'BURP' (1) WORSENS GLOTTIC VIEW WHEN APPLIED TO THE CRICOID CARTILAGE

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INTRODUCTION

Previous studies have shown that the 'BURP' maneuver improved glottic view, when applied to the thyroid cartilage. (1) We hypothesized that backward, upward and rightward pressure on the cricoid cartilage would combine benefits of both 'BURP' and Sellick's maneuver (2), improving glottic view and offer potential protection against passive regurgitation.

METHODS

We analyzed glottic view data from 40 adults undergoing elective surgery, in this prospective, randomized, double blind and crossover study. Patients at risk for regurgitation or with difficult airways were excluded. Patients were induced with fentanyl, propofol and rocuronium. In a random sequence for each case, and blinded by a sheet to the laryngoscopist, an anesthetic technician applied 30 newtons of direct, 'BURP', or no pressure to the patients cricoid cartilage. A separate laryngscopy was conducted for each maneuver and the views were graded as being good (part of the glottis seen), poor (the arytenoids were seen) and no view (only the epiglottis was seen). After the third maneuver the airway was secured with an endotracheal tube. The same anesthetic technician applied the pressures and the same laryngoscopist assessed the glottic views through the study. Views were recorded and blinding was maintained until the conclusion of the study. Differences were analyzed using the Wilcoxon Signed Rank test.

RESULTS

The hypothesis was rejected and 12/40 (30%) of the patients having 'BURP' applied to the cricoid cartilage showed a worse view ($p=0.007$), while only 2/40 (5%) showed an improved view. Direct cricoid pressure made the view worse in 5/40 (12.5%) of the patients, which was not statistically significant ($p=0.279$) and only 1/40 (2.5%) showed an improved view. No difference was seen in 26/40 (65%) of the patients.

DISCUSSION

The'BURP' maneuver worsens glottic view when applied to the cricoid cartilage. There would be no benefit in routinely applying 'BURP' to the cricoid cartilage, during rapid sequence inductions. Second, proper application of cricoid pressure is important to prevent an obstructed view of the glottis. Finally, there may be situations where cricoid pressure could be removed to get a better view.

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INTRATHECAL HYDROMORPHONE FOR POSTOPERATIVE ANALGESIA IN GYNECOLOGIC SURGERY

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INTRODUCTION

Morphine was the first opioid used intrathecally for pain relief purposes.[1] It is now held as the "gold standard" for pain relief in the post-operative setting. An alternative to morphine is lacking, however hydromorphone has been suggested for this role.[2] We designed a study to determine the dose of hydromorphone that would be acceptable as an alternative to morphine for pain relief after gynecologic surgery.

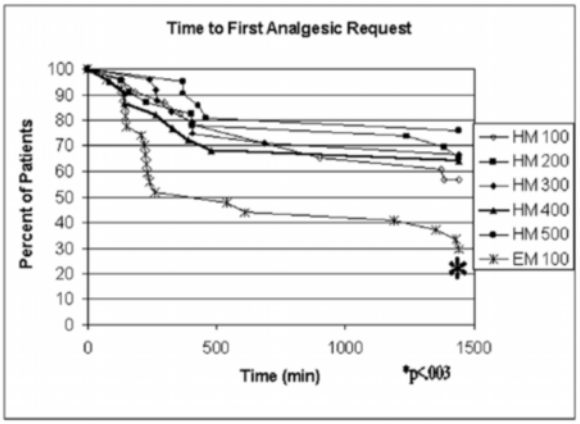
METHODS

With ethics approval obtained, suitable participants were randomized in a double blind fashion to six groups and received one of the following, along with spinal bupivicaine anesthesia: hydromorphone (HM) 100,200,300,400 or 500 µg versus morphine (M) 100 µg. Outcomes measured were adequacy of analgesia as well as the severity of side effects. Time to first analgesic request was recorded along with morphine consumption. Treatment of side effects was also noted.

RESULTS

Data were collected for 142 patients. VAS scores for pain at rest and with movement were ≤2 and ≤ 3.5 respectively throughout the first 24 hours. A significant portion of the morphine group however requested analgesia earlier ($p<.003$) (Figure) and used more morphine iv ($p=.003$). There was no difference in quality of analgesia or the quantity of additional morphine iv used amongst the hydromorphone groups. The incidence of side effects was not significantly different amongst all the groups, however there was less diphenhydramine used in the morphine group.

Figure



DISCUSSION

Excellent postoperative pain relief was achieved in all groups. However the morphine group required significantly more analgesia iv. The side effect profile was not significantly different in all groups. We therefore conclude that hydromorphone 100 µg offers superior analgesia when compared to morphine 100 µg. There was also no benefit in increasing the dose of hydromorphone above 100 µg. Future study should seek to determine the efficacy of a smaller dose of hydromorphone as well the effects in other patient groups.

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EFFECT OF SMALL EXTENSION TUBING ON INTRAVENOUS FLOW RATE

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INTRODUCTION

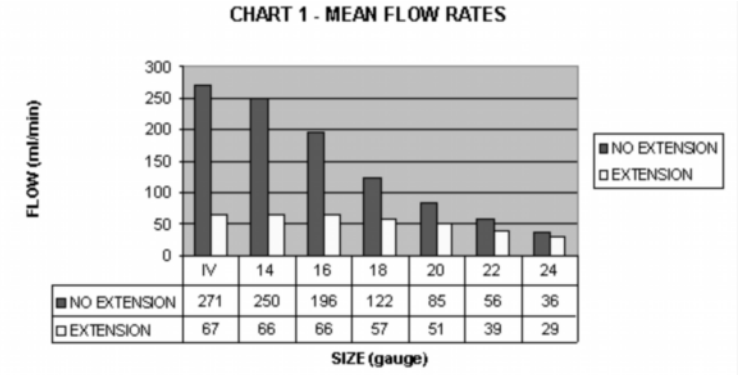
Short intravenous tubing extension sets (Baxter, 15.2 cm, Product 2N3874) are used extensively in our institution and patients present for anesthesia with extensions on their intravenous cannula. The size of the cannula usually is the major rate limiting step to flow[1], however we hypothesized that these extensions may overtake as the rate limiting factor.

METHODS

Intravenous flow rates were calculated by timing the in vitro drainage of a constant volume of normal saline through intravenous tubing, 14, 16, 18, 20, 22 and 24 gauge cannulae with and without the studied extension tubing sets. For each, three trials with and without the extension were timed under controlled conditions. Data for each gauge IV were compared with and without the extension set. Analysis with Student's t-test for equality of means was performed using a two-tailed significance, with the level of significance set at $p<0.05$.

RESULTS

The addition of the extension set resulted in a significant ($p<0.001$) decrease in flow rates for all IV cannulae studied. For a 14G (gauge) IV cannula, the average time of flow was 219 seconds; this increased by 276% to 867 seconds with the addition of the extension. Increases in flow times with the addition of the extension were 196% for 16G, 112% for18G, 67% for 20G, 45% for 22G, and 25% for 24G. Chart 1 summarizes flow rate data in $ml.min^{-1}$.



	IV	14	16	18	20	22	24
NO EXTENSION	271	250	196	122	85	56	36
EXTENSION	67	66	66	57	51	39	29

DISCUSSION

Use of this extension tubing set severely dampened flow in vitro and effectively transformed flow with a 14 or 16G catheter to approximately that of a 21G catheter, an 18G to approximately a 22G catheter, and a 20G to approximately a 23G catheter. In vivo flow rates are slower than in vitro rates[2], but in vitro rates may predict the potential for fluid infusion rates in vivo. The clinical implication is to ensure that such extensions be removed before or during situations that mandate rapid IV infusion rates.

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MORPHINE HAS NO POSTOPERATIVE PERIPHERAL ANALGESIC EFFECT

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INTRODUCTION

Growing clinical and experimental evidence shows a potential role of peripheral exogenous opioids in postoperative pain management.

The aim of this study is to test the hypothesis that morphine, injected into the wound at the end of surgery, improves postoperative pain scores, has an opioid sparing effect and therefore, diminishes narcotic related side-effects.

METHODS

After IRB approval, twenty-three patients undergoing elective gynecological procedures by laparotomy were included in this prospective, randomised and double-blinded trial. Anesthesia was standardised. Immediately before skin closure, the wound was infiltrated with morphine 0,1 mg/kg diluted in saline (total 20 mL) in group Morphine (M) and 20 mL of saline in the Control group (C). Patients in group M had a subcutaneous injection of 2mL of saline in the anterior aspect of the thigh while patients in group C received morphine 0,1 mg/kg diluted in saline (total 2 mL). Thus, every patient having the same amount of systemically available morphine, we could evaluate its local analgesic effect.

Patient Controlled Analgesia (PCA) with morphine was the sole analgesic used during the 24 hours of the study period. We measured pain intensity at rest and during standardized movements, using a Verbal Rating Scale (0 to 10), as well as narcotic related side effects at 1, 4, 8, 12, and 24h following extubation. Total amount of morphine consumption was noted at 12 and 24 h.

RESULTS

Demographic data were similar in both groups. No difference was found between the two study groups regarding postoperative mean morphine demand (M=30mg vs C=30,6mg; p=0,45 at 12h and M=56,5mg vs C=50,6mg; p=0,25 at 24h). Side effects were also comparable. Finally, there was no difference in pain intensity during the 24 hours follow-up except at 4 hours where the median pain score at rest was higher in the M group (5,5 compared with 3,5; p=0,02).

DISCUSSION

Morphine injected postoperatively, into the wound, after a gynecologic procedure laparotomy shows no advantage over a peripherally administered identical dose and could even slightly increase early postoperative pain. Histamine release and subsequent activation of nociceptors could be a proposed mecanism for this finding

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EMULSIV™ FILTER FOR REMOVAL OF MICROORGANISMS FROM PROPOFOL

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INTRODUCTION

Extrinsic contamination of propofol has been implicated in perioperative infection and death of patients.[1, 2] The Pall EmulSiv™ filter is a 0.45 micron rated filter, specifically designed for propofol administration. This study sought to determine the effectiveness of the EmulSiv™ filter.

METHODS

Microbes previously documented to be associated with the extrinsic contamination of propofol were studied. Included were *Staphylococcus aureus, Escherichia coli, Moroxella osloensis, Klebsiella pneumoniae, Candida albicans*, *Enterobacter agglomerans* and *Serratia marcescens. Moraxella catarrhalis, Haemophilus influenzae,*and *Campylobacter jejuni* were studied because of their unusual shape or small size. Approximately 1.8 X 10^6 organisms were inoculated into 20 ml sterile vials of propofol. Three 1µl samples were removed from the contaminated propofol mixture and plated onto three growth plates. The remainder of the contaminated propofol solution was filtered and three 1µl samples were taken and plated. All plates were incubated for 24 hours except for *C.albicans* and *C. jejuni* (slow growing organisms), which were incubated for 48 and 72 hours respectively. The number of colony forming units (CFU's) on each plate were counted twice. Values for replicate determinations (N=3) of CFU's are reported as the mean. The significance of the differences between the filtered and unfiltered CFU values for each organism was determined by a one-sample t-test.

RESULTS

The EmulSiv™ filter completely removed nine out of ten of the microorganisms inoculated into propofol. Only *H. influenzae* was not completely filtered.

TABLE

Organism	*Total organism challenge*	*Post-filtered growth*	*FilterEfficacy %*	*P value*
E. coli	7.8 X 10^5	0	100	0.0054
S. aureus	1.9 X 10^6	0	100	0.0242
K. pneumoniae	5.0 X 10^5	0	100	0.0260
M. catarrhalis	1.4 X 10^6	0	100	0.0044
M. osloensis	4.0 X 10^5	0	100	0.0098
E. agglomerans	7.4 X 10^5	0	100	0.0198
H. influenzae	3.6 X 10^6	6 X 10^3	99.8	0.0141
S. marcescens	1.7 X 10^6	0	100	0.0022
C. albicans	1.0 X 10^5	0	100	0.0377
C. jejuni	3.0 X 10^5	0	100	0.0059

DISCUSSION

The Emulsiv™ filter is effective at removing microorganisms from propofol. Small organisms such as *H. influenzae* may be able to evade filtration. Also, as filters do not remove endotoxins, which are produced by some organisms, strict aseptic technique in accordance with the manufacturer's recommendation is essential. The routine use of filters may reduce the incidence of propofol contamination related perioperative infections.

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CALCIUM ANTAGONISTS REDUCE MYOCARDIAL INFARCTION AFTER CARDIAC SURGERY

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INTRODUCTION

Calcium channel blockers (CCBs) may reduce cardiac complications following cardiac surgery. Observational studies however question their effectiveness[1,2]. We therefore carried out a meta-analysis of all randomized controlled trials (RCTs) evaluating CCBs in cardiac surgery.

METHODS

Eligible studies were RCTs comparing CCBs to non-CCBs during coronary-artery-bypass-grafting or valve surgery, and reporting one of the following perioperative outcomes: mortality, myocardial infarction (MI), myocardial ischemia or atrial fibrillation/supraventricular tachyarrthymias (SVT). Patients enrolled after developing SVTs were excluded. Studies were retrieved from MEDLINE and EMBASE with no language restriction: (Calcium channel blockers) *and* (Postoperative complications *or* Perioperative care *or* Intraoperative complications). Titles and abstracts were evaluated to exclude ineligible studies. The remaining studies were then read to determine eligibility. Bibliographies were surveyed to identify eligible studies. Study quality was rated using the scale of Jadad *et al*, a 5-point scale assessing blinding, randomization and withdrawal documentation. The minimal score required was 1/5. Quality assessment and data abstraction were performed by both authors; disagreements were resolved by consensus. Treatment effects were estimated using odds ratios (OR) and the random effects model (Review Manager 4.1). In the calculation of summary estimates of treatment effects, this model places more emphasis on larger studies with more subjects and outcomes. Subsequently, subgroup analyses were performed for CCB class (diltiazem, verapamil, dihydropyridines) and non-CCB class (nitrates, nitroprusside).

RESULTS

Our search yielded 1813 studies. Thirty-seven studies, encompassing 3105 patients, qualified for analysis. The Breslow-Day test for heterogeneity was negative for the primary analysis. CCBs significantly reduced perioperative ischemia (OR 0.48, 95% CI 0.33-0.68) and MIs (OR 0.58, 95% CI 0.37-0.91), but had no effect on mortality (OR 1.01). In subgroup analyses, CCBs were superior to nitrates in reducing ischemia (OR 0.65, 95% CI 0.40-1.05) and MIs (OR 0.44, 95% CI 0.21-0.93). In addition, postoperative atrial fibrillation and SVTs were significantly reduced among patients receiving non-dihydropyridine CCBs.

DISCUSSION

This systematic review of the perioperative use of CCB's shows significantly reduced myocardial ischemia and infarction after cardiac surgery. In subgroup analyses, CCB's were superior to nitrates. An adequately powered RCT is therefore justified.

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α–1 AGONISTS VS EPHEDRINE FOR C/S HYPOTENSION: A SYSTEMATIC REVIEW

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INTRODUCTION

Because α-1 agonists have been shown to have deleterious effects on uterine blood flow in animals, ephedrine has become the vasopressor of choice in the hypotensive obstetric patient. We report a systematic review of human studies to determine if α-1 agonists cause harm to the neonate.

METHODS

We searched Medline, Embase, and the Cochrane Database from 1966 to present. Key words used were phenylephrine, ephedrine, pregnancy and cesarean section. We also hand searched appropriate journals and supplements for the last 5yrs. We excluded non-human studies. We included any study comparing ephedrine to an α-1 agonist to treat or prevent hypotension due to neuroaxial blockade for elective cesarean section in full term parturients. All RCT=s were rated using a validated 5 point scoring system, with a score of ≥ 3 being high quality. Two independent investigators completed searching and scoring. The primary outcome was UApH. The secondary outcome were neonatal Apgar scores. Because of heterogeneous methodology, we did not combine the results mathematically, rather we used a graphical display.

RESULTS

We found 13 studies comprised of 737 patients that met our inclusion criteria. 12/13 RCTs–9 were of high quality. α-1 agonists used included phenylephrine in 10 studies, angiotensin II in 2, and metaraminol in 1. 7 studies used prophylactic vasopressor, 5 used only rescue doses, and 1 study included either. 5 studies showed no significant difference in UApH between groups (one compared UV pH, with no significant difference). 8 studies showed significantly better UA pHs in the α-1 agonist group (Figure). There were no significant differences in Apgar scores.

DISCUSSION

Animal studies have shown ephedrine to be better for the fetus than α-1 agonists. This systematic review of human studies has shown α-1 agonists to be equally as safe or better than ephedrine. The use of α-1 agonists in obstetric patients deserves further investigation.

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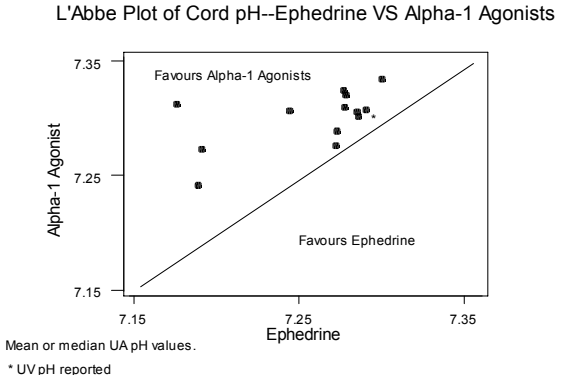

NEUROPSYCHOLOGICAL RECOVERY AFTER MIDAZOLAM COINDUCED ANESTHESIA

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INTRODUCTION

Following ambulatory surgery, rapid return of cognitive function is imperative. Data on the recovery of cognitive function after low dose midazolam coinduced general anesthesia is limited. This study uses neuropsychological testing to measure cognitive recovery after midazolam-propofol coinduced anesthesia compared to propofol induced controls in ambulatory gynecology patients undergoing short laparoscopic procedures.

METHODS

With approval of the hospital research ethics board, 88 eligible patients were randomized in a double blind manner into one of two groups; propofol 2 mg/kg control (n=44) or midazolam 0.02 mg/kg / propofol 1 mg/kg coinduced group (n=44). All patients received a standardized general anesthetic including intubation. Neuropsychological objective testing consisted of a Digit Symbol Substitution Test (DSST), a Treiger Dot Test (TDT) and five Visual Analogue Scales (VAS) for subjective assessment of anxiety, sedation, coordination, confusion and drowsiness. Tests were completed preoperatively and postoperatively every 30 minutes until discharged. Intraoperative variables (including adverse events, hemodynamics), time to discharge, Post Anesthesia Care Unit (PACU) narcotic and anti-emetic use were recorded.

RESULTS

At 60 minutes, 84 of the 88 subjects had complete data sets. There were no statistically significant differences on any of the neuropsychological testing between the propofol control group and the midazolam coinduced group (α=0.05). There were similar scores on the VAS testing, DSST (51.8±12.7 vs 55.7±10.5 p=0.12) and TDT (7.9±7.3 vs 7.1±5.8 p=0.56). The DSST, TDT and VAS data was analyzed using repeated measures ANOVA for between subject factors (adjusting for baseline preoperative test scores) and no significant difference was found based upon group randomization. There was no significant difference in the incidence of adverse events (3 (7.1%) vs 2 (4.8%)); failed induction (5 (11.9%) vs 5 (11.9%)); length of PACU stay (1:31±37 vs 1:23±32 min); PACU morphine (0.13±0.10 vs 0.13±0.11mg/kg); ondansetron rescue (13 (31%) vs 12 (28.6%)). There was no intraoperative awareness/recall.

DISCUSSION

Midazolam in a low dose (0.02 mg/kg) during coinduced general anesthesia for short ambulatory procedures does not appear to alter cognitive recovery as measured by neuropsychological testing compared to standard propofol (2 mg/kg) induction. Intraoperative and PACU variables also appear to be equivalent between techniques.

EFFECTS OF MIDAZOLAM ON PRE-OPERATIVE ANXIETY IN CHILDREN

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INTRODUCTION

Children often demonstrate anxiety during arrival in the operating room and anesthetic induction. It has become a common practice to administer oral midazolam to increase cooperation and reduce anxiety behaviour in young children[1]. This study investigated the effects of midazolam on anxiety behaviour at anesthesia induction in pediatric day surgery patients.

