

ETS (VCO₂)

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BACKGROUND: Open endotracheal suctioning (ETS), which is performed regularly in mechanically ventilated patients to remove obstructive secretions, can cause an immediate decrease in dynamic compliance and expired tidal volume and result in inadequate or inaccurate sidestream respiratory monitoring, necessitating prolonged periods of stabilization of connected metabolic monitors. We investigated the immediate effect of open ETS on the accuracy of oxygen consumption (VO₂) and carbon dioxide production (VCO₂) measurements and calculated lung mechanics, respiratory quotient, and resting energy expenditure in mechanically ventilated

children without severe lung pathology, when using a compact modular metabolic monitor (E-COVX) continuously recording patient spirometry and gas exchange measurements.

METHODS: Open ETS was performed when clinically indicated in 11 children mechanically ventilated for sepsis or head injury. A total of 2800 pulmonary 1-min gas exchange measurements were recorded in 28 ETS instances for 50 consecutive minutes before and 50 min after the standardized procedure.

RESULTS: Pulmonary mechanics and indirect calorimetry did not differ between pre- and postsuction sets of measurements. Pre- and postsuction VO_2 , VCO_2 , dynamic airway resistance, dynamic compliance, and expiratory minute ventilation remained stable from 5 to 55 min after tracheal suctioning and did not differ among different ventilatory modes. Average paired differences of sequential pre- and postsuction VO_2 , VCO_2 , respiratory quotient, and resting energy expenditure were -0.6% , -1% , -0.1% , and -0.3% . Ratio differences between the first and the second periods of measurements (1–25 vs 26–50 sets of 1-min measurements) did not differ in the two groups.

CONCLUSIONS: Pulmonary mechanics and indirect calorimetry measurements are not influenced after uneventful open ETS in well-sedated patients. The E-COVX is able to reliably record spirometry and metabolic indices as early as 5 min after suctioning at different ventilator modes.

Spdm 0m5

Intraoperative Awareness During General Anesthesia for Cesarean Delivery

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From the *Department of Anaesthesia, York Hospital, York; and Department of Obstetric Anaesthesia, St. James' University Hospital, Leeds, UK.

Anesth Analg 2009; 109:886-890

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Intraoperative awareness is defined as the spontaneous recall of an event occurring during general anesthesia. A move away from rigid anesthetic protocols, which were designed to limit drug transmission across the placenta, has reduced the incidence of awareness during cesarean delivery to approximately 0.26%. Nevertheless, it remains an undesirable complication with potential for the development of posttraumatic stress disorder. Assessing depth of anesthesia remains a challenge for the anesthesia

provider as clinical signs are unreliable and there is no sensitive and specific monitor. Bispectral Index monitoring with the goal of scores <60 has been recommended to prevent awareness. Induction drugs vary in their ability to produce amnesia and the period of hypnotic effect is affected by the rate at which they are redistributed. After initiation of anesthesia, volatile anesthetics should be administered to a target of 0.7 minimum alveolar anesthetic concentration, which has been shown to consistently achieve mean Bispectral Index scores <60. Because of its rapid uptake, nitrous oxide remains an important adjunct to reduce the risk of awareness during emergency cesarean delivery. In the absence of fetal compromise, there is no rationale for an inspired oxygen concentration above 0.33. Deeper levels of anesthesia reduce the incidence of awareness; current evidence does not suggest an increased risk of tocolysis or fetal morbidity.

مقدمة

الهدف

The Safety of Modern Hydroxyethyl Starch in Living Donor Liver

Transplantation: A Comparison with Human Albumin

Ahmed Mukhtar, MD*, Fawzia Aboulfetouh, MD*, Gihan Obayah, MD*, Maged Salah, MD*, Mohamed Emam, MD*, Yehia Khater, MD*, Ramzia Akram, MD, Aly Hoballah, MD, Mohamed Bahaa, MD, Mahmoud Elmeteini, MD, and Alaa Hamza, MD

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Anesth Analg 2009; 109:924-930

الهدف مقارنة

تأثير

حجم

الدم

HES 130/0.4

مع

4 (n = 20)

5% HES

4 (n = 20)

HES (6% HES

130/0.4)

50 mL · kg⁻¹ · d⁻¹

معدل

57mmHg

معدل

الدم

C

40

معدل

Q

HES 4

ALB 4

6229 ± 1140 mL

1153 mL (P = 0.003)

1100 ± 900 mL

3047 ± 2000 mL P = 0.029

HES 4

7634 ± 447

معدل

معدل

HES 130/0.4

معدل

(≥9)

BACKGROUND: Intravascular volume replacement therapy is an important issue in the perioperative management of liver transplantation. There is paucity of data on the safety of hydroxyethyl starch (HES) in patients undergoing liver transplantation. We evaluated the safety of a new HES 130/0.4 in the perioperative management of liver transplantation, with a special emphasis on renal function.