METHOD

Participants were forty 4-6 year old children scheduled for myringotomy. Children were assigned, randomly and double blind, to receive either oral midazolam 0.50 mg/kg, mixed with acetaminophen suspension 15 mg/kg (midazolam group), or acetaminophen alone (control group). The E.A.S.I. (Emotionality-Activity-Scalability-Impulsivity) scale[2] is a parent-administered measure of temperament that was administered before surgery. The Venham picture tasks tool[3] was administered both pre- and post-drug as a subjective measure of preoperative state anxiety. The m-YPAS[4] is an observer rated measure of state anxiety and was recorded pre- and post-drug and also at the induction of anesthesia. The study was approved by the institution's Research Ethics Board. Parental consent and child assent were obtained.

RESULTS

Children in the midazolam group had significantly lower m-YPAS at anesthesia induction than did children in the control group. Trait emotionality and subjective state anxiety of the child were not related to m-YPAS at anesthesia induction. In the control group, pre-drug m-YPAS correlated with the anesthesia induction m-YPAS (Pearson's $r = 0.58$, $p = 0.007$). This correlation was not found in the midazolam group, suggesting that midazolam dampened anxiety behaviour in highly anxious children. However, the child's baseline level of impulsivity (E.A.S.I.-I subscale) did correlate with induction m-YPAS in the midazolam group ($r = 0.418$, $p = 0.03$). Children with high levels of impulsivity in the midazolam group reacted more to the induction of anesthesia than did children with low impulsivity in the midazolam group.

CONCLUSION

Although midazolam reduced anxiety behaviour at induction of children with baseline high anxiety levels, there is a sub-group of impulsive children who fail to benefit from midazolam. Future studies will refine our ability to predict this temperament characteristic and make informed decisions regarding premedication.

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BLOOD CONSERVATION IN ELECTIVE SPINAL SURGERY.

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INTRODCUTION

Spinal fusion commonly results in large blood loss requiring allogeneic blood transfusion (ABT). Ongoing concerns about the costs, risks, and availability of allogeneic blood prompted us to initiate a multi-modality blood conservation program for patients undergoing spinal fusion since June 1999. After obtaining institutional ethics approval, we have reviewed our data to assess the effectiveness of our blood conservation strategies in reducing the rate of ABT.

METHODS

From June 1999 to September 2001, 173 patients underwent elective spinal fusion using combinations of the following blood conservation techniques: cell saver (CS), preoperative autologous donation (PAD), and preoperative erythropoietin therapy (PET). To determine the modalities' effectiveness, we compared the rate of ABT according to the number of modalities used (0, 1, 2, or 3 modalities) using ANOVA with Duncan post-hoc analysis. In addition, logistic regression analysis was used to identify the variables that had an independent relationship to ABT in the whole population and in patients who had preoperative anemia (Hb $\leq$ 130 g/L).

RESULTS

The overall ABT rate was 28% (n=49/173). Thirteen percent of patients received platelets and 2% received fresh frozen plasma. The rate of ABT was inversely related to the number of modalities used: 74% (n=14/19) when no blood conservation modality was used; 32%* (n=24/74) when 1 modality was used; 17%* (n=9/52) when 2 modalities were used; and 7%*† (n=2/28) when 3 modalities were used (* statistically significant compared to 0 modality group; † statistically significant compared to 1 modality group). The patient and surgical variables were similar between the four groups. In the whole population, only the use of CS and PAD was independently related to ABT. In the anemic group, all three modalities (CS, PAD, and PET) were independently related to ABT.

DISCUSSION

A multi-modal blood conservation strategy is essential for reducing the risk of ABT in patients undergoing spinal surgery. Furthermore, for those patients whose preoperative Hb is $\leq$ 130 g/L, all three modalities (PET, EPO, and CS) should be used.

EFFECT OF INJECTION SPEED ON LEVEL OF SPINAL BLOCK IN PARTURIENTS

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INTRODUCTION

The influence of speed of injection on sensory level of spinal anesthesia is controversial (1, 2, 3). Injection speed may affect blood pressure in parturients (4). We hypothesized that a fast injection of hyperbaric bupivacaine by causing turbulence would increase the level of sensory block in parturients and be asssociated with a higher incidence of hypotension and nausea.

METHODS

After IRB approval and informed consent, 90 ASA I-II parturients for elective Cesarean section were randomized to receive either fast (4 sec.) or slow (40 sec.) injection of 12mg of 0.75% bupivacaine and 200 μg of morphine at room temperature. After a 1500ml crystalloid bolus spinal injection was done in the sitting position at L2-3 or L3-4 interspace with a 25g Whitacre needle. Patients were then placed supine with left uterine displacement. A blinded anesthesiologist assessed sensory block to pinprick, motor block, and blood pressure every minute for the first 15 minutes, then every 5 minutes for the next 20 minutes. Nausea, hypotension, and use of ephedrine were also noted. Statistics included Wilcoxon two-sample test and chi square test as appropriate. $P<0.05$ was considered significant.

RESULTS

43 patients in the fast group (F) and 42 patients in the slow group (S) completed the study. 5 patients were excluded because of incomplete data collection. Demographic data were similar between groups. No difference in maximum block height (F=T2, S=T3) or time to maximum block height (F=9.3 min, S=9.7 min) was observed. No difference in hypotension (F=81.4%, S=76.2%), ephedrine use (F=74.4%, S=61.9%) and nausea (F=34.9%, S=38.1%) was found.

DISCUSSION

We found that a ten fold difference in injection speed of hyperbaric bupivacaine at room temperature did not affect sensory level of spinal anesthesia or incidence of hypotension and nausea in parturients.

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TARGET-CONTROLLED VS. BOLUS FENTANYL ADMINISTRATION IN CABG

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INTRODUCTION

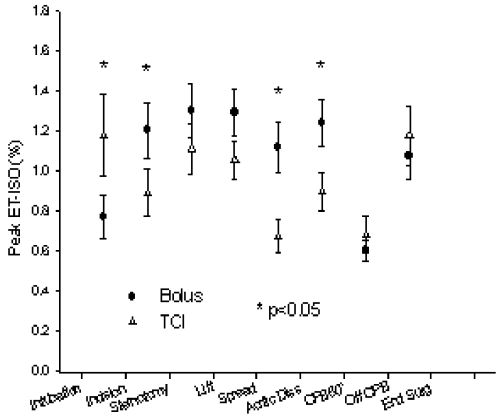
Target-controlled infusion (TCI) of fentanyl has theoretical advantages over bolus administration in patients undergoing coronary artery bypass grafting (CABG).

METHODS

After IRB approval, 33 consenting patients undergoing elective CABG entered a randomized, double-blind trial comparing two methods of fentanyl administration. Anesthesia was induced with thiopental and fentanyl and maintained with isoflurane. Group TCI (n=17) received TCI fentanyl using the program STANPUMP. The target effect-site concentrations were 5 ng/ml prior to periaortic dissection and then 1.5 ng/ml until skin closure. Group B (n=16) received the same estimated total fentanyl dose as a single bolus. Measured variables included hemodynamics, end-tidal isoflurane concentration (ET-ISO), arterial fentanyl concentration, and recovery parameters. Student's *t*-test and analysis of variance with post-hoc Tukey's test were used appropriately (significance level $P < 0.05$).

RESULTS

Total fentanyl dose was slightly but significantly greater in Group TCI than in Group B (14.6±2.5 µg/kg vs. 13.0±0.9 µg/kg). Fentanyl concentrations were higher in Group TCI than in Group B at sternotomy (5.4±2.0 vs. 3.5±0.9 ng/ml) and periaortic dissection (4.9±1.1 vs. 3.0±.0.9), but not different at end-surgery (1.4±0.4 vs. 1.4±0.5 ng/ml). At intubation, Group B patients required less isoflurane and had lower mean arterial pressure (MAP) and heart rate (HR) compared to Group TCI. In contrast, during skin incision, sternotomy, sternal spread and periaortic dissection, isoflurane requirements and/or MAP were lower in Group TCI. Between Groups TCI and B respectively, time to extubation (8.0±3.1 vs. 6.5±3.7 h), ICU stay (23±14 vs 26±11 h), VAS pain scores and patient satisfaction did not differ.



DISCUSSION

TCI fentanyl was more effective than bolus administration during prebypass surgery, but the converse was true at intubation. These differences were minor, and neither regimen improved recovery. Given its simplicity, bolus fentanyl administration is preferable to TCI in patients undergoing CABG. Pharmacokinetic modeling suggests that a divided dose fentanyl bolus regimen (half at induction, half at incision) would be nearly ideal. A shorter-acting opioid than fentanyl is needed to exploit the potential advantages of TCI in CABG.

RAT SPINAL GABAERGIC CELL TRANSPLANTATION IN ALLODYNIA

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INTRODUCTION

Allodynia, a condition of intense pain caused by normally non-painful stimuli (e.g. light-touch), can develop following spinal injury due to loss of inhibitory GABAergic cells involved in sensory function in the spinal cord. The present study investigates whether spinal implants of GABAergic cells to increase inhibitory tone can produce a decrease in pain behaviours in the strychnine model of allodynia in the rodent.

METHODS

Following approval from the University Committee on Animal Care, GABAergic cells were harvested from the striatal primordia of E15 day old rats and 800,000 cells were implanted into the spinal cord of adult, female, Sprague-Dawley rats (300-325 g.) by either direct implantation at the L1-2 level or via injection through an indwelling intrathecal (i.t.) catheter at L1-2. Following implantation, pain behaviours were scored using the tail-flick latency test. Catechol-oxidation current (CAOC) of the locus coeruleus was measured by *in vivo* voltammetry and blood pressure monitored in response to hair-deflection in urethane (1.0 g/kg i.v.) anesthetized rats receiving i.t. strychnine (40 μg)[1]. Spinal cords were removed and examined using glutamic acid decarboxylase (GAD) immunohistochemistry to assess graft survival and integrity.

RESULTS

No changes were observed in morbidity or latency times in the tail-flick test of animals with implants compared to controls: 3.1 ± 0.6 s for direct implants (n=9); 3.4 ± 0.8 s for catheter implants (n=8); and 3.2 ± 0.4 s for control group (n=6). There was no suppression of increased CAOC or blood pressure in response to hair-deflection following strychnine injection in implanted animals compared to controls. Immunohistochemistry revealed the presence of GAD-positive grafts in the direct implant animals but not in those with catheter implants.

DISCUSSION

Although GABAergic grafts survived following direct implantation in the spinal cord, no beneficial effects were observed in the pain behaviours tested in the present study. It is possible that implantation of cells in non-injured animals does not result in functional changes in response to strychnine. Further work is required to improve graft integration into the host and examine their effect in models where GABAergic cell loss occurs.

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CLONIDINE SUPPRESSES RVLM ACTIVATION IN RODENT ALLODYNIA

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INTRODUCTION

The C1 adrenergic neurons of the rostral ventrolateral medulla (RVLM) are involved in control of sympathetic outflow, cardiovascular regulation and pain processing. We have previously shown significant activation of the RVLM in an acute anesthetized rodent model of allodynia resulting from removal of spinal glycinergic modulation by intrathecal (i.t.) strychnine [1]. The objective of this study was to explore the effects of clonidine in this model of allodynia.

METHODS

Following approval by the University Committee on Animal Care, urethane (1.0 g/kg i.v.) anesthetized rats were artificially ventilated and stereotaxic neurochemical activity of the RVLM adrenergic neurons was observed by measuring the voltammetric catechol-oxidation current (CAOC). Separate groups of animals (n=4-7) were given either i.t. or intracerebroventricular (i.c.v.) clonidine (10 µg) followed by i.t. strychnine (40 µg) or saline followed by hair-deflection to lumbar dermatomes for 60 min. Results are expressed as mean percent of baseline.

RESULTS

Clonidine initially produced a significant decrease (30% i.t., 25% i.c.v.) in RVLM CAOC prior to strychnine injection and hair-deflection in all four groups. Both i.t. and i.c.v. clonidine suppressed RVLM hyperactivity previously reported [1] (peak effect 45.6 ± 7.1 % of baseline for i.t. and 59.2 ± 9.3% of baseline for i.c.v.) following strychnine and hair-deflection. There was no significant increase in blood pressure following strychnine and hair deflection.

DISCUSSION

Previous findings have shown that i.t. strychnine followed by hair-deflection activates RLVM adrenergic output and increases blood pressure. Administration of clonidine either spinally or centrally suppresses this increase in RVLM activity and blood pressure in this acute model of allodynia where innocuous hair-deflection evokes a nociceptive-like activation of the C1 adrenergic neurons. Therapeutic strategies targeting the RVLM may have clinical importance in management of neural injury induced pain which remains insensitive to opioid treatment.

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EFFECTS OF EVOKED VS. SPONTANEOUS PAIN ON POSTOPERATIVE LUNG FUNCTION

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INTRODUCTION

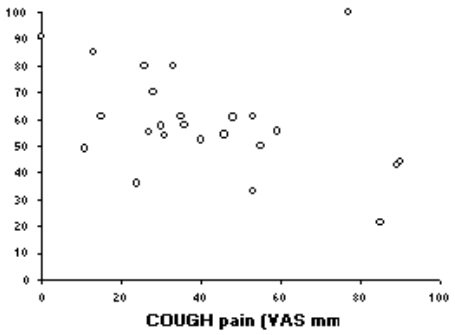
The pathogenesis of postoperative atelectasis and pneumonia imply a role for movement-evoked pain (e.g. splinting/hypoventilation due to "pain avoidance"). However, interactions between evoked pain and lung function are poorly understood. Thus, we have examined the relationship between evoked versus spontaneous pain and postoperative pulmonary function.

METHODS

In 25 patients following hysterectomy, VAS (0-100 mm) intensity for spontaneous pain (REST), and pain during ambulation (SIT), forced expiration (BLOW), and coughing (COUGH) were measured together with oxygen saturation, oxygen requirements and peak expiratory flow (PEFR) at 8 time points during postoperative days 1 and 2 (20,24,28,32,44,48,52 and 56 hours after completion of surgery).

RESULTS

All pain measures diminished and PEFR reductions improved across the study period ($p<0.05$). Mean [SE] COUGH (26.1 [1.7]) and SIT (21.5 [1.5]) were more intense ($p<0.05$) than REST (10.5 [0.8]), and COUGH was more intense ($p<0.05$) than BLOW (16.8 [1.3]). Significant negative correlations between pain and PEFR were observed for COUGH, SIT, BLOW and REST at 8, 7, 4, and 2 of the 8 studied time points, respectively ($p<0.05$). As an illustrative example, the figure below describes the correlation between COUGH and PEFR, 20 h after completion of surgery (correlation coefficient=-0.64, $p<0.05$).



DISCUSSION

Differences between COUGH and BLOW suggest that PEFR reductions reflect true changes in ventilatory capacity and are less likely due to poor performance related to pain avoidance. We hypothesize that the consistent negative correlation of cough-evoked pain with PEFR is, in part, due to avoidance of coughing which ultimately limits deep inspiration, lung re-expansion and clearance of secretions [1]. Future study should focus on understanding unique mechanisms of evoked pain and characterizing the physiological implications of evoked pain as they pertain to relevant postoperative respiratory, cardiac and thromboembolic complications.

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SPINAL ANESTHESIA AND PULSATILE HEMODYNAMICS: A COMPUTER SIMULATION

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INTRODUCTION

The effects of spinal anesthesia on non-pulsatile hemodynamics have been well described for both animals and humans. The effects on pulsatile hemodynamics have not been well-elucidated, due in part to the difficulty involved and the need to use human subjects. As the pulsatile contribution to LV external hydraulic load approaches 20% in the elderly, any reduction through the use of spinal anesthesia may be beneficial.

METHODS

The human arterial system was modeled using 128 segments as previously described[1]. The segments' moduli of elasticity were increased to simulate human ageing. The effect of spinal anesthesia was simulated by:

1. Simultaneously reducing the reflection coefficient (RefC) in the segments below the diaphragm from 0.8 to 0.7, while increasing the RefC in the remaining segments from 0.8 to 0.85[2].
2. Reducing the pulse wave velocity (PWV) in the arterial segments below the diaphragm by 15%.
3. 1 and 2 combined.

The effects of these modifications were examined through changes in the calculated aortic input impedance (AII).

RESULTS

The altered RefC resulted in a 2.5% decrease in the amplitude of the moduli of the AII. This reduction was limited to the lower frequencies. A similar but larger reduction (9.5%) occurred as a consequence of the decrease in PWV. The combination of altered RefC and decreased PWV were additive, with a resultant decrease of 12%.

DISCUSSION

The effect of spinal anesthesia on pulsatile hemodynamics was simulated using a computer model of the aged human arterial tree. The simulation suggests that spinal anesthesia results in a significant reduction in pulsatile LV external hydraulic load. This benefit would be most manifest at lower heart rates, resulting in improved efficiency or reduced myocardial oxygen demand.

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CANADIAN POST-SURGICAL PAIN SURVEY

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INTRODUCTION

The objective was to survey the general population of Canada regarding post-operative pain experiences and medications, and to determine predictors of satisfaction with post-operative pain medication.

METHODS

General population subjects from across Canada who had surgery in the previous three years were eligible for the survey. The survey instrument was based on the American Pain Society guidelines questionnaire (1) and previously published general population pain surveys.(2,3) It focused on: pain levels while in the surgical facility and at home, pain medication administration, efficacy, adverse events, satisfaction and counseling, and attitudes to pain and pain management.

RESULTS

Pain was experienced by 68% of inpatients and 48% of outpatients while in the surgical facility. For those who experienced pain, 68% of inpatients and 29% of outpatients reported that their highest level of pain was severe or extreme; 37% of inpatients and 18% of outpatients reported that their average pain level was severe or extreme. In the two weeks post-discharge, three-quarters of inpatients and outpatients experienced pain. The proportion of patients who reported severe or extreme pain decreased to 32% for inpatients but rose to 38% for outpatients.

Complete or a lot of pain relief was experienced by the majority of inpatients and outpatients, both in the surgical facility and at home. Patients were satisfied with pain medication in both settings. Adverse events were experienced by approximately one quarter of survey subjects.

Satisfaction with pain medications was higher if pre-surgical counseling was received. Satisfaction was lower with increased levels of pain, for patients who waited after asking for pain medication, for those worried about pain before their surgery, and for those who experienced side effects from medication.

DISCUSSION

Severe or extreme pain levels were experienced by a high number of surgical patients. Improvements could be made to patients= post-surgical pain experience in Canada.

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HANDHELDS VERSUS PAPER FOR ACUTE PAIN ASSESSMENTS: TIME AND CONTENT

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INTRODUCTION

Less than one third of Canadian academic Acute Pain Management Services (APMS) have ongoing or computerized data collection[1]. Handheld computers (HH) could facilitate this process by providing access to timely, comprehensive data while streamlining the data entry process[2-4], however, there is a paucity of information supporting the use of HHs for patient assessments[3,5]. The purpose of this study was to compare acute pain assessment time and content using paper versus HH documentation.

METHODS

80 orthopedic patients who were admitted to the APMS post-operatively were randomized to APMS documentation using either paper or HH. HH assessment and order labels were printed at the bedside using an infrared capable portable printer and reviewed by the anesthesiologist before being affixed to the chart.

RESULTS

5 HH patients were discharged from the APMS before the initial trial assessment. Valid times were obtained on 106 assessments (table 1) and valid assessment data was collected on 100 assessments (table 2). The average increase in the number of data points collected using paper versus HH was 2.1 to 6.5.

TABLE 1 Mean (SD) assessment time (min)

	HH(n=54)	*Paper(n=62)*	*p value*
Assessment only	3.1 (1.6)	4.1 (3.6)	0.05
Assessment and documentation	6.6 (2.8)	5.9 (4.0)	0.30
Total (includes printing label)	9.9 (4.1)	n/a	

TABLE 2 Percent of assessments collecting 7 most frequently documented side effects

Method	*Side Effect*	*% of Assessments*
Paper	Pain Control (Qualitative)	49
	Pain Score	43
	Nausea	33
	"No other Side Effects"	28
	Level of sedation	18
	Oral intake status	18
	Pruritis	12
PDA	Nausea	100
	Level of sedation	100
	Pruritis	100
	Pain Score at Rest	63
	Pain Score Active	33
	Vomiting	33
	Oral intake status	29

DISCUSSION

Assessment time did not vary between the 2 methods. The main variables collected were similar for both groups. The frequency of recording pain scores and side effects was greater in the HH group.

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DRUG SIDE EFFECT REPORTING IN CANADIAN ACADEMIC ACUTE PAIN SERVICES

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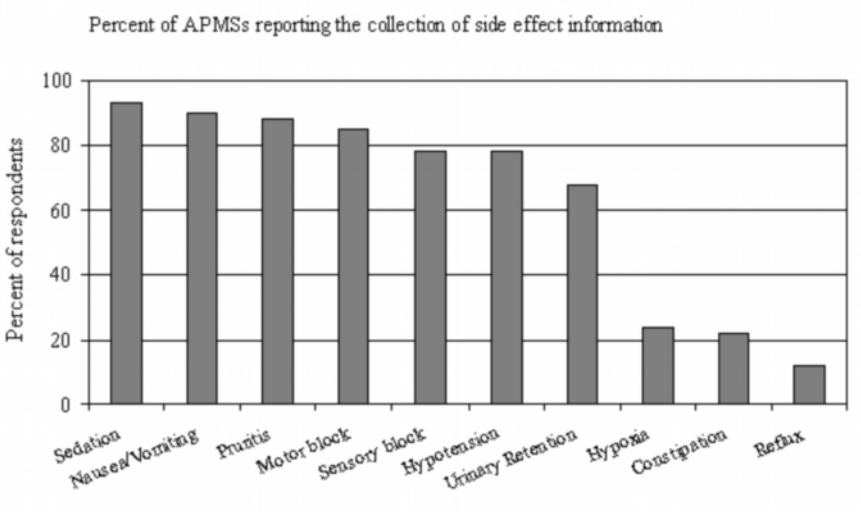
INTRODUCTION

Postoperative pain is usually managed by Acute Pain Management Services[1,2]. In addition to managing pain, the treatment of therapy side effects is an important aspect of patient care. The purpose of this study was to determine the type and frequency of side effects monitored by Acute Pain Management Services (APMS) in Canadian academic hospitals.

METHODS

62 Canadian hospitals affiliated with academic institutions were surveyed regarding the existence of APMSs. The 93-question survey took approximately 20 minutes to complete and consisted mostly of multiple choice responses with some open-ended questions. The survey included questions about the collection of side effect data.



RESULTS

42 of the 47 (76%) respondents had an APMS. The percent of respondents reporting the collection of side effect information is displayed in the table. Drugs used on APMSs included non-steroidal antiinflammatories, local anesthetics, opiates, antiemetics, and anti-pruritic drugs.

DISCUSSION

The management of acute pain postoperatively has seen dramatic changes over the past decade. Future efforts should address minimum acceptable guidelines for acute pain assessments and documentation, thereby fostering a continuous quality improvement environment.

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NATURE DU VOLUME GASTRIQUE ET APPENDICITE

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INTRODUCTION

Déterminer s'il existe une relation entre la période de jeûne, la sensation subjective de faim, la présence de nausée, la présence d'anxiété, la présence ou non de reflux gastro-œsophagien et l'importance du volume gastrique. Qualifier également la nature du volume gastrique.

MÉTHODOLOGIE

Étude prospective : 60 patients (53 patients à jeun, 7 patients non à jeun). Évaluation par une échographie abdominale lors du diagnostic d'appendicite, de la nature du volume gastrique (vide, air, liquide, solide) et quantification du volume gastrique. Questionnaire aux patients quant aux nombre d'heures de jeûne, sensation de faim, présence de nausée, présence d'anxiété et présence de reflux gastro-œsophagien. Approbation éthique obtenue.

RÉSULTATS ET DISCUSSION

Un estomac plein équivalait à la présence d'un résidu gastrique solide ou liquide. Un estomac vide signifiait une absence de résidu ou la présence d'air. Le jeûne était défini comme un statut nil per os ≥ 8 heures. Aucune relation, statistiquement significative, entre le statut de jeûne et l'importance du volume gastrique n'a été observée. Cependant l'augmentation du nombre d'heures de jeûne s'accompagnait d'une diminution du pourcentage de patients avec un estomac plein. Et, chez les patients avec un estomac plein (23 pts), peu importe le nombre d'heures de jeûne, le volume gastrique était majoritairement petit. L'évaluation du volume gastrique était subjective car elle reposait sur l'estimation échographique du résidu gastrique (petit ~50ml, moyen ~250ml, grand >500ml). Quant à la présence ou non d'un estomac plein, aucune influence sur la sensation subjective de faim n'a été observée. De plus nous ne pouvons conclure que le statut d'estomac plein s'accompagne de nausée. En effet une minorité de patient avec estomac plein sont nauséeux. Quant à l'anxiété, la majorité des patients avec estomac plein étaient anxieux, et cet état pourrait expliquer un ralentissement du transit digestif. Cette donnée demeure cependant incomplète puisque le statut d'anxiété était inconnu chez 9 des 23 patients avec estomac plein. Par ailleurs seulement 3 des 23 patients avec un estomac plein présentaient du reflux. Et finalement, lors du diagnostic d'appendicite, la nature du volume gastrique est majoritairement celui d'un estomac vide.

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Tableau 1. Données démographiques

Sexe	
Femme	29 (48.3%)
Homme	31 (51.7%)
Age (ans)	24 ± 17.2
Taille (cm)	164.8 ± 14.1
Poids (kg)	55.2 ± 21.1
ASA	
I	47 (78.3%)
II	11 (18.3%)
III	2 (3.3%)

PAIN AND NAUSEA AND VOMITING IN AMBULATORY LUMBAR DISCECTOMY

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INTRODUCTION

Currently in North America, 65% of the surgical procedures are carried out in ambulatory settings. Microsurgical discectomy can be performed as an ambulatory procedure. A retrospective chart review was done to document factors that delayed discharge or led to unanticipated admission.

METHODS

After Institutional Review Board (IRB) approval, the hospital medical records of 106 patients who underwent microsurgical discectomy on an ambulatory basis were reviewed. A single surgeon at the Toronto Western Hospital operated on all patients. Preoperative, intraoperative and postoperative data was collected on specifically designed data sheets. All anesthetic and surgical factors that affected discharge were noted.

RESULTS

Of the 106 patients reviewed, only 6 (5.7%) were unanticipated admissions. Two patients were admitted due to nausea and vomiting, one due to severe pain, one due to urinary retention and 2 were surgical causes, recurrent disc herniation and dural tear. Eight patients (7.5%) had delayed discharge. One patient had delayed discharge due to severe nausea, one due to severe pain, two patients complained of dry eyes and required ophthalmology consult, one severe sore throat, and one due to low oxygen saturation. Two patients had surgical causes, one due to bleeding from surgical site and the other due to persistent leg weakness. Sixty-one percent of patients (65/106) complained of nausea in PostAnesthesia Care Unit (PACU). Of these, 16% (17/106) complained of severe nausea requiring treatment with antiemetics. Postoperative vomiting was observed in 9.4% (10/106) patients. A significant number of patients, 75.4% (80/106), complained of pain in PACU. Of these, 33.9% (36/106) patients had VAS scores more than 6 and required intravenous analgesics.

DISCUSSION

Ambulatory lumbar microdiscectomy can be safely carried out as an ambulatory procedure with a low unanticipated admission rate, 5.7%. However a significant number of patients had severe pain or nausea and vomiting. Better intraoperative pain and antiemetic management is warranted in these patients.

COST SAVING OF ELIMINATION OF LABORATORY TESTS IN AMBULATORY CATARACT SURGERY

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INTRODUCTION

Schein et al following a study of 19,557 cataract surgeries, recommended that cataract patients should not have routine tests done; only tests indicated by history and physical examination. Our hospital introduced a policy to eliminate routine tests for cataract patients on February 1, 2001. The purpose of this study is to evaluate the cost savings in laboratory tests before and after policy introduction.

METHODS

Institutional Research Ethics Board approval was obtained. The policy stated that no routine tests should be ordered by the surgeons. Patients with medical problems were referred to the anesthesiologist who would order tests as indicated. Anesthesia was with local (topical or retrobulbar block) and sedation. Patient demographics, clinical, laboratory tests and morbidity data were collected in consecutive cataract patients in a four-month period in 2000 (Group 1: before policy) and 2001 (Group 2: after policy). The cost of individual tests was ascertained from the hospital finance department. The number and cost of laboratory tests per patient between groups were compared. Student's t test was used for continuous data while Chi square was used for categorical data. $P < 0.05$ was accepted as significant.

RESULTS

A total of 1,231 patients were included in the study, 636 in group 1 and 595 in group 2. There was no difference in co-morbidities, ASA status, and preoperative medication use between the groups. There was over 90% cost savings (group 1 $34.20 vs group 2 $3.00) per patient. There was a statistically significant reduction in number of tests and cost of tests per patient without any difference in morbidity between the groups.

	Group 1	Group 2
PREOP TESTS (ORDERED)	% Patients	% Patients
Complete Blood Count	93.5	5.9
Electrolytes	69.7	4.3
Creatinine / Urea	60.5	4.3
Glucose	37.7	2.2
Electrocardiogram	94.7	7.2
Patients with no tests	2.7	89.4

CONCLUSION

Over 90% in potential cost savings was possible by eliminating routine preoperative tests in cataract patients, without adversely affecting morbidity and mortality. Further studies are required to assess whether the same preoperative testing policy could be extended to other low risk surgeries.

COMPARISON OF PATIENT CONTROLLED SEVOFLURANE INDUCTION WITH SEVOFLURANE VITAL CAPACITY INDUCTION IN OUTPATIENTS UNDERGOING ARTHROSCOPY

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INTRODUCTION

The technique of Patient Controlled Induction (PCI) using sevoflurane (sevo) inhalation is popular. Although this technique has been considered as an easy and effective method to be used in adults as well as cooperative children, few studies have been performed to compare it with other sevo induction techniques. We designed this clinical study to compare PCI with the most commonly used sevo induction technique, Vital Capacity Induction (VCI).[1]

METHODS

Following the approval of Research Ethics Board, 118 outpatients undergoing knee arthroscopy were randomly assigned to receive either PCI or VCI sevo induction followed by a laryngeal mask airway (LMA) insertion and sevo maintenance. The circuit was not primed and the patients in PCI group were asked to hold the facemask themselves and breathe normally with sevo 8% dial marker concentration in oxygen at a flow rate of 4 L/min. Patients in VCI group were asked to do vital capacity breaths with sevo concentration of 8% but at a flow rate of 8 L/min. The LMA was inserted as soon as the patient's jaw was relaxed. Times from induction to LMA insertion were recorded. The airway condition for LMA insertion was rated by the anesthesiologist. In addition, the consumption of sevo for LMA insertion was calculated. Patients' vitals were monitored at 1-min intervals until 10 min after LMA insertion.

RESULTS

The demographic data were comparable. There were no differences found with respect to induction time, induction side effects, airway condition, MAP, HR, PaO2 as well as patient's overall satisfaction. However, the sevo usage in the VCI group was significantly higher than that in the PCI group.

	Time to LMA insertion (min)	Coughing (%)	Breath holding (%)	Laryngeal spasm (%)	Movement (%)	Sevo usage (ml)
PCI	3.4±1	0	16	6	15	4.43±1
VCI	3.3±1	2	8	4	20	8.00±3 *

CONCLUSION

PCI was comparable to VCI in sevo induction with respect to the speed and quality. The amount of sevo consumed for the induction was significantly less in PCI technique than in VCI technique.

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ONDANSETRON FOR THE PREVENTION OF PROPOFOL INJECTION PAIN

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INTRODUCTION

Propofol produces pain near the IV injection site in 50-100% of patients, which is recalled postoperatively by 52-62% of those who experience it. Many techniques have been advocated to prevent this pain (especially IV lidocaine), but none are reliable. Ondansetron has local anesthetic properties and in rats is 15X more potent than lidocaine[1]. This randomized, double-blind, placebo-controlled study was designed to examine the efficacy of ondansetron in preventing propofol injection pain, and to determine the incidence of recall of such pain. Midazolam and fentanyl were administered before the ondansetron and propofol to mimic the usual clinical scenario.

METHODS

After IRB approval and informed consent, 21 subjects scheduled for surgery were randomized to 3 groups, determining the dose of ondansetron to be received. An 18G IV was inserted in a dorsal hand vein and 1 mg IV midazolam injected 5 minutes before entering the OR. In the OR, 2 μg/kg IV fentanyl was administered. Three minutes later the flow of IV fluids was stopped and ondansetron (0, 4 or 8 mg) was administered over 30 seconds. The IV fluids were then allowed to flow freely and propofol was injected at 0.5 ml/sec. Patients were asked if the arm with the IV hurt, at 10-second intervals until they lost consciousness. In PACU, they were asked about recall of pain during induction. Data were analyzed with Chi-square tests and ANOVA. $P<0.05$ was considered statistically significant.

RESULTS

There were 7 male and 14 female subjects, with a mean age 47.1 ± 15.4 yrs. The gender and age did not differ between groups. The percentages of patients with pain during induction were identical in all groups (see Table). Recall of pain occurred in 3/9 subjects with pain (33%).

TABLE:

ONDANSETRON DOSE (mgs)	SUBJECTS WITH PAIN	TOTAL SUBJECTS
0	3	7
4	3	7
8	3	7

DISCUSSION

Ondansetron did not effect the incidence of propofol injection pain. This may be because the effects of fentanyl overshadowed any benefit which may have occurred with ondansetron. Alternatively, ondansetron may truly be ineffective using our technique of administration, or the sample size was too small. Recall of pain was almost ½ that reported previously, possibly due to our use of midazolam.

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INFLUENCE OF NEUROMUSCULAR BLOCK DURING POSITIVE PRESSURE VENTILATION USING A LARYNGEAL MASK AIRWAY ON POSTOPERATIVE LARYNGO-PHARYNGEAL DISCOMFORT.

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INTRODUCTION

The purpose of this study was to evaluate the influence of neuromuscular block (NMB) during positive pressure ventilation (PPV) using a laryngeal mask airway (LMA) on the incidence of postoperative laryngo-pharyngeal discomfort.

METHODS

After approval of the local Ethics Committee and informed consent, 130 patients undergoing general surgery in LMA were included in the study. Anesthesia was induced by remifentanil/propofol and maintained using remifentanil/ sevoflurane (oxygen/air 30 %, PPV). Patients were randomly assigned to receive no neuromuscular blocking agent (Group A) or boli of cisatracurium titrated to establish and maintain no visual response of the corrugator supercilii muscle after TOF stimulation (Group B). Prior to the end of surgery, morphine 3 - 5 mg IV was injected. The ease of insertion of the LMA, cuff- and inspiratory pressures were recorded. Patients were asked immediately postop. (S1), 2 hours postop. (S2) and 24 h after surgery (S3) to rate sore throat, dysphonia or dysphagia as not existent, minimal, moderate or severe. Continuous data were compared using t-test, categorical variables using Chi-squared test ($P<0.05$).

RESULTS

LMA insertion was possible in all patients, age, sex, weight distribution was not different between the groups (A, N= 68, B, N= 62). Results are presented in Table 1 (no patient had any complaints of scores higher than moderate) and did not differ between the groups.

TABLE

	Group A	*Group B*
First attempt insertion	89 %	92 %
Duration of anesthesia (min)	55	58
Mean cuff pressure (mmHg)	105 (35)	96 (44)
Mean inspiratory pressure (mmHg)	13 (3)	15 (2)
Sore throat (% of patients at S 1,2,3)	22 %, 18 %, 9 %	18 %, 16 %, 10 %
Dysphonia (at S 1,2,3)	4 %, 4 %, 4 %	5 %, 5 %, 5 %
Dysphagia (at S 1,2,3)	11 %, 10 %, 5 %	13 %, 10 %, 9 %

DISCUSSION

Despite high cuff pressures, the incidence of laryngopharyngeal discomfort was lower than previously recorded (1). Our findings cannot support the theory that positive pressure ventilation using a LMA without NMB increases the incidence of sore throat or dysphonia (1).

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QUALITY ASSURANCE AUDIT ADOPTING PROTOCOL DRIVEN DISCHARGE CRITERIA

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INTRODUCTION

Budgetary constraints and nursing shortages have a significant impact on waiting lists and on our ability to deliver an adequate healthcare service in the ambulatory surgical setting. Efficient discharge scoring systems are based on adhering to achieving objective clinical criteria instead of traditional subjective nursing protocols. In attempt to improve efficiency in our ambulatory surgical unit, we introduced an objective discharge scoring system and audited the change in practice.

METHODS

A two-phase prospective observational study was conducted in our ambulatory surgical unit. Initial data was collected over a 2-month period [Phase A] prior to adoption of a new discharge scoring sheet incorporating the Modified Aldrete Score and the Modified Post Anesthetic Scoring System. Data was collected after nursing education over another 2-month period [Phase B]. We looked at three time intervals; the time spent in the PACU [T1], the time spent in the lounge [T2] and the overall time to discharge home [T3]. We analyzed the reduction in all three time frames.

RESULTS

Overall demographics were similar in the two phases. There was a statistically significant reduction in overall mean T1, T2, and T3 in phase B. Some procedures were associated with significant reductions in all three intervals more than others. (Table) We demonstrated differences in these time intervals in cases categorized by ASA status, anesthetic type and those done in the morning vs those in the afternoon.

DISCUSSION

An objective scoring system and a nursing education program enabled us to significantly reduce our discharge times from our ambulatory care unit. This study has also highlighted that further efficiency can be achieved under time pressure constraints (pm vs am). Even though it is difficult to influence system factors that affect overall discharge time, such as awaiting a ride, anesthesiologists must rise to the new challenges of cost containment and the most efficient use of nursing personnel.

TABLE PACU and Overall Time Frames for Common Procedures.

Procedures	*Phase A T1*	*Phase B T1*	*Phase A T3*	*Phase B T3*
Microlaryngoscopy	88.4	79.1	99.8	94.1
Tonsillectomy	253.2	181.4*	276.4	190.0*
Septorhinoplasty	146.0	116.2*	173.9	141.5*
Strabismus Repair	153.3	118.9*	169.3	137.0*
D&C	99.31	79.13*	110.3	105.3
Dental Extraction	92.75	83.61	107.0	103.2

*$p < 0.05$

RADIOGRAPHIC LANDMARKS OF THE UPPER MARGIN OF THE SUPERIOR VENA CAVA (SVC) IN CHILDREN.

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INTRODUCTION

In adults, in order to determine optimal central venous catheter position, the right tracheobronchial angle was found to be the most reliable radiographic landmark for the upper margin of the SVC by MRI and radiographic study (1). However, children with congenital heart diseases (CHD) were not part of this study. We have therefore determined the upper margin of SVC in relation to the anatomical landmark on supine chest film by angiography in children with CHD.

METHODS

The protocol was approved by institutional Ethical Committee and written parental consent was obtained. Twenty-seven patients (15~108 months) with CHD (ASD , VSD, TOF, PDA) were included. Their weight and height were 15.1±6.3 kg, and 94.9±15.6cm , respectively. Following routine cardiac catheterization, an angiographic catheter was introduced into the innominate vein and vena cavogram was obtained with 76% iohexol. We then determined the upper margin of the SVC in relation to the level of thoracic vertebra.

RESULTS

The upper margin of the SVC was at the level of T3(upper)<3>, T3(middle)<1>, T3(lower)<4>, T4(upper)<15>, T4(middle)<1>, T4(lower)<1> and T5(upper)<2>. In 85.2% of the patients studied, the upper margin of the SVC was situated at or above the level of T4(upper). We found no correlation between the age, weight or height and the level of the upper margin of SVC.

DISCUSSION

Our results showed that in most children the upper margin of the SVC was situated above the level of T4(lower). We suggest attempting to position the tip of the central venous catheter, inserted via the internal jugular vein, at or just below the level of T4 (lower).

REFERENCE

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SEVO PROVIDES FASTER POSTOP NEURO EXAM THAN ISO AFTER NEUROSURGERY

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INTRODUCTION

It has been demonstrated that the use of inhalational anesthetics having a lower blood:gas partition coefficient results in faster emergence times and it is speculated that this advantage increases with the duration of anesthetic exposure. We designed a prospective randomized double-blind controlled clinical study to compare the recovery profile of Sevoflurane versus Isoflurane in neuroanesthesia of long duration.

METHODS

Following IRB approval and informed consent, 56 adult patients presenting for intracranial surgery were enrolled. They were randomized to receive either Sevoflurane (SEVO) or Isoflurane (ISO) in 40% oxygen (2 l/min.) as part of a balanced anesthesia regimen. Mean blood pressure and heart rate values were maintained at ± 20 % of the pre-induction baseline with adjustment of the anesthetic depth (0.5 to 1.0 MAC). Pharyngeal temperature was maintained above 35°C. Sufentanil infusion (0.25 µg/kg/h) was stopped at dural closure. At removal of the head holder, paralysis was reversed, anesthetics were discontinued and fresh gas flow increased to 10 l/min. Several recovery endpoints were measured as time from closure of the anesthetic vaporizer.