METHODS: Forty patients undergoing living donor liver transplantation were prospectively randomized into two groups. Patients in the ALB group ($n = 20$) received 5% human albumin. Patients in the HES group ($n = 20$) received third generation HES (6% HES 130/0.4). Total colloid administration was limited to $50 \text{ mL} \cdot \text{kg}^{-1} \cdot \text{d}^{-1}$. The volume was given to maintain pulmonary artery occlusion pressure or central venous pressure between 5 and 7 mm Hg. If additional fluids were required, balanced crystalloid solution was used. Anesthetic and surgical techniques were standardized. Serum creatinine and cystatin C plasma levels were measured from arterial blood samples after induction of anesthesia, at the end of surgery, and on the first 4 postoperative days.

RESULTS: All 40 enrolled patients completed the study. Demographic and intraoperative variables were comparable in both groups. Postoperatively, the mean \pm sd volume was $6229 \pm 1140 \text{ mL}$ and $4636 \pm 1153 \text{ mL}$ in HES and ALB groups, respectively ($P = 0.003$). There was significantly larger net cumulative fluid balance in the ALB group $1100 \pm 900 \text{ mL}$ compared with the HES group $3047 \pm 2000 \text{ mL}$, $P = 0.029$. Serum creatinine, creatinine clearance, and cystatin C plasma levels showed no significant differences between the two groups. One patient in each group developed acute renal failure requiring renal replacement therapy.

CONCLUSION: The use of HES 130/0.4 as an alternative to human albumin resulted in equivalent renal outcome after liver transplantation.

DOI:

Raj

Sciatic Nerve Catheter Placement: Success with Using the Raj Approach

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Anesth Analg 2009; 109:972-975

OBJECTIVE:

To evaluate the success of the Raj approach for sciatic nerve catheter placement.

DESIGN: Retrospective cohort study.

SETTING:

Mayo Clinic Florida, Jacksonville, Florida. **RESULTS:**

Of 20 patients who underwent sciatic nerve catheter placement using the Raj approach, 15 (75%) were successful.

The mean distance from the skin to the catheter tip was 2-4 cm.

The mean volume of 1.5% bromage solution required for catheter placement was 20 mL.

The mean time to achieve analgesia was 15 minutes.

CONCLUSION:

The Raj approach for sciatic nerve catheter placement is a simple and effective technique.

KEY WORDS:

sciatic nerve catheter placement, Raj approach, bromage solution.

INTRODUCTION:

Continuous regional analgesia has increased in popularity and is becoming standard of care for many painful surgical procedures. Various approaches of sciatic catheter insertion have been proposed, each with attributes and disadvantages. We investigated whether the Raj approach that uses a simple midpoint

BACKGROUND: Continuous regional analgesia has increased in popularity and is becoming standard of care for many painful surgical procedures. Various approaches of sciatic catheter insertion have been proposed, each with attributes and disadvantages. We investigated whether the Raj approach that uses a simple midpoint

landmark between the ischial tuberosity and greater trochanter will facilitate sciatic catheter placement.

METHODS: After informed consent, 20 patients were recruited to receive sciatic catheter placement using the Raj approach. An insulated Tuohy needle was inserted perpendicular to skin at the midpoint of a line between the ischial tuberosity and greater trochanter. After sciatic nerve stimulation, a catheter was inserted 2–4 cm past the end of the needle and secured. The catheters were then incrementally injected with 30 mL of 1.5% mepivacaine. Twenty minutes after local anesthetic injection, sensory block was assessed using cold and pinprick tests, whereas motor block was assessed using a modified Bromage score. Complications and side effects were recorded.

RESULTS: In all instances, blocks were easy to perform and were successful. No major side effects or complications were noted.

CONCLUSION: Use of a simple landmark between easily identifiable bony structures enhances the simplicity and placement of a sciatic nerve catheter and is recommended for use in clinical practice.

Unilateral Anesthesia Does Not Affect the Incidence of Urinary Retention After Low-Dose Spinal Anesthesia for Knee Surgery

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We evaluated whether unilateral low-dose spinal anesthesia may reduce the likelihood of postoperative urinary retention. Forty patients scheduled for knee arthroscopy randomly received bilateral ($n = 20$) or unilateral ($n = 20$) spinal anesthesia with 6-mg hyperbaric bupivacaine 0.5%. The incidence of urinary retention (>500 mL) assessed with an ultrasound device (Bladderscan) and subsequent temporary catheterization was 7/20 patients in the bilateral versus 6/20 in the unilateral group (not significant). We concluded that unilateral low-dose spinal anesthesia does not further decrease the likelihood of urinary retention. Our results demonstrate the value and necessity of monitoring bladder volume postoperatively.