RESULTS

There were no difference in mean duration of anesthetic exposure [6.4 h SEVO vs. 6.8 h ISO, p=0.29] and amount of anesthetic needed during intervention were similar [MAC-h total 4.74 SEVO vs. 4.70 ISO, p=0.47]. Patients in SEVO demonstrated a shorter time to emergence (eye opening) [15 min. vs. 21 min. in the ISO group, p=0.02] and shorter time for response to command (movement of all limbs) [21 min. vs. 31 min. in the ISO group, p=0.01]. Differences in time to spontaneous breathing, time to extubation, time for orientation, time to first analgesic and time to discharge from PACU did not achieve statistical significance. Demographic data were similar in both groups.

DISCUSSION

As it is primordial in the neurosurgical population to quickly obtain a postoperative neurological evaluation, the observed difference between Sevoflurane and Isoflurane could afford a clinical advantage in this setting.

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DEXMEDETOMIDINE DURING INTRACRANIAL HYPERTENSION IN RATS

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INTRODUCTION

Acute head trauma with intracranial hypertension is associated with cardiovascular instability, myocardial dysfunction and neurogenic pulmonary edema. The mechanism involves sympathetic nervous system hyperactivity[1]. We hypothesize that depression of central sympathetic outflow by dexmedetomidine, a selective a_2 adrenergic agonist, protects against cardiorespiratory complications in a rat model of acute intracranial hypertension.

METHODS

The study received ethical approval from the Queen's University Animal Care Committee. Mechanically ventilated Sprague-Dawley rats (340-380g) under halothane anesthesia received levomedetomidine (1 µg, n=9,LEVO) or dexmedetomidine (1 µg, n=10, DEX) in the cisterna magna. After 2 minutes, an intracranial subdural 3F fogarty catheter (0.3 ml saline) was inflated for 60 seconds to induce acute intracranial hypertension. Intracranial (ICP), arterial (MAP), and left ventricular (LV) pressures, heart rate (HR) and ECG were monitored for 30 minutes. Lung wet and dry weights were measured at the end of experiments. Results are reported as mean ± SEM. Comparisons between groups were made using the unpaired Student's T test. Significance was reported if $P<0.05$.

RESULTS

Dexmedetomidine injection decreased baseline HR (369±20 vs. 305±6). MAP and HR increased in LEVO rats during balloon inflation and decreased below baseline following deflation. This was associated with decreases in peak LV pressure (LVP), LV end diastolic pressure (LVEDP), LV developed pressure (LVDP), maximum and minimum LV dP/dt, and rate-pressure product (RPP). DEX rats had blunted hemodynamic changes with preserved hemodynamic indices at 30 minutes after balloon deflation (see Table). There was no difference in lung weights or pulmonary water content.

	ICP	*MAP**	*HR**	*LVP**	*LVEDP*	*LVDP**	*dP/dt max**	*dP/dt min**	*RPP**
LEVO	618±133	45±4	90±5	59±4	55±13	60±5	53±4	45±4	55±6.2
DEX	535±122	78±3	102±2	89±2	80±8	85±3	91±3	86±4	87±4.2

Results reported as % baseline ± SEM. *$P<0.05$.

DISCUSSION

The results demonstrate that dexmedetomidine stereoselectively attenuates hemodynamic complications associated with acute intracranial hypertension. As dexmedetomidine inhibits central presympathetic neurons[2], protection is likely a result of sympathetic blockade. Our results provide evidence for the role of central sympathetic actions in the development of cardiovascular complications during acute intracranial hypertension.

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HERBAL MEDICINE USE IN CHILDREN SCHEDULED FOR ANAESTHESIA

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INTRODUCTION

Herbal medicine usage by patients who are scheduled for anaesthesia has implications for the anesthesiologist because of potential herb-drug interactions.[1] Although the frequency of herbal medicine use in adults scheduled for anaesthesia has been reported,[2] the frequency in children has not. Therefore, we surveyed parents of children who were scheduled for anaesthesia to determine the profile of herbal medicine use in this population.

METHODS

After institutional research ethics board approval, parents of five-hundred and twenty children ages 2-15 years of age undergoing anaesthesia for elective procedures were invited to complete a self-administered questionnaire. The survey asked parents if their child had ever used an herbal medicine. Those who said yes were asked 1. To indicate which herbal medicine their child used, the last time it was used and the reason for its use 2. What influenced their decision to give their child herbal medicines and 3. Their beliefs and attitudes regarding herbal medicines. Demographic data including age, gender and health status of the child and education background, income level and parental use of herbal medicines were surveyed for all participants. Data are presented as means and proportions where appropriate.

RESULTS

Four hundred and thirty five surveys (84%) were completed and returned. Of these 22% indicated that their child used herbal medicines ($p<0.0001$). The commonest medicines used were Echinacea (68%) and Goldenseal (9%). The top three factors influencing parents to administer herbal medicines included personal experience (68%), friends/relatives (50%) and books/magazines (34%). Only 10% cited a family doctor as an influencing factor. Finally, 82% of parents felt it was important to inform the anesthesiologist that their child used an herbal medicine.

DISCUSSION

The percentage of children using herbal medicine in this survey is greater than that reported for a general outpatient pediatric population (11.5%)[3]. Unlike adults who don't disclose their use of herbal medicines before anaesthesia the majority of parents will inform the anesthesiologist that their child takes an herbal medicine. The primary herbal medicine administered in our survey was Echinacea which has not been associated with any adverse events during anesthesia.

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CEREBRAL OXYGENATION DURING ACUTE NORMOVOLEMIC ANEMIA IN RATS.

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INTRODUCTION

Cerebral hypoxia may be responsible for the cognitive impairment observed with acute and chronic anemia in humans [1-2]. This study tests the hypothesis that severe acute normotensive normovolemic anemia causes cerebral hypoxia *in vivo*.

METHODS

Experiments were performed in concordance with the Animal Care and Use Committee. Anesthetized male Sprague Dawley rats (isoflurane 1-2%), were ventilated to maintain normoxia and normocapnia. Tail artery and jugular vein cannulae provided vascular access for hemodilution and measurement of mean arterial blood pressure (MAP). Bilateral burr holes were trephined at the level of the bregma, and brain temperature and oxygenation ($P_{Br}O_2$) probes (LICOX, GMS) were inserted 6-8 mm into the caudate nucleus using stereotaxic coordinates. A laser doppler flow probe (Transonic) measured contralateral cerebral blood flow (CBF). Hemoglobin concentrations were determined by co-oximetry (Radiometer). Anemia was induced by performing acute normovolemic hemodilution (ANH), simultaneously exchanging 30 $ml \cdot kg^{-1}$ of blood with an equal volume of pentastarch (Dupont) over 10 minutes (n=7). Animals were monitored for another 40 minutes, prior to sacrifice by anaesthetic overdose. Controls did not undergo ANH (n=6). Comparisons between and within groups were performed using Wilcoxon rank sum and signed rank tests, respectively (mean ± SEM).

RESULTS

ANH reduced the hemoglobin concentration from 126.9 ± 7.2 to 51.0 ± 1.2 $g \cdot L^{-1}$ ($p<0.003$). MAP did not change significantly from baseline (67.8 ± 2.6 mmHg), following ANH. Cerebral $P_{Br}O_2$ decreased from 17.3 ± 4.1 to a minimum of 14.4 ± 4.1 mmHg ($p< 0.01$), but returned to baseline 10 minutes after completion of ANH. The recovery of $P_{Br}O_2$ coincided with an increase in CBF from 39.5 ± 5.5 to 60.0 ± 7.0 $ml \cdot min^{-1} \cdot 100\ g^{-1}$ after ANH ($p< 0.001$). No significant changes were observed in controls.

CONCLUSION

Induction of severe normotensive, normovolemic anemia caused a transient fall in cerebral oxygenation. Rapid return of $P_{Br}O_2$ to baseline was associated with a substantial increase in CBF, suggesting the existence of a highly efficient mechanism for protecting cerebral oxygen delivery. Preliminary RT-PCR data suggest that this increase in CBF may be mediated by neuronal nitric oxide synthase.

(Supported by the Canadian Anesthesiologists' Society, JP Bickell Foundation, PSI)

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IMPROVING CAUDAL ANALGESIA FOR URETERAL RE-IMPLANTATION SURGERY

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INTRODUCTION

The single injection of local anesthesia, caudally, does not provide adequately prolonged analgesia for ureteral re-implantation convalescence. Postoperative epidural analgesia is both labor intensive and costly[1]. This is a report of success with an alternative approach which has reduce hospital stay and cost.

METHODS

With institutional approval, 14 consecutive children having simple unilateral ureteral re-implantation surgery are reported. All children were ASA I or II. Each child received a general anesthetic using sevoflurane, nitrous and oxygen only. 1 ml/kg of 0.1% ropivacaine was injected caudally prior to surgical incision. An ilio-inguinal nerve block and infiltration of the bladder trigome with 0.1% ropivacaine was done by the surgeon during surgical closure. The caudal was repeated with ½ the original dose for surgery lasting more than 3 hours. Acetaminophen, 35mg/kg PR, ketorolac, 0.5mg/kg IV, and droperidol, 10µg/kg IV, were given at emergence. Standardized does of acetaminophen, PR and ketorolac, IV, were given at regular intervals thereafter. Morphine, IV, was offered for breakthrough pain and was the only drug offered on a PRN basis. Nausea was treated with odansetron. The average length of stay was compared to historical controls using continuous epidural analgesia at our institute.

RESULTS

The mean patient age was 4.8 years. The mean dose of morphine for the entire hospital stay was 1.8 mg./patient. All children were able to drink and eat on postoperative day 0. All children were discharged on the morning of postoperative day 2. Historical data for the same surgery using epidural analgesia revealed a mean hospital stay of 4.2 days. There were no surgical or anesthetic complications.

DISCUSSION

Combing surgical local anesthesia infiltration, local anesthetic caudal analgesia, and non-narcotic analgesics, given at regular intervals, provides good postoperative care for children having simple ureteral re-implantation. Hospital stay, and resultantly, costs were substantially reduced.

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DO STEROIDS OR LIDOCAINE ATTENUATE THE LUNG INJURY INDUCED BY ASPIRATED HUMAN BREAST MILK IN RABBITS?

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INTRODUCTION

Aspiration injury may produce a severe lung injury that could progress to acute respiratory distress syndrome. Cellular components (e.g. neutrophils) play a central role in the pathogenesis of such an injury. Published studies have suggested that both steroids and lidocaine inhibit neutrophil chemotaxis and activation. A recent study demonstrated a significant improvement in alveolar – arterial oxygen gradients (AaDO2) in lidocaine treated rabbits when acidified saline was instilled into the lungs(1).The purpose of this study was to compare the effects of steroids and lidocaine on the severity of the lung injury after tracheal instillation of acidified human breast milk.

METHODS

After Animal Care Committee approval 18 adult rabbits were randomly assigned to one of three groups: control, steroids (30mg/kg methylprednisolone) or lidocaine (given 2mg/kg before injury and 2mg/kg/hr until end of the protocol). Anaesthesia was induced and maintained with halothane in oxygen by mask while a tracheostomy was performed. Ventilation was controlled using pancuronium to maintain a pCO2 of 35-40 mmHg. Treatments were administered before the lung injury. After stable blood gases were achieved, human breast milk (HBM) at pH 1.8 and volume 1.2 ml/kg was instilled into the trachea. AaDO2 and static compliances were measured at baseline and at 1 and 4 hours post injury. Blood was taken for cytokine analysis and white cell count. After 4 hours, the left upper lobe was isolated to measure the wet/dry ratio and the right lung was lavaged for albumin and white cell count. AaDO2 were compared using repeated measures ANOVA and SNK ($P<0.05$).

RESULTS

AaDO2 values increased significantly ($p<0.05$) and compliances decreased in all groups at 1 and 4 hours compared with baseline. At each measurement, the AaDO2 measurements were similar among the three groups.

DISCUSSION

On the basis of the AaDO2 evidence, neither steroids or lidocaine influenced the degree of lung injury induced by acidified breast milk. We conclude that neither prophylactic steroid or lidocaine attenuate the severity of lung injury after tracheal instillation of breastmilk.

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AADO2 (MMHG)

Group	*Baseline*	*1 Hour*	*4 Hour*
Control	190.6 ± 16.09	523.54 ± 97.28	588.8 ±20.20
Steroid	153.3 ± 28.30	572.5 ± 54.30	531.61 ± 110.4
Lidocaine	193.62 ± 51.47	482 ± 134.90	528 ± 176.72

Mean ± SD

METABOTROPIC GLUTAMATE RECEPTOR IN TRAUMATIC AXONAL INJURY IN THE RAT

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INTRODUCTION

Following SCI and TBI, secondary injury mechanisms promote axonal damage. We hypothesized that the mGluR1 and mGluR5 receptors are involved in these processes and sought to determine their role in post-traumatic axonal dysfunction.

METHODS

Western immunoblotting and immunohistochemistry were performed on rat corpus callosum following fluid percussion TBI. Compound action potentials (CAPs) were recorded in dorsal columns after SCI and corpus callosum brain slices following TBI. $[Ca^{2+}]_i$ fluorescence was measured in spinal cord slices in wild-type and mGluR1-/- mice.

RESULTS

Immunoblots showed increase ßAPP at 24hr, calpain activation at 30min and 24hr, and NF200 breakdown at 7d following TBI. Axonal electrophysiological recovery following *in vitro* SCI and TBI improved with Group 1 blockade using PHCCC. $[Ca^{2+}]_i$ imaging showed a reduction in post- traumatic $[Ca^{2+}]_i$ rises with PHCCC and mGluR1 gene deletion. Following TBI, Group 1 mGluRs blockade led to a CAP recovery of 77.1 ± 10.2% compared to 37.6 ± 5.4% in controls. mGluR1 blockade led to a recovery of 52.9 ± 7.4%, while mGluR5 blockade resulted in 63.2 ± 10.3% recovery. All results were statistically significant ($p<0.01$).

CONCLUSIONS

Our results suggest that Group1 mGluRs are involved in axonal dysfunction following neurotrauma. Combined mGlur1 and mGlur5 blockade leads to a better axonal recovery than blockade of each receptor alone.

ELECTROPHYSIOLOGY AND HISTOLOGY OF AXONAL INJURY IN THE RAT

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INTRODUCTION

Diffuse axonal injury (DAI) is associated with poor outcome following traumatic brain injury(TBI). In this study, we sought to determine and quantify the functional deterioration of axons following TBI and correlate this with histological markers of injury.

METHODS

Adult male rats underwent fluid percussion-induced TBI. Compound action potentials(CAPs) were recorded in the corpus callosum at 3h, 1d, 3d, 7d, and 14d following injury and compared to shams(n=5/group). Brains were harvested in shams, 3d, 7d and 14d(n=4/group), sectioned, and stained for APP and injured myelin using immunohistochemistry.

RESULTS

Corpus callosum axonal conduction was significantly reduced at 3h(48.8±3.3%), 1d(54.9±3.1%) and 3d(52.9±3.7%) compared to shams(100%). CAP recovered partially at 7d(85.1±4.9%), but deteriorated by 14d(53.2±7.8%). APP expression was significantly increased at 3d(count:1966.3±232.0), 7d(3052.5±265.1), and 14d(1156±218.8) compared to shams(61±13.9). Injured myelin was increased at 3d (count:664.3±194.1), 7d(721±87.8), and 14d(687.8±31.4) compared to shams(52.3±4.4). APP and injured myelin deposition tended to be distributed caudally and laterally.

CONCLUSIONS

This study is the first to report an evaluation of the degree and temporal pattern of axonal dysfunction following TBI. Reversibility was seen between 3d and 7d electrophysiologically but not histologically. This highlights the value and importance of combined functional and morphological approaches in the evaluation of experimental TBI, especially DAI.

MEASUREMENT OF EXHALED NITRIC OXIDE IN PRE-SCHOOL CHILDREN.

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INTRODUCTION

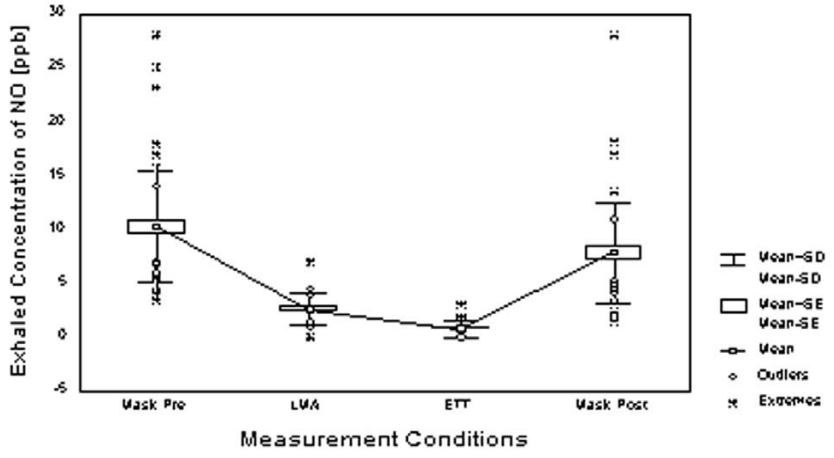
Elevated exhaled nitric oxide (eNO) levels have been demonstrated in inflammatory airway conditions e.g. asthma[1]. This study measured eNO in normal preschool children for whom there is little data available and in whom the prevalence of asthma high[2].

METHODS

Fifty children, 1-7 years old, undergoing elective surgery, excluding airway procedures, were recruited with parental written informed consent. Children with known respiratory disease or acute viral infections were excluded. Gas for eNO measurement was collected in a non-diffusing bag[3]: 1. Via the mask after inhalational induction of anaesthesia 2. Via endotracheal tube (ETT) or laryngeal mask airway (LMA), 3. during emergence. Measurement was off-line by chemiluminescent analyser (Sievers).

RESULTS

Mean eNO by mask was 10.23 (95%CI 8.7-11.1)ppb after induction and 8.35 (95%CI 5.9-10.8)ppb on emergence (NSD). Mean eNO for ETT group (n=25) was 0.75 (95% CI 0.4-1.1)ppb ($p<0.0001$ vs mask); mean eNO for LMA group (n=25) was 2.6 (95% CI 2.0-3.2ppb) which differed from mask ($p<0.0001$) and from ETT values ($p<0.0001$).



DISCUSSION

Most eNO is produced by the upper airway in healthy pre-school children. The lower airway constitutive eNO production is very low. The LMA does not completely isolate the upper airway and current mask collection techniques allow significant contamination of samples by sinonasal eNO production in young children.

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$F_{2\alpha}$-ISOPROSTANE FORMATION IN HIGH RISK PATIENTS DURING ACBP SURGERY

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INTRODUCTION

8-iso-Prostaglandin $F_{2\alpha}$ (8-iso-$PGF_{2\alpha}$), a marker of oxidant stress, may be a mediator of myocardial depression.[1,2] We wanted to characterize the perioperative generation of 8-iso-$PGF_{2\alpha}$ during ACBP surgery in two high risk patient groups, sp. patients with a preoperative history of diabetes mellitis (DM) or congestive heart failure (CHF).

METHODS

A pilot study of 30 patients scheduled for ACBP surgery was conducted. Anesthesia care was standardized to fentanyl 10-15 µg·kg / Isoflurane 0.05-2.0% in air/O_2. Hemodynamic monitoring included arterial and pulmonary artery catheterization. Central venous blood sampling was conducted at baseline, 30 min global ischemia, 10, 30, and 120 min reperfusion. Plasma 8-iso-$PGF_{2\alpha}$ levels were determined by radioimmunoassay (Caymen Chemical, Ann Arbor, MI). $p<0.05$ was considered significant.

RESULTS

Eight patients had a preoperative history of DM (Type I or II), 7 patients had CHF. 8-iso-$PGF_{2\alpha}$ increased significantly during ischemia in diabetic vs nondiabetic controls (n = 15)(288 ± 135 vs 176 ± 48 pg/ml; p=0.03). In contrast, 8-iso-$PGF_{2\alpha}$ increased significantly at 10-30 min reperfusion, in patients with a pre-operative history of CHF (183 ± 72 vs 100 ± 36 pg/ml; p=0.01). This elevation in 8-iso-$PGF_{2\alpha}$ persisted up to 120 min reperfusion. Mean 8-iso-$PGF_{2\alpha}$ remained elevated above baseline(141.8 ± 48 pg/ml vs 69.5 ± 12 pg/ml), in patients requiring two or more inotropes for postoperative hemodynamic stabilization (n=6; p=0.03). 8-iso-$PGF_{2\alpha}$ returned to baseline by 30 min reperfusion in patients not requiring inotropic support (n =5). No patient in this group had a preoperative history of DM or CHF.

DISCUSSION

Oxidant stress during ACBP surgery may contribute to postoperative myocardial depression. A preoperative history of DM or CHF may predict the increased production of a biologically active marker of oxidant stress, 8-iso-$PGF_{2\alpha}$. The timing and duration of increased 8-iso-$PGF_{2\alpha}$ generation, may indicate differences in the pathogenesis of postoperative myocardial depression in patients with DM and CHF. Further study, including the effect of antioxidant strategies for ACBP surgery in patients with DM or CHF, is required.

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COMPARING INR'S MEASURED DURING (ON A HEPARINASE-TREATED SAMPLE) AND AFTER CPB

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INTRODUCTION

To be able to predict, during cardiopulmonary bypass (CPB), the post-CPB INR, would allow for the early preparation for fresh frozen plasma (FFP) transfusion, bypassing the inherent delays caused by long laboratory turnaround times and the need to thaw the FFP.

METHODS

This study had institutional ethics approval. 158 adults undergoing CPB for cardiac surgery were studied. All patients signed a written informed consent. A sample of blood was taken during CPB and treated *in vitro* with heparinase (1). The INR on this sample was compared with the INR on a sample taken after CPB and i.v. protamine, using Bland and Altman plots (2) with the threshold set a priori ± 0.1 (INR). For each INR measured during CPB, the corresponding confidence interval (CI) (3) for the post-protamine INR was calculated.

RESULTS

INR measurements during CPB *vs.* after CPB were comparable. However, the limits of agreement exceeded our thresholds and increased with the magnitude of INR measured during CPB. During CPB, a laboratory INR of ≤ 1.5 or ≥ 1.7 suggests a ≥ 82% or ≥ 86% probability of not requiring or potentially requiring, respectively, post-CPB FFP transfusion (Table).

TABLE INR during CPB and expected post-CPB INR estimated from the Bland and Altman plot and percentage level of confidence if INR ≤ 1.5 or if INR ≥ 1.6.

INR during CPB	*Expected INR after CPB (95%CI)*	*Percentage level of confidence*	
		INR ≤ 1.5	*INR ≥ 1.6*
1.4	1.3 (1.1 to 1.5)	97.5	
1.5	1.5 (1.2 to 1.7)	82	
1.6	1.6 (1.3 to 1.9)		22.7
1.7	1.7 (1.3 to 2.1)		86.3
1.8	1.9 (1.4 to 2.3)		93.1
1.9	2.0 (1.5 to 2.5)		96.4

DISCUSSION

A significant minority of adult patients have excessively high post-CPB INRs, suggesting excessive coagulopathy that may contribute to post-CPB bleeding. Early use of FFP in these patients could minimize bleeding and transfusion requirements. We have found that INR measurements obtained from blood taken before weaning from CPB and treated *in vitro* with heparinase was associated with a high (≥ 82%) probability of whether or not FFP may be needed after CPB. This simple and inexpensive technique could potentially be adopted as a routine monitor of coagulation status during CPB.

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PROPOFOL ENHANCES ISCHEMIC TOLERANCE OF MIDDLE-AGED RAT HEARTS

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INTRODUCTION

Ageing is associated with increased myocardial susceptibility to ischemia-reperfusion injury (IRI) and enhanced oxidative stress. Myocardium becomes more vulnerable to IRI during middle-age [1]. We investigated the protective effect of propofol on IRI in isolated hearts of middle-aged rats.

METHODS

After ethical approval, we studied the hearts of young adult (10 weeks old, Y) and middle-aged rats (20 weeks old, M) assigned to propofol (P-Y, P-M) and control (C-Y, C-M) groups (n=6 each). We perfused hearts in Langendorff preparation with Krebs-Henseleit Solution(KH) at a constant flow rate of 10 ml/min (P-Y, C-Y) or 15 ml/min (P-M, C-M); with comparable initial perfusion pressures. After 10 min equilibration, we applied propofol (P-Y, P-M) for 10 min at 12 ug/ml before inducing 40 min global ischemia. During ischemia, saline(C-Y, C-M) or Propofol (P-Y, P-M) in saline was perfused through aorta at 60 µl/min. KH was perfused during 90 min of reperfusion in control groups. Propofol in KH was perfused at 12 µg/ml for the first 15 min of reperfusion, reduced to 5 µg/ml thereafter in P-Y and P-M groups. Left ventricular functions and coronary perfusion pressure was assessed. Perfusate was assayed for F_2- isoprostane after equilibration, during ischemia after the first 30 min period(T1) and during reperfusion. After 90 min reperfusion(T4), heart tissue isoprostane was measured in P-M and C-M.

RESULTS

We observed an increased latency to ischemic-contracture in P-Y, (24±4 vs C-Y, 15±2; C-M, 17.7±3 min, $P<0.05$) and a significantly reduced contracture after 35 min ischemia (LVEDP, 14±8 vs C-Y, 32±11; C-M, 29±9mmHg, $P<0.01$). No ischemic contracture was observed in P-M. There were significantly lower [isoprostane] in P-M and P-Y (24±5; 30±9pg/ml) than in C-M and C-Y (53±21; 63±26 pg/ml) at T1. At T4, the recovery of left ventricular developed pressure in P-M was greater than in P-Y ($P=0.012$); both were greater than in C-M and C-Y ($P<0.05$). Heart tissue free [isoprostane] was lower in P-M than in C-M (24±5 vs 37±6 pg/100 mg tissue, $P<0.05$).

DISCUSSION

Propofol enhanced ischemic tolerance of middle-aged hearts, by inhibiting the formation of isoprostane, marker of lipid peroxidation and potent vasoconstrictor.

REFERENCE

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DILTIAZEM REDUCES DEATH AND MYOCARDIAL INFARCTION AFTER NON-CARDIAC SURGERY

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INTRODUCTION

Calcium channel blockers (CCBs) may reduce cardiac complications following non-cardiac surgery. In the non-perioperative setting, CCBs have raised concerns[1,2]. We carried out a meta-analysis of all randomized controlled trials (RCTs) evaluating CCBs in non-cardiac surgery.

METHODS

Eligible studies were RCTs comparing CCBs to non-CCBs during non-cardiac surgery and reporting one of the following perioperative outcomes: mortality, myocardial infarction (MI), or myocardial ischemia. Organ transplant recipients, cerebral aneurysm repair, and supraventricular tachyarrythmia treatment were excluded. Studies were retrieved from MEDLINE and EMBASE with no language restriction: (Calcium channel blockers.exp) *and* (Postoperative complications.exp *or* Perioperative care.exp *or* Intraoperative complications.exp). Titles and abstracts were evaluated to exclude ineligible studies. The remaining studies were then read to determine eligibility. Bibliographies were surveyed to identify eligible studies. Study quality was rated using the scale of Jadad *et al*, a 5-point scale assessing blinding, randomization, and withdrawal documentation. Quality assessment and data abstraction were performed by both authors; disagreements were resolved by consensus. Treatment effects were estimated using odds ratios (OR) and the random effects model (Review Manager 4.1). In the calculation of summary estimates of treatment effects, this model places more emphasis on larger studies with more subjects and outcomes. Subsequently, subgroup analyses were performed for diltiazem, verapamil, and dihydropyridines.

RESULTS

Our search yielded 1813 studies. Eleven studies, encompassing a total of 947 patients, qualified for analysis. The Breslow-Day test for heterogeneity was negative. CCBs reduced myocardial ischemia (OR 0.36, 95% CI 0.13-1.01) and death/MI (OR 0.27, 95% CI 0.09-0.82). In subgroup analyses, diltiazem was associated with significant improvements in ischemia (OR 0.20, 95% CI 0.08-0.51) and death/MI (OR 0.26, 95% CI 0.08-0.87).

DISCUSSION

CCBs cause a significant reduction in perioperative cardiac complications. In subgroup analyses, diltiazem exerted a similar effect independently. An appropriately powered RCT is now justified among patients undergoing non-cardiac surgery.

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ULTRA-FAST-TRACK ANESTHESIA IN OFF-PUMP CARDIAC SURGERY: MAINTENANCE OF CORE TEMPERATURE IS MORE IMPORTANT THAN SPECIFIC ANESTHETIC TECHNIQUES

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INTRODUCTION

This study investigated whether operating room extubation could be achieved with a variety of anaesthetic techniques by maintaining core temperature during off-pump cardiac surgery (CABG).

METHODS

The study was designed as a prospective audit of 30 patients undergoing off-pump CABG. The goal was to maintain the patient's core temperature during surgery of more than 35.5°C by active temperature control. If extubation could not be achieved within 30 min after surgery (or core temperature was below 35.5), the patient was transferred to the ICU intubated and ventilated. Postoperative analgesia during the first 24 hours was achieved by either thoracic epidural analgesia (TEA)or patient controlled application of morphine (PCA). Data as means (SD).

RESULTS

Preliminary results of 17 patients (2 women, 15 men) of mean age of 59 yrs (8), weight of 83 (18) kg and an ejection fraction of 51 (11) % undergoing CABG with 3 grafts (0.7) during surgery of 140 (35) min are presented. Core temperature at extubation at 14 (8) min after the end of surgery was 35.9 (0.3) °C. Three patients were not extubated due to low core temperature. Intraoperative analgesia was achieved by fentanyl boli; sevoflurane (N=13) or isoflurane (N=4) was used to maintain a bispectral index between 40 and 60. No patient needed re-intubation. Postoperative analgesia was achieved by TEA of 0.125 % bupivacaine (N=6), adjusted according to the patient's pain score, after an initial bolus of 4-8 ml bupivacaine 0.125 % 15 min prior to extubation, or PCA (N=11, bolus 1 mg, lockout: 6 min). Pain scores postoperatively were comparably low in both groups (1.8 vs 1.4, first 24 h). First PO_2 and PCO_2 after surgery was 128 mmHg (36) and 43 mmHg (5) mmHg (FiO_2 = 100 %).

DISCUSSION

Preliminary results indicate that Ultra Fast Track anaesthesia can be achieved with conventional anaesthetic techniques. Maintenance of core body temperature is the most important task to allow operating room extubation.

CANADIAN SURVEY ON ANTICOAGULATION FOR CARDIOPULMONARY BYPASS

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INTRODUCTION

Heparin is commonly used for anticoagulation during cardiopulmonary bypass (CPB). A survey of cardiac anesthesiologists and perfusionists in Canada was carried out to identify practice patterns in management of anticoagulation during CPB.

METHODS

The survey instrument was developed by Leo Pharma Inc. with input from members of the Cardiovascular and Thoracic section of the Canadian Anesthesiologists' Society, and the Canadian Society of Clinical Perfusion. The survey instrument comprised 17 closed and open-ended questions. It was mailed to all members of both societies in the fall of 2001.

RESULTS

A total of 64 responses were received from cardiac anesthesiologists, and 105 responses were received from perfusionists. All used heparin as their primary agent for anticoagulation for CPB with dosage based on body weight (300-400 U/kg). All respondents used the ACT for monitoring anticoagulation and 14% of respondents used additional techniques (such as PTT). The route of heparin administration was reported to be peripheral by 9 respondents, central/peripheral by 4, and all others administered heparin centrally. Protamine was used universally to reverse the effects of heparin at the end of surgery. The target ACT after heparin reversal was baseline (72% of respondents), baseline +10% (22%), or baseline +20% (6%). When asked what agent is used for patients with heparin induced thrombocytopenia, 10% of respondents specified danaproid, 7% ancrod and 7% hirudin.

DISCUSSION

This survey has helped to describe and summarize the most common current anticoagulation practices of cardiac anesthesiologists and perfusionists in Canada. Although some variability exists between centers, practice patterns are similar among most hospitals.

Acknowledgements: This project was supported by Leo Pharma Inc.

COMPARISON OF INVASIVE AND NON-INVASIVE MAP MONITORING IN THE HEAD UP POSITION FOR MAXILLOFACIAL SURGERY DURING INDUCED HYPOTENSION.

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INTRODUCTION

Maxillofacial surgeries have the potential for significant blood loss.1,2 Various techniques such as induced hypotension and head elevation have been used to reduce blood loss.3 Of concern, is that non-invasive blood pressure monitoring may not detect differences in mean arterial pressure (MAP) between the supine and elevated head position during induced hypotension

METHODS

Following IRB approval, 11 ASA I-II patients undergoing elective LeFort I maxillary osteotomy ± mandibular advancement were enrolled. Under a standardized induced hypotension (MAP 60-65) general anesthesia protocol, MAP's were simultaneously determined non-invasively (Vitalert North American Drager 3200) and invasively (20G radial arterial line). 34 measurements were made in the supine position and 150 were made with the head elevated approximately 15 degrees. Statistical analyses included the paired T-test and intraclass correlation coefficient.

RESULTS

In the supine position, MAP was 65.53 ± 9.87, and 63.76 ± 9.53 for non-invasive and invasive pressures respectively. Mean difference was 1.76 ± 7.55, $p<0.182$. Single measure intraclass correlation was 0.6968. For the elevated head position, MAP were 63.95 ± 6.98 and 62.32 ± 7.36 for non-invasive and invasive MAP respectively. Mean difference was 1.63 ± 5.94, $p<0.001$. Single measure intraclass correlation was 0.6570.

DISCUSSION

Although there were statistically significant differences between invasive and non-invasive MAP in the elevated head position were observed, the clinical relevance of this difference is unclear. We propose that non-invasive MAP monitoring reflects can be safely used during induced hypotension anesthesia for maxillofacial surgery performed in the slight (15 degree) head up position.

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P-6 ACUPRESSURE DO NOT PREVENT EMESIS DURING CESAREAN SECTION

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INTRODUCTION

Nausea and vomiting are major adverse effects during Cesarean section (CS) under spinal anesthesia (SA). These may distress the parturient and decrease her overall satisfaction with anesthesia. Stimulation of P-6 (Neiguan) acupoint is a traditional Chinese acupuncture modality used for antiemetic purpose, and it has been found to be effective.[1,2] The aim of this study was to evaluate the antiemetic effect of P-6 acupressure in parturient during CS under SA.

METHODS

The Institutional Review Board of our hospital approved the protocol and prior informed consent was obtained from each parturient. Simple size was predetermined. We expected a 30% difference in the incidence of nausea and vomiting between groups.[1] The ? error was set at 0.05 (two-sided) with a power of 0.9. The projected sample size was 52 patients in each group. One hundred and ten parturients, ASA I to II physical status, aged between 23 and 40, scheduled for elective CS were enrolled in the study. Those who had previous carpal tunnel syndrome, or those who had experienced nausea or vomiting within 24 hrs prior to CS were excluded from the study. Parturients were prospectively randomized *via* an envelope system into one of two groups. No premedication was given, expect for 15 ml oral antacid within 1 hr before surgery. Before 30 minutes prior to SA, the acupressure group (n = 55) received Sea Band bilaterally on P-6 acupiont; the control group (n = 55) received placebo wristbands at the same point.[2] All parturients received bupivacaine SA with dose ranging from 12-14 mg for CS. Vital signs, nausea and vomiting, were evaluated intraoperatively by an independent anesthetist who were blinded to all the parturient groups. Statistical analyses were done using unpaired Student's *t*-test, the Chi-square test and Fisher's exact test. A p-value < 0.05 was considered statistically significant.

RESULTS

There were no statistically significant differences in maternal demographics. Incidences of nausea were 64% (acupressure group), 71% (control group); and incidences of vomiting were 22% (acupressure group), 27% (control group).

DISSCUSSION

In conclusion, acupressure on P-6 acupoint bilaterally was ineffective in preventing emesis during CS under SA.

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UNIPORT VS MULTIPORT CATHETERS FOR LABOUR: A META-ANALYSIS

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INTRODUCTION

The purpose of this meta-analysis is to determine whether multiport (M) or uniport (U) epidural catheters results in the best analgesia with fewest complications when used for labour.

METHODS

We conducted a computerized search from Jan 1, 1985 to Sept 30, 2001 of MEDLINE, EMBASE, and the Cochrane for RCT's in English that compared M and U epidural catheters of the same material in labouring or c/s patients. We used the following text terms (with alternate spellings) in the search: uniport, multiport, end hole, terminal hole catheter, single end hole and epidural catheter. Subject terms included: obstetrical anaesthesia, neuraxial anaesthesia and catheters. We also hand searched appropriate journals for manuscripts and published abstracts. We reviewed reference lists of all retrieved articles. We rated eligible studies for quality on a validated 5 point scale, a score of <3 was poor quality. The search for articles, data extraction and quality scores were done independently by both authors and differences resolved by consensus. The primary outcome was inadequate analgesia. Secondary outcomes were unilateral block, missed segments, catheter resiting, and IV catheter placement. We used chi-square to detect heterogeneity and combined data with random effects modeling. We calculated the odds ratio (OR) and 95% CI, an OR<1 favoured U.

RESULTS

(Table). We found 5 trials (N=2231), 2 were of high quality. There was significant heterogeneity.

DISCUSSION

The incidence of inadequate block was higher with U. There was no difference in resiting in spite of more IV placements in M. Heterogeneity was caused by differences in practice between studies. Variations in efficacy and complication rates are dependent on practice patterns and catheter design.

REFERENCES

From MS

TABLE

Outcome	*Uniport n/N*	*Multiport n/N*	*OR (95% CI)*	*P*
Inadequate analgesia	270/1101	151/1077	1.9(1.2,3.1)	0.005*
Unilateral Block	137/852	68/829	1.9(0.88,4.1)	0.1
Missed Segment	52/696	24/682	2.1(0.96,4.5)	0.06
Catheter Manipulation	114/242	79/245	1.8(1.2,2.7)	0.003*
Catheter Replacement	67/944	44/949	1.9(0.78,4.5)	0.2
Blood in catheter	50/401	83/874	0.6	0.04*

EPIDURAL ROPIVACAINE VS BUPIVACAINE FOR LABOUR: A META-ANALYSIS

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INTRODUCTION

The purpose of this meta-analysis is to determine whether ropivacaine (R) reduces the incidence of adverse obstetrical outcome and maternal motor block compared to bupivacaine (B).

METHODS

RCTs comparing epidural B to R for labour analgesia were sought using a computerized search of MEDLINE, EMBASE, the Cochrane library and Science citation index from 1966 to Jan 1, 2001. Search terms included: obstetrical analgesia, epidural analgesia, labour analgesia, extradural analgesia, ropivacaine and bupivacaine. We conducted a hand search of the relevant journals and supplements for the previous 5 yrs. We inspected the bibliographies of retrieved articles. Researchers in this area were contacted for additional data. We included RCTs in healthy parturients that compared R to B, with or without identical additives in each group. We excluded studies that used different additives. Eligible studies were rated for quality on a previously validated 5 point scale–studies score $\geq$ 3 were "high quality". The literature search. data extraction and quality scores were done independently by 2 of the authors with disagreements resolved by consensus. The primary outcome was the incidence of c/s. Other outcomes included operative vag delivery, spontaneous delivery, motor block, and analgesic quality. We used Chi square to detect heterogeneity. The data were combined using a random effects model. ORs that did not include 1.0 in the 95% confidence interval were considered statistically significant.

RESULTS

There were 18 studies with 1557 patients. There was no significant heterogeneity in the primary outcome. All published studies were of high quality. There was no difference in mode of delivery or excellent analgesia (Table). More patients in the R group that had no detectable motor block.

DISCUSSION

The use of R for labour analgesia does not change the incidence of adverse obstetrical outcomes. Although R is as effective as B as an analgesic, R appears to reduce the incidence of detectable motor block and therefore may be preferable in some circumstances.

REFERENCES

available from SH.

TABLE

Outcome	*Rop (n/N)*	*Bup (n/N)*	*OR (95% CI)*	*P*
Caesarean	113/785	124/772	0.87 (0.65,1.2)	0.3
Inst Vag Del	196/737	211/726	0.82 (0.61,1.1)	0.2
Spont Del	442/769	407/754	1.17(0.95,1.4)	0.6
No motor block	424/620	342/599	2.0(1.1,3.5)	0.02*

SHIVERING POST EPIDURAL ANESTHESIA: DIFFERENT DOSES OF INTRAVENOUS CLONIDINE

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INTRODUCTION

Shivering following epidural anesthesia is a frequent complication[1], and is noted as a particular problem in some countries. Deleterious effects include significant increases in myocardial oxygen consumption, increases in metabolic rate and cardiac work, and possible disruption of surgical repair. The treatment for shivering in the pregnant patient under epidural anesthesia for C-section represents a challenge due to the need to maintain mean arterial blood pressure, which has a direct effect on placental perfusion pressure and fetal wellbeing. This study determined the efficacy of different doses of clonidine for the treatment of shivering after epidural anesthesia for C-Section.

METHODS

Of 56 eligible patients, 32 demonstrated shivering after epidural anesthesia for C-section. They were randomly assigned to two groups. Group 1 received intravenous clonidine 0.5 μg/kg (n=16) and Group 2 received 1 μg/kg (n=16). The hemodynamic variables (SBP, DBP, MAP and HR), core temperature, onset time of shivering and the time to disappeareance of shivering were recorded. The study was approved by the institution's ethics review committee and patient consent was obtained.

RESULTS

In Group 2 the shivering ceased in a mean time of 4 ± 3.14 minutes. In Group 1 shivering lasted 6.56 ± 2.58 minutes; the difference was statistically significant ($p<0.05$). There were statistically significant differences in hemodynamic variables, but these were not clinically significant.

DISCUSSION

The incidence of shivering in our sample was 57%, which is consistent with other reports. Both doses of clonidine given intravenously were effective in the treatment, and neither caused hemodynamic side effects that could compromise utero-placental perfusion. Intravenous clonidine 1 μg/kg resulted in a decrease in faster cessation of post anesthetic shivering under epidural anesthesia for C-section, with no reappearance of shivering.

REFERENCE

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INCIDENCE OF HYPOTENSION AFTER SPINAL FOR CESAREAN SECTION

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INTRODUCTION

Numerous studies have addressed the impact of fluid preloading on the incidence of hypotension after spinal for C/S[1]. The results have been highly variable and a number of methodological shortcomings have been identified[1] such as: Definition of hypotension used[1,2]; place where baseline BP was established (stress response in OR), crystalloid to colloid ratio[3], failure to delineate preload-spinal interval[2], prophylactic vasopressor use, reliance on single hypotensive BP readings, lack of standardized spinal dose and injection rate, and lack of adequate sample size[1]. This study was designed to tightly control these variables and determine if the incidence of hypotension after spinal for C/S is as high as the literature suggests.

METHODS

After institutional ethics approval 160 healthy women were randomized in a controlled double blind fashion to receive pentastarch 10ml/kg or NS 30ml/kg prior to spinal for C/S. Sample size was based on a literature review[1]. An average of 3 BPs were taken in the holding area to establish the baseline. Hypotension was defined as SBP<90mmHg or <70% of baseline or symptoms. Vasopressors were only given after two successive hypotensive readings or symptoms. Preload-to-spinal interval was <30 min. Spinal dose and injection rate were standardized.

RESULTS

Interim analysis of 80 women enrolled to date indicates the incidence of hypotension is not statistically different between the groups (A=32.5% B=20.0% p=0.155). The groups are demographically similar.

DISCUSSION

This is the first study that tightly controls all of the methodological variables discussed above. The incidence of hypotension in the two groups was similar and is less than in other studies that compare crystalloids to colloids[1]. Close attention to these methodological variables may have reduced the observed incidence of hypotension in this study. Complete data collection is necessary to confirm these interim observations.

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EXPECTANT MANAGEMENT, PDPH AND LENGTH OF HOSPITAL STAY

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INTRODUCTION

Prophylactic extradural patching to prevent postdural puncture headache (PDPH) has been advocated after large gauge dural puncture (DP).[1] In many institutions, however, management is expectant. This matched case-control study examined the impact of expectant management on length of hospital stay (LOS) in parturients who developed PDPH vs women with uncomplicated epidurals.

METHODS

After REB approval, our perinatal database was used to identify ASA I-II parturients with recognized unintentional DPs during epidural placement (1996-2001) and otherwise uncomplicated deliveries. Women with recognized DPs who developed PDPH were matched by parity, mode of delivery (vaginal /instrumental) and admission date(<l yr) with women who had uneventful epidural placement/delivery. Exclusion criteria included prematurity, multiple gestation, significant maternal/neonatal illness, NICU admission or post-delivery complications. All charts were independently reviewed by 2 authors to identify cases with PDPH, to exclude PDPH in controls and to confirm study eligibility. Outcomes were assessed only after patients were entered into the study. Primary outcome was LOS (hrs) from birth to patient discharge (or last recorded time). Secondary outcomes included # nights in hospital, # of EW visits related to PDPH, time of EBP (pre vs post-discharge), and blood volume used. LOS and # of nights in hospital were assessed using a 2-tailed paired t-test.

RESULTS

106 charts were reviewed to find 26 cases and 26 controls with firm discharge times found for 23 cases/controls. Demographics did not differ significantly between groups. LOS in hospital in PDPH cases was increased by a mean of 17 ± 23 (SD) hours (95%CI,8,26; p=0.0012) and # of nights in hospital was increased by a mean of 0.62 nights (95%CI,0.26,0.98,p=0.0027). 73% (19/26) of cases received at least l EBP (mean blood volume of 18.7ml). 68%(13/19) of cases had EBPs done on the ward. 11 cases visited the EW 14 times for evaluation of PDPH with 54% receiving at least 1 EBP.

DISCUSSION

Women developing PDPH after recognized large gauge DP and expectant management have a significant increase in hospital LOS compared with women with uncomplicated epidurals as well as a large number of EW visits for evaluation/treatment. Prophylactic therapy warrants further investigation.

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DURAL TRAUMA AND CSF LEAK AFTER EPIDURAL NEEDLE PUNCTURE

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INTRODUCTION

The effect of epidural needle design, angle of puncture and bevel orientation on dural trauma patterns and CSF leak was examined.

METHODS

Following REB approval, human cadaveric lumbar dura mounted on a cylindrical model of the dural sac, was pressurized to 15cm with artificial CSF(left lateral decubitus pressure) and dura punctured with epidural needles, in randomized order. The pressure was then raised to 25cm(labor/semi-sitting pressure) and leak measured over 15minute intervalsx4. A micromanipulator ensured precise needle angle and bevel orientation at the time of puncture. Dural trauma patterns were examined using Scanning Electron Microscopy (SEM). Dura from the same cadaver was used for every comparison. Part1 addressed the effect of gauge/tip design using 6 epidural needles:17GHustead;17GTuohy;18G Special Sprotte; 18G Crawford; and 20GTuohy(10 cadavers). Punctures were made at 90° to the long axis of the dura, bevel parallel, where applicable. Part2: The effect of needle angle (30 vs 90°) was examined for each of 2needle types: 18GTuohy (bevel parallel, 10 cadavers) and the 18G Special Sprotte Needle (6cadavers). Part3: The effect of bevel parallel vs. perpendicular bevel orientation was examined using the 18GTuohy (10 cadavers). Statistical analysis using RMANOVA was blinded with $p<0.05$ considered significant.

RESULTS

We found a large(3-5 fold) statistically significant reduction in CSF leak/15 minute interval between the 20GTuohy and each of the other needles examined in Part1 (reported as mean gm±SD per 15minutes; 1gm=1ml; p values=comparison with the 20GTuohy) :Hustead (516 ± 319, p=0.002); 18GTuohy (420 ± 191, p=0.002);17G Tuohy (405 ± 209, p=0.002); 18G Special Sprotte (359 ± 208, p=0.016);18G Crawford (356 ± 121, p=0.0001); 20GTuohy (99.5 ± 112).

Part 2:CSF leak: 18GTouhy 30° 401 ± 135 vs 485 ± 215 at 90° (p=0.31). Leak :18G Special Sprotte 30° 408 ± 205 vs 401 ± 208: at 90° (p=0.96). Part3: Leak after puncture with 18G Tuohy bevel perpendicular 367 ± 119,vs 485 ± 216 bevel parallel (p=0.12).

DISCUSSION

SEM showed characteristic dural trauma patterns for each needle type, orientation and angle of puncture. Results suggest statistically significant reduction in CSF leak with a 20G Tuohy needle compared with larger needles. Large reductions in leak were found with the Tuohy at 30° vs 90° (not statistically significant). Angle of puncture made no difference in leak for the Sprotte epidural needle. Large reductions in leak, not achieving statistical significance were found with a perpendicular Tuohy bevel orientation compared to parallel orientation.

EFFECT OF NEURAXIAL ANALGESIA ON LABOR PROGRESS: A META-ANALYSIS

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INTRODUCTION

Epidural analgesia is associated with a higher incidence of instrumental delivery when compared with iv opioids.(1) This meta-analysis examined the impact of low dose mobile vs high dose epidural analgesia on labor progress with a focus on instrumental delivery.

METHODS

We identified relevant randomized trials using independent searches of computerized databases(PreMEDLINE;MEDLINE; EMBASE; COCHRANE Library; Dissertation Abstracts on Disk) from 1980-Dec 4,2001(all languages, limited to human only). Search terms included: epidural;analgesia;obstetric; labor; bupivacaine; combined spinal epidural and mobile. References of retrieved articles, chapters, abstracts of major conferences, high impact journals and publications of authors of major articles were searched. An attempt was made to locate relevant unpublished studies. "Low dose mobile"(LD) was defined a priori as any low dose initiation (CSE of any type or epidural initiated with bupivacaine <0.125%)followed by a LD maintenance solution containing bupivacaine <0.125%. "High dose"(HD) was defined as initiation / maintenance of analgesia with a solution containing ≥ 0.125% bupivacaine. The primary outcome was instrumental delivery. Secondary outcomes included:pruritus; maternal hypotension; nausea; neonatal Apgar scores <7 at 5minutes.

We included all RCTs comparing LD vs HD analgesic regimens, reported mode of delivery, and used bupivacaine as the sole local anesthetic. 2 reviewers independently assessed study relevance, quality and performed data extraction. Agreement was assessed (kappa) and differences resolved by article re-review/consensus.

RESULTS

4 trials(2-5)enrolling 2092 patients were found. Statistical heterogeneity was not found. Pooled odds ratios(OR) and 95%CI were calculated using a random effects model. Results are in the table.

DISCUSSION

In the LD group, odds of instrumental delivery was significantly reduced while spontaneous vaginal delivery was increased. Cesarean section did not differ between groups. Pruritus was more likely in the LD group. No differences were found in hypotension, nausea, or neonatal Apgar scores at 5minutes.

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Outcome	*Low Dose n/N*	*High Dose n/N*	*OR (95% CI)*	*P value*
Instrumental delivery	371/1344	268/748	0.69(0.53,0.92)	0.01*
SVD	665/1344	323/748	1.3(1.1,1.6)	0.003*
C/Section	308/1344	157/748	1.1(0.86,1.3)	0.51
Pruritus	261/589	23/342	10.39(6.6,16.4)	0.00*
Nausea	17/589	10/342	1.2(0.52,2.9)	0.65
Decreased BP	20/589	11/340	1.63(0.75,3.6)	0.22
5min Apgar <7	2/1303	5/708	1.83(0.72,4.6)	0.20

BUPIVACAINE VS. ROPIVACAINE FOR SPINAL ANESTHESIA FOR C-SECTION

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INTRODUCTION

The dosage and efficacy of spinal ropivacaine for Cesarean delivery has not been well defined. Hyperbaric ropivacaine (18mg) appears to provide adequate analgesia for cesarean section (1). However, the use of low-dose isobaric ropivacaine for spinal anesthesia for Cesarean section has not been previously reported. The purpose of this study was to evaluate the efficacy and safety of spinal anesthesia with 1% isobaric ropivacaine and to compare the results obtained to 0.75% hyperbaric bupivacaine controls.

METHODS

This on-going analysis received Institutional Review Board approval for the review of medical records of all Cesarean section patients from the previous one-year period (2001).

Patients were stratified into two groups: isobaric ropivacaine 1%, and hyperbaric bupivacaine 0.75%. Data collected included: spinal anesthetic dose, duration of procedure, adjuncts to the spinal anesthetic, intra-operative adjunctive analgesics, episodes of hypotension requiring treatment, side effects requiring treatment and duration of post-op analgesia. The data was analyzed using Chi-square, and Students T-test where appropriate, with a P value of ≤ 0.05 considered statistically significant.

RESULTS

Demographic data were similar in both groups. Onset time, adjunctive intraoperative analgesia, intraoperative ephedrine use, time to first request for postoperative analgesia, total postoperative analgesic requirement and side effects requiring treatment, did not differ between the two groups.

	Intra-op ephedrine use # of patients	*Adjunct intra-op analgesia # of patients*	*Time to first analgesic request (min)*	*Nausea requiring treatment # of patients*	*Pruritis requiring treatment # of patients*
Group 1 (bupivacaine)	37% (19/51)	20% (10/51)	742+495	27% (14/51)	27% (14/51)
Group 2 (ropivacaine)	35% (9/26)	8% (2/26)	927+477	23% (6/26)	35% (9/26)

DISCUSSION

This analysis showed no significant difference between the two studied groups. The finding that the intra-op adjunctive analgesic requirement and the time to first post-op pain medicine request did not differ between the groups was especially surprising considering the apparent large disparity between the doses of the spinal local anesthetics used. Contrary to the dose-finding study of Khaw (2), our analysis shows when combined with morphine and fentanyl much lower doses of ropivacaine may be effective for anesthesia for Cesarean section.

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INTRATHECAL FENTANYL AS ADJUNCT FOR SPINAL ANESTHESIA FOR C-SECTION

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INTRODUCTION

The aim of this study was to determine whether the addition of fentanyl to a bupivacaine/morphine (B/M) solution offers clinical benefit to patients receiving spinal anesthesia for Cesarean section. While some of the previous studies suggest that intrathecal fentanyl produces acute spinal opioid tolerance and increases postoperative opioid requirements (1), other studies suggest that patients receiving intrathecal fentanyl have faster block onset time, improved intraoperative analgesia and decreased perioperative nausea and vomiting (2,3).

METHODS

Following IRB approval, and patient consent, 30 healthy parturient undergoing elective Cesarean section were randomized to two groups. Group 1 received 12 mg of bupivacaine, 0.25 mg of morphine and 25 µg of fentanyl; whereas, Group 2 received 12 mg of bupivacaine, 0.25 mg of morphine, and 0.5 ml of normal saline (placebo), for spinal anesthesia. Onset time, adjunctive intraoperative analgesia, time to first request for postoperative analgesia, total postoperative analgesic requirement and side effects requiring treatment, were recorded and compared between the two groups (Table 1). Data are expressed as mean ± SD, results were analyzed using Student t-test, and a p-value < 0.05 was considered significant.

RESULTS

Demographic data were similar in both groups. Onset time, adjunctive intraoperative analgesia, time to first request for postoperative analgesia, total postoperative analgesic requirement and side effects requiring treatment, did not differ between two groups.

	Onset time to T4 (sec)	*Adjunct intra-op analgesia # of patients*	*Time to first analgesic request (min)*	*Post-op analgesia Ketorolac (mg/12h)*	*Nausea requiring treatment*
Group 1 (B/M/F)	214 ± 81	0 (15) 0%	891 ± 451	24 ± 30	7 (15) 46%
Group 2 (B/M)	214 ± 85	0 (15) 13%	929 ± 503	18 ± 24	7 (15) 46%

DISCUSSION

This randomized double blind study failed to show any clinical benefit of adding fentanyl to B/M for spinal anesthesia for Cesarean section. Furthermore, we found no evidence of acute opioid tolerance related to the addition of intrathecal fentanyl. It appears therefore, that intrathecal fentanyl, in the dose utilized in this study, exhibits no positive or negative effect on bupivacaine/morphine spinal anesthesia for Cesarean section.

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ACOUSTIC REFLECTOMETRY CHARACTERIZATION OF 200 ADULT INTUBATIONS

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INTRODUCTION

Acoustic reflectometry (AR) allows the construction of a 'one-dimensional' image' of a cavity, such as the airway or the esophagus. For an intubated patient, the reflectometric area-distance profile consists of a constant cross-sectional area segment (length of endotracheal tube), followed either by a rapid rise in the area beyond the carina (endotracheal intubation) or by an immediate decrease in the area (esophageal intubation).

METHODS

With Institutional Review Board approval, two hundred (N = 200) adult patients were induced and intubated, without restrictions on the anesthetic agents or airway adjunct devices used. A two-microphone acoustic reflectometer was used to determine whether the breathing tube was placed in the trachea or esophagus. A blinded reflectometer operator, seated a distance away from the patient, used the acoustic area-distance profile only to decide where the tube was placed. End-tidal capnography was used as the 'gold standard'.

RESULTS

Out of 200 tracheal intubations confirmed by capnography, the reflectometer operator correctly identified 198 correctly (99 % correct tracheal intubation identification rate). Two patients were false positives, i.e., patients with a tracheal intubation interpreted as an esophageal intubation. A total of fourteen (14) esophageal intubations resulted, all correctly identified by reflectometry, for a 100 % esophageal intubation identification rate. In twenty patients, the time for the reflectometer operator to reach a cognitive decision as to correct tube placement was measured: for reflectometry, 1.60 ± 0.39 sec; for capnography, 9.65 ± 1.76 sec, after three successive CO_2 waveforms.

DISCUSSION

Acoustic reflectometry is a rapid, non-invasive method by which to determine whether breathing tube placement is correct (tracheal) or incorrect (esophageal). Reflectometry determination of tube placement may be useful in cases where visualization of the glottic area is not possible and capnography may fail, as in cardiac arrest patients. Acoustic reflectometry may also have a more general use as an imaging device in the diagnosis and treatment of airway emergencies.

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THE LMA AUDIO MONITOR – A NEW DEVICE FOR PATIENT MONITORING

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INTRODUCTION

The Laryngeal Mask Airway (LMA) is a well-known method of clinical airway management in world-wide use. This report describes the design and preliminary evaluation of a new medical instrument for auscultatory monitoring which attaches to the LMA cuff inflation line. The device is essentially a new form of electronic stethoscope, and is intended for qualitative cardiorespiratory monitoring during general anesthesia when the LMA is in use.

METHODS

A special leak-free microphone assembly was designed, fabricated and pressure tested to 300 mmHg using a miniature electret microphone, a shortened 3 ml plastic syringe with a Luer lock end, and using epoxy to permanently secure the microphone into the barrel of the syringe. A high-gain battery-operated monaural audio amplifier was used to amplify the microphone signal. The amplifier output was then connected to a headset for listening as well as to a digital audio recorder (in some cases). Following institutional approval, the device was then used in a series of ten patients, where the unit was hooked up to the cuff inflation line of the LMA after standard LMA cuff inflation.

RESULTS

In all cases attaching the device to the pilot line of the LMA was easy and lead to no problems. Also, in all cases clearly identified breath sounds were heard that were felt to be suitable for qualitative respiratory monitoring. It was observed that with normal breathing, the sounds are regular and smooth. In one patient who developed partial airway obstruction with the LMA in situ, the sounds become chaotic, irregular and intense. Sample recordings are available at http://lmamonitor.homestead.com.

DISCUSSION

The LMA Audio Monitor allows anesthesiologists to hear intraoperative laryngeal acoustic emissions, and works with all forms of the LMA. Note that the unit is battery-operated and that there is no direct connection of the device to the patient, eliminating all risk. The expected value of the device is that (with experience) anesthesiologists will be able to interpret the obtained sounds to detect various normal and pathological clinical states. These include states such as normal breathing, tachypnea, phonation, partial airway obstruction, wheezing, and ventilation leaks with positive pressure ventilation.

RESERVE NITROUS OXIDE E-CYLINDERS: ARE THEY NECESSARY?

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INTRODUCTION

Nitrous oxide has been an important component of anesthesia for many years. However, its use may be declining because of increasing popularity of total intravenous anesthetics and new volatile agents. In addition, adverse effects of nitrous oxide are a concern. The goal of this study was to determine the current level of use of nitrous oxide by anesthesiologists; to consider the requirement for reserve nitrous oxide E-cylinders on the anesthesia machine; and to estimate the financial impact of maintaining nitrous oxide reserve cylinders.

METHODS

A questionnaire was distributed randomly to ninety anesthesiologists in the Maritime provinces. The questionnaire evaluated the frequency of use of nitrous oxide E-cylinders, the level of maintenance of the reserve cylinder, and the importance of reserve nitrous oxide E-cylinders in the operating room, as perceived by anesthesiologists. Expiry and filling dates of the reserve cylinders in two Maritime tertiary hospitals were noted. The financial benefit of removal of reserve nitrous oxide cylinders from the anesthesia machines was estimated.

RESULTS

Sixty-nine of ninety questionnaires (77%) were completed. Forty-eight (70%) respondents use nitrous oxide for more than half of their cases. Piped nitrous oxide is the preferred delivery system. Forty-one (59%) respondents would use the reserve nitrous oxide supply if the piped supply failed. However, sixty-two (90%) respondents would not be concerned if the reserve cylinders were removed from their anesthesia machines. Forty-two (61%) respondents never check the reserve nitrous oxide E-cylinder. The annual cost of reserve nitrous oxide E-cylinders is less than $1000.00 for each of the centres studied. No cylinder was found to be past its expiry date.

DISCUSSION

Our data suggests that the majority of Maritime anesthesiologists continue to use nitrous oxide routinely. Most anesthesiologists feel that the presence of the reserve nitrous oxide E-cylinder on the anesthesia machine is not essential. All reserve cylinders are up to date at the centres, despite the fact that they are neither used nor properly checked by anesthesiologists. Removal of nitrous oxide E-cylinders from anesthesia machines would be a simple and modest way to help reduce cost, labour and storage without jeopardizing patient safety.

MEDICAL STUDENTS' APPROACH TO SIMULATED CRITICAL EVENTS

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INTRODUCTION

The purpose of this study was to examine how medical students approach the management of critical events using a high-fidelity patient mannequin

METHODS

The Undergraduate Education Committee developed ten scenarios based on the objectives of the anesthesia undergraduate curriculum. Performance protocols were designed by asking fifteen faculty involved in undergraduate education to propose expected performance items at a level appropriate for medical students. These items consisted of essential management maneuvers as well as critical omissions. Items endorsed by less than 20% of faculty were deleted. Each item was weighted according to the number of faculty listing the response with a possible total score of 100. These protocols were used to score the students' videotaped performances. Incorrect responses were subtracted from correct responses and a negative score was possible if students committed multiple management errors. Mistakes were categorized into management omissions and critical omissions.

RESULTS

Performance data of 165 students were analyzed with some students having managed more than one case. Mean performance scores for the 10 scenarios was 47.39 (Range–24.44 to 79.88). The management of ventricular tachycardia was associated with the lowest scores and the management of postoperative hypotension in the recovery room associated with the highest scores. Common management omissions (% occurrence) were failure of adequate airway management (44%), failure to check blood pressure (38%), and failure to increase FiO_2 (33%). Students reliably performed the following during critical event management: air entry check (92%), administration of intravenous fluids (89%), verbalization of differential diagnosis or management plan (86%), and initiation of treatment (76%). The most common critical omissions were failure to call for help (80%), failure to take a history/do physical examination (59%), and failure to prepare airway equipment (31%).

DISCUSSION

Management and critical omissions noted during performance assessments provide information regarding students' educational needs enabling faculty to focus attention on demonstrated areas of weakness. Emphasis on the importance of calling for help and performing a focussed history and physical examination during critical event management are two areas where educational efforts should be improved.

ANESTHESIOLOGISTS' PREFERENCES REGARDING DESIGN AND DELIVERY OF CONTINUING EDUCATION COURSES

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INTRODUCTION

In response to RCPSC maincert program the Anesthesia Continuing Education Committee resolved to provide learning modules enabling anesthesiologist to engage in self-directed continuing education. Expansion of electronic communication suggests that many would prefer this form of course delivery. A project was undertaken to gather relevant information from practicing Ontario anesthesiologists.

Objectives:

- To obtain from anesthesiologists their delivery preferences of CE course materials.
- To explore whether interest in electronic delivery is correlated to gender, age, location of practice, appointment to teaching hospitals, or number of years in practice.

METHODS

A survey questionnaire was sent to 875 anesthesiologists practicing in Ontario. A follow-up reminder letter was mailed one month later. Included with the questionnaire was an offer of a free module to be delivered by Email or regular mail that could generate Maincert credits.

RESULTS

Of 875 questionnaires mailed, 27 were returned due to incorrect addresses. A total of 413 were returned (47% return rate). Nine of those returned had no or little data due to the retirement of the anesthesiologist. A total of 404 responses (113 (30%) female/291 (70%) male) were entered in the database. Median age range was 41-50 years, number of years in practice 11-25 years; average of CE courses taken in one year was 3. Most (55%) were in rural practice, with 44% in university/teaching hospitals (other 1%). When asked to rate their level of comfort with the Internet on a 10 point scale (1 low, 10 high), 59% indicated a level of 8 or higher. Three hundred and thirty three respondents requested the module and of these the preferred delivery was regular mail 172 (52%), Email 134 (40%), fax 10 (3%), preference not selected 17 (5%). Rural and urban respondents requested regular mail delivery more often than Email, whereas the majority of those located in universities requested Email. However, Chi-squared tests showed no significant differences between gender, among age groups, location of practice nor affiliation with university/teaching hospitals.

DISCUSSION

Both Email and regular mail delivery was requested by all sub groups, indicating that both methods are needed to facilitate optimal use of learning modules.

MIDAZOLAM IMPAIRS MEMORY IN CHILDREN UNDERGOING MYRINGOTOMY

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INTRODUCTION

Benzodiazepines such as midazolam are commonly used as a preoperative medicant for children undergoing surgery (Kain et al., 1997). Lab studies indicate that benzodiazepines impair memory and attention and increase sedation, (Buffett-Jerrott & Stewart, in press). We attempted to extend previous lab findings to the surgery context and to a pediatric sample.

METHODS

Approval was obtained from the hospital REB. Participants were forty 4-6 year olds undergoing myringotomy, randomly assigned, in a double blind fashion, to receive either oral midazolam 0.50 mg/kg mixed with acetaminophen suspension (midazolam group) or acetaminophen alone (placebo group). After drug ingestion, children encoded a set of pictures either well before the theoretical peak blood concentration of midazolam (5 minutes post-drug) or closer to theoretical peak (20 minutes post-drug). Memory for the pictures was tested both pre- and post-surgery with a cued recall test (i.e., items from zoo, kitchen, park, or restaurant; cf. Greenbaum & Graf, 1989). Attention and sedation (observer-rated and objective) were also assessed. After surgery, children freely recalled surgery day events. Events were classified as to whether they likely occurred during the drug influence window.

RESULTS

Midazolam caused impairments relative to placebo on the cued recall test, even when encoding occurred at 5 minutes post-drug (Fig 1). These memory impairments persisted at post-surgery when the acute effects of the drug had worn off (Fig 2). Free recall of post-drug surgery day events was also impaired by midazolam ($p < .05$). Although midazolam produced impairments relative to placebo on the attention task variables ($p's < .05$) and was associated with increased levels of sedation on the observer-rated ($p < .005$) and objective ($p < .01$) measures, analyses of covariance indicated that midazolam induced amnesia was not completely secondary to these other cognitive effects.

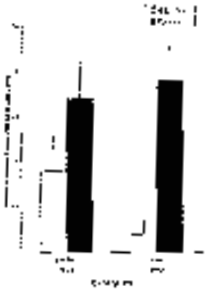

FIGURE 1 Cued Recall Performance: Mean number of pictures correctly recalled on the recall test as a function of Drug Group, at each Encoding Time (pre-surgery period). Bars represent standard errors.

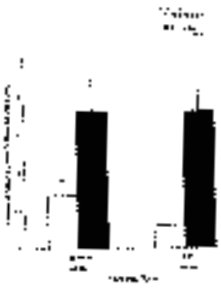

FIGURE 2 Cued Recall Performance: Mean number of pictures correctly recalled on the cued recall test as a function of Drug Group, at each Encoding Time (post-surgery period). Bars represent standard errors.

CONCLUSIONS

Results extend to children and to a surgery context, lab findings that benzodiazepines cause amnesia. Midazolam's amnestic effects appear to occur for material encoded even shortly after the drug is ingested (even highly-salient material), and persist following surgery.

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SCHEDULED EMERGENCY BLOCKS, ARE THEY EFFECTIVE IN LARGE INSTITUTIONS?

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INTRODUCTION

We compared the utilization of scheduled service specific emergency time blocks to standard 'elective' scheduled service blocks to determine if this was an efficient use of OR personnel resources.

METHODS

The utilization of all service blocks was collected from Sept 1, 2001 to December 31, 2001. The data was extracted from our ORMIS operating room information system (iPath, 2341 West Beaver Creek Dr, Powell, Tennessee, U.S., 37849). Utilization data is collected and reported in our system according to the standard definitions as developed by the Association of Anesthesia Clinical Directors Procedural Times Glossary[1]. For this study Adjusted Service Utilization was used. Statistical analysis was by one sample sign test for adjusted utilization differences with outlier analysis by box plot.

RESULTS

Case totals by Service and scheduled block Adjusted Service Utilization are presented in the table. There were no significant differences in adjusted utilization. Outlier analysis identified general surgery scheduled elective time as greater than the 90th percentile and plastics/wound and scheduled general emerg blocks as less than the 10th percentile.

Service	*Unshed Cases*	*Sched Cases*	*Adj Utliz(%)*
General	354	438	127
Cardiac	63	285	90
Neuro	135	298	98
Oral	3	35	86
Ortho Rec	23	340	100
Thoracic	80	210	93
Urology	36	276	91
Spinal	57	157	100
Gynae	61	438	98
Ortho Tr	322	122	74
Plastic/Wound	261	8	18
OTL	36	208	106
Ophth	218	328	76
Vascular	168	163	97
POTT			80
PPTT			100
Ret Prot			103
Sch Gen Emerg			43
Sch Vasc Emerg			66

DISCUSSION

Our data shows that scheduled daytime service specific blocks can be as efficiently utilized as scheduled elective blocks and are therefore a cost effective way to organize expensive OR personnel. These blocks tend to work well with services who have a large volume of work that is emergent but can be delayed up to 24 hrs and with surgical groups who are able to either assume care of patients as a group (eg the Ortho and Plastics Trauma groups in our institution) or who are able to assign blocks to individuals who reliably utilize the block for emergency care (eg Retinal Surgery). These blocks will not work well where either of these conditions cannot be met even in the presence of a large emergency case load as in the case of general surgery over this time period. Working with the surgical team to identify adequate block size, distribution and assignment is essential for success.

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THE IMPACT OF ERYTHROPOIETIN ON QUALITY OF LIFE IN TOTAL HIP JOINT ARTHROPLASTY

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INTRODUCTION

Erythropoietin administered peri-operatively in patients undergoing Total Hip Joint Arthroplasty (THJA) has been shown to reduce exposure to allogeneic blood. The effect of erythropoietin therapy on patients' Quality of Life (QOL) in this setting has not been determined.

METHODS

In a double-blind multi-centre study 201 patients undergoing primary THJA were randomized in a 3:5:5 ratio to receive four weekly doses of either 40,000 units (high-dose, n=44) or 20,000 units (low-dose, n=79) of erythropoietin or placebo (n=78), starting four weeks prior to surgery. Patients' QOL was assessed by the generic SF-36 questionnaire and a fatigue questionnaire specifically developed for this study; measured at baseline, pre-surgery and on post-operative Day 5. The primary QOL outcomes were the SF-36 vitality (VT) scale and the total fatigue score.

RESULTS

Patients' quality of life declined after surgery. By postoperative Day 5, the change from baseline in VT was -17.4, -10.6 and -9.3 points respectively for the placebo, low-dose and high-dose groups (P=0.087 overall; P=0.059 placebo versus high-dose). The fatigue scores also decreased, with the smallest decline noted in the high-dose group. Significant differences were found in the total score (P=0.034) and energy subscore (P=0.021) between the high-dose and placebo groups. The total score decreased by -3.9, -3.8 and -2.0 points, and the energy subscore by -1.1, -1.0 and -0.4 points, respectively in the placebo, low-dose and high-dose groups.

DISCUSSION

Erythropoietin given pre-surgery was associated with better postoperative vitality and energy level in patients undergoing THJA. This benefit should be taken into consideration in the peri-operative management of anemia.

BLOOD PRODUCT USE DURING HEPATIC TRANSPLANT.

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INTRODUCTION

Liver transplantation is associated with considerable blood product requirement[1,2], yet bloodless transplantation has been achieved in Jehovah's Witness patients[3]. The patient profile associated with bloodless liver transplantation has not been validated[4]. In this study of intra-operative blood product use, patient characteristics were compared in those who did not (Group 1) and did (Group 2) require blood products.

METHODS

We reviewed 218 consecutive first-time liver transplants (1995-2000). Patients were anesthetized using a standardized protocol. Temperature was maintained by administration of warmed fluids and air. All patients received aprotinin (500,000-2,000,000 U bolus post-induction followed by 500,000U.hr^{-1}. Blood sampling was kept to a minimum, and scavenged blood was returned to the patient. Transfusion triggers for PRBC's included Hct < 0.25 or sudden catastrophic blood loss. Although platelet count, fibrinogen level, PT and PTT were periodically measured, trigger for transfusion of platelets, cryoprecipitate and FFP was based on the clinical impression of excessive oozing and lack of clots.

RESULTS

35 patients (Group 1, 16%) received no blood products. 183 patients (Group 2, 84%) received PRBC,s (3.9±2.8 [SD] U), FFP (5.6±4.1 U), platelets (4.8±7.6 U) or cryoprecipitate (3.3±5.6 U). Groups 1 & 2 could not be differentiated on the basis of age (53.5±14.6; 55.7±11.1 yrs), gender (M/F: 68%/31%; 65%/35%), BMI (27.5±5.7; 26.4 ±4.9 kg.m^{-2}) and etiology of liver failure. Group 2 had lower hemoglobin (120± 17; 105±19g.L^{-1}, NS) and platelets (151±67; 100±63 x10^{9}.L^{-1}, NS), and higher PT (16.6±3.2; 17.9±8.5 sec, NS), PTT (40.2±15.7; 53.9±22.5 sec, NS) and Child's-Pugh score (7.6±2.4; 9.8±2.4, p< 0.0001). Using pre-operative cut-off values of Hct 0.35, platelets 80x10^{9}.L^{-1}, PT 15 sec, PTT 45 sec, and Child's-Pugh score 7, there was a correct prediction that products would be required in 169/183 (92%) patients and that they would not be necessary in 15/33 patients (45%).

DISCUSSION

Liver transplant may be associated with less blood product transfusion than previously reported[1,2]. A subset of patients may be considered for bloodless surgery.

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RATIONALIZING BLOOD CONSERVATION BY USING A PATIENT-SPECIFIC RISK INDEX

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INTRODUCTION

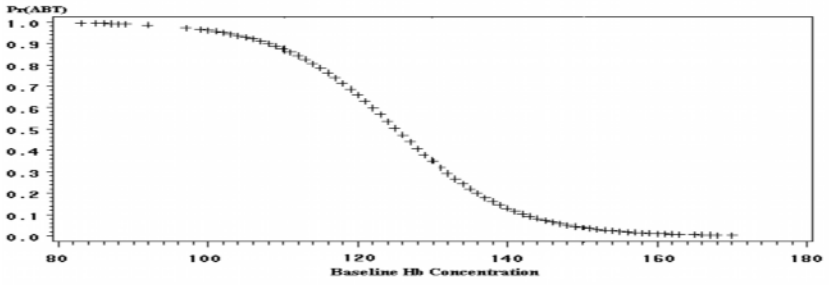
Preoperative erythropoietin therapy (PET) and autologous blood donation (PAD) are effective choices for reducing exposure to allogeneic blood transfusion (ABT) during surgery. Both modalities, however, are expensive and their routine use in all patients undergoing high blood loss surgery is not cost-effective. Rather, their use should be based on the patient-specific risk of transfusion. Logistic regression can be used to develop accurate patient-specific risk indices using only patients' preoperative hemoglobin concentration (Hb_{base}). Practical instructions for developing and applying such an index are provided here.

METHODS

Using the outcome of allogeneic blood transfusion (yes or no) and the Hbbase of patients, statistical programs can fit the data to a logistic function where the probability of ABT (Pr(ABT)) = $1/\{1+\exp[-(\alpha + ß.Hb_{base})]\}$ by solving for α and ß. The results can then be used to calculate $Pr_{(ABT)}$ for each patient, which can then be plotted against each patient's Hb_{base} to obtain a graphical representation of risk based on Hb_{base}. We completed the above on 259 patients who underwent primary hip arthroplasty since January 2000 without using PET or PAD (after obtaining institutional ethics approval).

RESUTLS

Seventy-nine patients (30%) received allogeneic blood. The logistic regression α = 16.015 and ß = -0.128. The model is highly accurate (ROC area = 0.828). The graph of $Pr_{(ABT)}$ and Hb_{base} is reproduced:



DISCUSSION

By providing an accurate estimate for each patient's risk of transfusion during THA, this graph allows us to focus our blood conservation efforts on patients whose risk of transfusion is >10%, which corresponds to those with a Hb_{base} <145 g/L (80% of our patient population). Similar graphs can be obtained for all high blood-loss procedures at other institutions to allow for more cost-effective use of blood conservation modalities.

BLOOD CONSERVATION IN RADICAL PROSTATECTOMY: PAD VERSUS ANH

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INTRODUCTION

Preoperative Autologous Blood Donation (PAD) has traditionally been considered to be the standard-of-care for reducing allogeneic blood transfusion (ABT) in radical prostatectomy (RP). Based on several recent studies that have found ANH to be as efficacious as PAD, however, ANH has been recommended as a replacement for PAD in RP because it is less expensive and more convenient. At our institution, the modality of choice for RP was switched from PAD to ANH (Acute Normovolemic Hemodilution) as of June 1999, allowing us to compare the effectiveness of these two modalities in a large cohort of patients.

METHODS

Following institutional ethics approval, the charts of all patients who underwent RP at our institution from October 1997 to April 2001 were reviewed for: patient demographics and medical status, blood conservation modalities used, blood products transfused, laboratory results, and perioperative course. The t-test or chi-squared test were used to compare variables between the two time periods (pre and post June 1999) and between the PAD and ANH groups. Logistic regression was used to compare PAD and ANH while controlling for confounders.

RESULTS

For both PAD and ANH, 1-3 units of blood were collected from patients (median=2). The ABT rate trended lower from pre June 1999 to post June 1999: 17.4% (53/304) to 13.1% (41/312); P=0.15. Despite the fact that PAD was limited to pre June 1999 and ANH to post June 1999, the transfusion rate in the PAD group was lower than in the ANH group: 7.2% (7/97) vs. 13.6% (35/258), respectively; P=0.08. Logistic regression showed that ANH did not significantly reduce ABT, but PAD did (P<0.001). Other independent predictors of ABT were older age, preoperative anemia, and date of surgery pre June 1999 (P<0.05).

DISCUSSION

We found that PAD is a more effective blood conservation modality than moderate ANH in RP. This finding disagrees with recent trials that have found the two modalities to be equally efficacious. These trials, however, were not adequately powered (i.e., their sample sizes were too small) to detect real differences between the two modalities. On the other hand, more aggressive ANH than what was used here may be more effective than was found in this study.

PREOPERATIVE ERYTHROPOIETIN THERAPY: EFFICACY VERSUS EFFECTIVENESS

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INTRODUCTION

The efficacy of preoperative erythropoietin therapy (PET) has been clearly demonstrated by randomized clinical trials: in anemic patients (Hb≤130 g/L), four weekly injections of 300-600 U/kg before surgery increases the Hb concentration by 15±10 gm/L and reduces the allogeneic blood transfusion (ABT) rate by more than 50% [1]. This led us to institute PET as a routine part of our management of anemic patients undergoing total joint arthroplasty (TJA) since January 2000. We have reviewed our data to compare the effectiveness of PET in routine practice with the efficacy observed in clinical trials.

METHODS

Since January 2000, after obtaining institutional ethics approval, we have prospectively collected the following information on patients undergoing TJA: demographics, blood conservation modalities used, Hb concentration on presentation, preoperative, and upon discharge, and blood product usage. To measure the effectiveness of PET, we compared the pre and post-treatment Hb (t-test) and the rate of transfusion (chi-squared test) between the treated and untreated patients. To correct for any selection bias, we used multivariable logistic regression to adjust for any significant between-group differences.

RESULTS

There were 469 hips (375 primary), and 444 knees (372 primary). The overall ABT was 26.3% (240/913); in anemic patients it was 38.8% (158/407). Of the anemic patients, 141 received PET (average dose 70,000 U, range 20,000-120,000 U) and their ABT rate was 12.8% (18/141), whereas of the 266 anemic patients who did not receive PET the ABT rate was 52.6% ($P<0.001$). PET increased the Hb concentration by 14.5 ± 9.6 g/L ($P<0.0001$ compared to no PET group). After controlling for patients' age, weight, preoperative Hb and creatinine, type of procedure, the surgeon performing the procedure, and all blood conservation modalities used, PET reduced the risk of ABT by 14 times (95% C.I. = 7-26 times).

DISCUSSION

We found that PET is as effective in routine clinical practice as it is in controlled clinical trials. This is despite the fact that many of our patients did not receive the full recommended dose. PET should therefore be made available to all suitable surgical patients (i.e., anemic patients undergoing high blood-loss surgery).

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A REVIEW OF PERIOPERATIVE BLOOD CONSERVATION PRACTICES IN CANADA.

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INTRODUCTION

Concerns about the risks, cost, and availability of allogeneic blood transfusion (ABT) have heightened the interest in perioperative blood conservation. This interest led to the creation of our organisation, which is dedicated to improving the perioperative transfusion practice. As a first step towards achieving this goal, we collected detailed transfusion-related information on patients undergoing total hip or knee arthroplasty (THA or TKA) at seven Canadian hospitals from January to March 2001 in order to assess the current status of, and variations in, transfusion and blood conservation practices across Canada

METHODS

At each of the seven institutions, after obtaining institutional ethics approval, data were collected prospectively on all patients undergoing elective THA or TKA from January to March 2001, including patient demographics, baseline and discharge hemoglobin concentrations, blood conservation modalities used, blood products used, and postoperative course. We compared the rate of ABT and the use of blood conservation modalities among the hospitals using descriptive statistics and ANOVA. We used logistic regression analysis to determine if inter-hospital differences in the rate of ABT were due to patient variables.

RESULTS

Data were collected on 676 patients, of whom 137 received ABT (inter-hospital range 7-33%, $P<0.05$). Forty-one percent of patients were anemic (Hb $\leq$ 130 g/L) preoperatively. The average discharge Hb was 99 ± 13 g/L (range 93-103 g/L, $P<0.05$). Oral iron was the most widely used blood conservation modality (43%), followed by autologous blood donation (18%). Other modalities were rarely used: erythropoietin = 2%; acute normovolemic hemodilution, cell saver, and intravenous iron <1%). Four variables – preoperative anemia, older age, not collecting autologous blood, and having the operation at two of the institutions – increased the risk of transfusion ($P<0.05$ in logistic regression analysis, model c-index = 0.775).

DISCUSSION

The rate of ABT still varies widely among Canadian hospitals, and this variability is not completely explained by patient variables. In addition, many of the available blood conservation modalities are severely underused (e.g., only 14 of 272 anemic patients received erythropoietin). More attention needs to be paid to perioperative blood conservation to ensure that patients have access to appropriate blood conservation modalities and are not exposed to unnecessary transfusions.

RISK FACTORS FOR TRANSFUSION IN JOINT ARTHROPLASTY SURGERY

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INTRODUCTION

Elective total joint arthroplasty (TJA) places major demands on the blood supply, being a high volume procedure where transfusion occurs frequently. The implementation of an effective peri-operative blood conservation program to reduce allogeneic blood exposure would be facilitated if risk factors for transfusion were identified.

METHODS

Following ethics committee approval, all patients undergoing primary TJA in a tertiary referral university center were retrospectively analyzed. Demographic and clinical information was obtained from hospital and blood bank computerized databases and supplemented where necessary by manual review of hospital records. Univariate analysis was performed for each of the variables of interest to determine whether or not an association existed with transfusion. Thereafter logistic regression modeling was performed to determine which of these factors remained significantly associated with transfusion after controlling for confounding variables.

RESULTS

Analysis was performed on 829 patients. Thirty one percent of patients were transfused, with a mean unit exposure of 0.47 units per case. Univariate analysis showed positive associations between transfusion risk and increasing age, female gender, preexisting anemia, low body weight, short stature and surgical time in excess of 2 hours. Surgeon specific transfusion rates varied from 17% to 67%. Risk of transfusion was not affected by whether replacement was of the hip or the knee, anesthesia type or ASA classification. Following logistic regression modeling, the following factors were identified as independent predictors of transfusion risk: Age > 70; Weight < 60kg, and Hb < and 120 g/L.

DISCUSSION

The factors identified allow the development of a patient profile that could be used pre-operatively to identify those who would benefit the most from a pre-operative blood conservation program. Individual surgical transfusion rates were clustered around the mean donor exposure rate but there were outliers. Considerable opportunities exist to reduce donor unit exposure both by education and the aggressive implementation of peri-operative blood conservation measures.

PERIOPERATIVE BLOOD CONSERVATION PROGRAMS: ARE THEY WORTH THE EFFORT?

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INTRODUCTION

Demand for blood products increases yearly raising concerns about the sustainability of supply in the future. Blood conservation programs are in operation in many Canadian centers in an attempt to minimize allogeneic blood product use peri-operatively. We reviewed our program at a University referral center.

METHODS

Following ethics approval, data were collected prospectively in patients accepted into the program in 2001. Demographics, referral surgical service, scheduled elective procedure, blood alternatives used and autologous and allogeneic blood utilization rates recorded.

RESULTS

Three hundred and twenty records were reviewed. Patients were referred by multiple surgical specialties with orthopedic and cardiac predominating. Of these, 241 patients accessed alternatives to allogeneic red cells. Deferrals from the program were due to positive transmissible disease markers, severe cardiac disease, and negligible transfusion risk. Autologous units were donated by 89% of the patients, 7% were prescribed erythropoietin (Epo) therapy and 4% were prescribed combination Epo/autologous therapy. Autologous blood utilization rates varied from a high of 89%in orthopedic revision/bilateral procedures to a low of 17% in major abdominal surgery. Overall, 53% of autologous units collected were reinfused. Of the 26 patients who received Epo therapy alone or in combination with autologous donation, 2 required allogeneic transfusion (3 units total). Of the 216 autologous donors, 26 (12%) received allogeneic blood (75 units total) in addition to autologous blood.

DISCUSSION

These data suggest that certain surgical services are referring appropriately to the program (orthopedic, cardiac and vascular) but that others require further education in this regard. The program has operated on an open referral basis but pre-screening by the clinic prior to acceptance and/or education of referring physicians appears indicated. In particular, it would appear to be prudent to re-evaluate the need for autologous collections in gynecological surgery, major abdominal surgery and radical prostatectomy. Epo administered in a selective and appropriate manner is an effective strategy to reduce donor unit exposure peri-operatively. In a region performing in excess of 50,000 surgical procedures annually, it is apparent that the peri-operative conservation program is underutilized. An opportunity exists to expand the program and decrease demands on the blood supply arising as a consequence of elective surgery.

ENHANCED CIRCULATORY CONTROL FOLLOWING CAROTID ENDARTERECTOMY

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INTRODUCTION

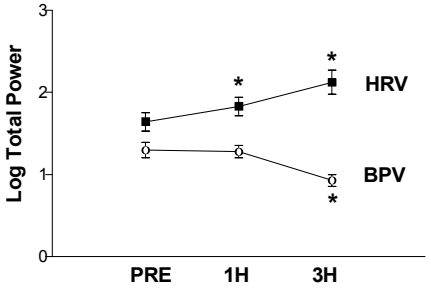
Patients with underlying cardiovascular disease frequently experience circulatory instability in the perioperative period, which may lead to arrhythmias and myocardial ischemia.(1) This instability may be related to a prolonged postoperative impairment of autonomic reflex mechanisms, which normally act to maintain hemodynamic equilibrium, following major surgery.(2) Surgery of the carotid artery is unique in that it may have direct effects on baroreflex function, either by surgical manipulation of the baroreceptor nerves, or due to the restoration of carotid perfusion. The purpose of this observational study was to characterize changes in the control of heart rate and blood pressure in the early recovery period from carotid endarterectomy (CEA).

METHODS

Following institutional ethics approval, 21 patients scheduled for CEA gave consent to participate. Standard monitoring and general anesthetic protocols were used. Continuous signals of blood pressure and electrocardiogram were recorded a) prior to surgery (PRE), b) 1 hour post extubation (1H), and c) 3 hours post extubation (3H). Data were analyzed using the techniques of power spectral analysis of blood pressure (BPV) and heart rate variability (HRV), and spontaneous baroreflex sensitivity, to quantify the relative parasympathetic and sympathetic influence on circulatory control.

RESULTS

Systolic blood pressure was unchanged postoperatively (132±20 PRE vs 126±36 mmHg 3H, NS), while blood pressure variability was markedly reduced at 1H (P=0.016) and 3H (P<0.001). Heart rate was decreased at 3H from PRE (71±12 vs 65±14 bpm, P=0.005), while total power of HRV was increased from PRE at 1HR and 3HR. The parasympathetic indicators of spontaneous baroreflex sensitivity and high frequency HRV were increased at 3H, but not at 1H.



DISCUSSION

Contrary to previous studies in patients undergoing non-carotid surgery,(2) CEA appears to be unique in leading to an increase in parasympathetic modulation of heart rate in the early postoperative period. This was accompanied by a decrease in lability of blood pressure. This enhanced vagal control may be protective against cardiovascular complications, although determination of the duration of this effect requires further study.

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RBC ANTIOXIDANT CAPACITY-PLASMA ISOPROSTANE CORRELATION DURING CPB

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INTRODUCTION

Pharmacologic enhancement of red blood cell (RBC) antioxidant capacity during CPB in humans was associated with improved postoperative cardiac index [1]. We investigated whether RBC antioxidant capacity predicts alterations in oxidative stress during CPB in humans.

METHODS

After ethical approval and informed, written consent, 8 patients (age 66 ± 9 yr), for ACBP, were anesthetized with fentanyl and isoflurane. Central venous blood was drawn at pre-induction (T_0), after 30 min of CPB (T_1), 10 (T_2), 30 (T_3) and 120 min of reperfusion (T_4) to measure RBC antioxidant capacity (malondialdehyde (MDA) production in response to *ex vivo* forced peroxidation and plasma free isoprostane concentration (radioimmunoassay). Data were expressed as mean ± SEM.

RESULTS

RBC MDA production at 1 mM t-BHP were 93.9 ± 11.5, 101.8 ± 10.1, 104.3 ± 10.4, 99.1 ± 9.1 and 102.5 ± 10.3 nM/ g RBC respectively at T_0 , T_1 , T_2 , T_3 and T_4. Plasma free isoprostane concentration were 90.4 ± 25.9, 175.2 ± 57.4, 129.5 ± 18.1, 106.0 ± 19.5 and 98.8 ± 23.4 respectively at T_0, T_1, T_2, T_3 and T_4 . RBC MDA at T1 was significantly correlated with plasma free isoprostane at T1 ($R = 0.803$, $P = 0.0165$). RBC MDA at T_0, T_1, T_2 and T_3 were all significantly correlated with plasma free [isoprostane] at T_3 (R equal to 0.770, 0.829, 0.715 and 0.789 respectively, all P less than 0.05). A correlation of RBC MDA and plasma free [isoprostane] at T_0 was not observed ($R = 0.561$, $P = 0.148$).

DISCUSSION

During CPB changes in RBC antioxidant capacity predicted changes in the concentration of isoprostane, a specific marker of lipid peroxidation and potent vasoconstrictor. Isoprostane may contribute to postoperative myocardial depression. Alterations in RBC antioxidant capacity may serve as an index in estimating oxidative stress in humans in pathophysiological situations similar to CPB.

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PREDICTORS FOR CHEST REEXPLORATION TO CONTROL BLEEDING IN CARDIAC SURGERY

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INTRODUCTION

Rate of reoperation to control excessive bleeding after cardiac surgery is 5%. The predictors for reoperation are not well defined.

METHODS

After IRB approval, we collected prospective data on 2013 patients undergoing cardiac surgery. On the basis of reoperation owing to excessive bleeding, patients were divided into two groups; reoperated and non-reoperated. All received tranexamic acid 50-100 $mg.kg^{-1}$ before sternotomy. Time to reoperation, rate of bleeding, total blood loss and blood transfusion within 24h after surgery was recorded.

RESULTS

We identified 93 (4.6%) patients with 6h postoperative blood loss ≥ 750 ml. Complete data was obtained on 84 patients. 48 (57%) required reexploration to control bleeding, within 276 ± 206 min of arrival to ICU. Mean blood loss in this group was 1238 ± 623 ml. The rate of bleeding was 371 ± 271 $ml.h^{-1}$. There was no difference with preoperative hemoglobin, diabetes, previous cardiac surgery, aspirin, heparin, coumadin, CPB time, and postoperative coagulation measurements between the groups. Significant differences between groups presented in Table.

TABLE

	Reoperated (n = 48)	*Non-reoperated (n = 36)*	*P value**
Hemoglobin ($g.L^{-1}$)	73 (69-77)	83 (78-88)	0.01
Blood loss 24h (ml)	2676 (2338-3015)	1720 (1512-1929)	0.001
Bleeding rate per hr ($ml.h^{-1}$)	**371 (289-453)**	**193 (169-217)**	**0.001**
Packed RBC (units)	4.1(3.2-5)	2.0 (1.2-2.8)	0.001
ICU (days)	4.7 (3.7-5.6)	3.1 (2.6-3.6)	0.008
Hospital LOS (days)	11.9 (10-13.4)	9.4 (9.6-12)	0.04

Mean (CI.95), * One way ANOVA

Aortic valve patients were more likely to require reoperation (37% vs 11% in reoperated and non-reoperated groups respectively, p=0.006). 47 (98%) patients in the reoperated and 26 (72%) in the non-reoperated received blood transfusions (p=0.001). During reoperation, 28 (58%) patients had surgical source of bleeding. Bleeding sites; left internal thoracic artery 9 (32%) patients, chest wall 8 (29%) patients, aorta 5 (18%) patients, atrium 4 (14%) patients, and 2 other sites.

DISCUSSION

The rate of bleeding per hour is a significant predictor of chest reexploration after cardiac surgery. Patients who require reoperation are at higher risk for blood transfusion and longer ICU and hospital LOS.

TRANSFUSION PREDICTORS IN COMPLEX ADULT CONGENITAL CARDIAC SURGERY

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INTRODUCTION

Blood product transfusion is a major morbidity in cardiac surgery. Congenital adult cardiac surgical (CACS) patients are especially high risk for transfusion. Our study attempts to identify risk factors of transfusion in this population.

METHODS

After IRB approval we reviewed 110 consecutive CACS patients from 1997-2000. Frequency and volume of blood product transfusion, postop blood loss, CPB time, procedure and demographics were collected. Autologous predonation and cell saver was not used. Two groups: (1) received blood products, (2) did not received blood products. Data were compared with univariate and multivariate analysis.

RESULTS

59 patients had valve replacement/repair (37 pulmonic valve), 12 VSD repairs, 11 conduit placements, 3 switch procedures, 3 TET repairs and 22 patients other procedures. Previous heart surgery in 75 patients (68%), tranexamic acid given before surgery in 93 patients (mean 110 ±45 mg/kg). Blood products were given to 80 (72%) patients. Mean number of blood products per patient who received was 20.8 units CI .95 (14.3-27.3). Reoperation in 7 patients. Two patients died.

Variable	*Group 1 (n=80)*	*Group 2 (n=30)*	*P value*
Age (years)	37.3 (34.0-40.7)	37.0 (32.2-41.8)	NS
Creatinine mmol/L (pre-op)	92.8 (82.9-102.5)	78.3 (70.6-85.9)	0.06*§
Hemoglobin g/l (pre-op)	144 (139-148)	139 (134-145)	NS
Prothrombin time sec. (pre-op)	14.5 (13.8-15.0)	13.4 (12.7-14.0)	0.02*§
CPB time (minutes)	165 (150-180)	103 (88-118)	0.0001*§
Blood loss 24 hr. (post-op) ml	935 (789-1081)	467 (402-532)	0.0001*§
Hospitalization (post-op) days	12.8 (10.8-15)	6.5 (5.7-7.3)	0.0001*§

Mean values (CI-.95), * chi-square (§ Mann-Whitney U non-parametric multivariant analysis)

81% with previous surgery received blood products versus 54% operated for the first time (p=0.004§). 89% of patients on coumadin received blood products versus 67% not on coumadin (p=0.04§). 100 % of patients on preoperative heparin received blood products versus 67% not on heparin (p=0.03§). Type of surgery and preoperative aspirin made no difference in blood transfusion.

CONCLUSION

CACS patients are at high risk for blood product transfusion. Significant blood products (mean 20.8 units) were transfused to 72%. CPB time, postop blood loss and previous cardiac surgery were strongly associated with the need for transfusion.

BETA BLOCKADE LITERATURE - IMPACT ON ANESTHESIOLOGISTS' PRACTICE

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INTRODUCTION

Recent literature suggests that perioperative beta blockade improves long-term outcome after surgery in patients with risk factors or known coronary artery (CAD)[1,2]. The American College of Physicians advises that this strategy become a standard of care in the treatment of patients at risk for cardiac complications[3]. The purpose of this study was to determine the impact of literature on Canadian anesthesiologists' practice with respect to perioperative beta blockade.

METHODS

In November 2001, postal and electronic surveys were sent to 1168 members of the Canadian Anesthesiologists' Society. The 21-item questionnaire asked about awareness, beliefs and practice regarding beta blockade in the perioperative period.

RESULTS

Of the 462(40%) who responded within 2 months, 94% were aware of the literature regarding perioperative beta blocker therapy. For patients with known CAD, 91% agreed it is effective, and 54% routinely prescribed it. For patients with risk factors for CAD, 79% agreed that it is effective, while 40% prescribed it routinely. Nine percent, representing 25 hospitals, indicated that a departmental protocol for perioperative beta blockade was in place.

Patterns of use of perioperative beta blockade (BB) by respondents who indicated routine use (n=394)

		#	%
Multiple doses preoperatively		131	33
Single dose preoperatively		252	64
Duration of use:	Preoperatively only	139	35
	Early postoperatively	154	39
	Duration of hospital stay	84	21
	Post-discharge	17	4
Surgical risk:	High	371	94
	Moderate	311	79
	Low	37	9
Anesthesia type influences BB decision		160	41
Preferred drug:	Metoprolol	275	70
	Atenolol	87	22
	Other	32	8

DISCUSSION

While Canadian anesthesiologists are aware of the literature regarding the benefits of beta blockade in the perioperative period, less than half routinely prescribe these drugs. Of those who do, almost all discontinue therapy before or within days of surgery. The findings of this survey indicate that while anesthesiologists are aware of the evidence published in "high impact" journals regarding the benefits of beta blocker therapy in the perioperative period, the majority have not transferred this knowledge to their practice.

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BEHAVIOR OF PHYSICIANS IN PRE-OPERATIVE ASSESSMENT

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INTRODUCTION

Pre-operative cardiac assessment of patients having surgery is important to identify patients at risk. We know little of how clinical physician evaluate risk in patients undergoing non-cardiac surgery. Persantine Thallium and Echocardiography have demonstrated to be predictors of cardiac events. These tests add predictive value in moderate risk patients only.

DESIGN

After approval of the hospital ethics committee a retrospective study was conducted for twelve consecutive months in the year 2001 at a university affiliated hospital. A total of 113 patients were seen by medicine and anesthesia pre-operatively scheduled for abdominal, vascular, and thoracic surgery. We assessed the ability of consultants to assign cardiac risk, the pattern of ordering non-invasive testing, and changes in medical management. Further, we evaluated the surgical outcomes cancellation, myocardial infarction, death, within the immediate post-operative period up to 30 days post-op. Outcomes were correlated with patients' risks, testing and treatments used peri-operatively

RESULTS

Eleven percent of physicians used a validated clinical risk index. We retrospectively assigned a Lee Risk Score1 to each patient. 60 thallium and 68 2D echocardiogram examinations were ordered 42 % of Thallium tests and 50% of the 2D echocardiograms were performed in low risk patients (Lee Risk <3). No morbid clinical events occurred in any of these low risk patients. Twelve high risk patients had no further cardiac testing performed. High risk patients with positive thallium exams resulted in the following medical management changes. (27% had a beta blocker started; 20% of patients were cancelled; 20% referred to cardiology; 10% had nitrates started; 5% had a platelet inhibitors or calcium channel blockers started; 13% of patients had no change in medical management).

DISSCUSSION

The use of a risk index defining cardiac risk in patients going for non-cardiac surgery is low . Application of such an index would result in few tests being ordered with no change in outcome. Changes in medical management are variable and depend on the consultant.

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ISOFLURANE PC, VIA K_{ATP} CHANNELS, PROTECTS THE HYPOTHERMIC HEART

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INTRODUCTION

Preconditioning (PC) alters exogenous glucose metabolism, reducing glycolysis in aerobically perfused hearts and hearts subject to reperfusion following prolonged ischemia. Isoflurane exposure prior to regional ischemia reduces infarct size. We assessed the metabolic and mechanical functional effects of isoflurane preconditioning in hearts subjected to prolonged no-flow hypothermic arrest.

METHODS

Following animal ethics committee approval, rat hearts were subject to a 10-min Langendorff perfusion (L), a storage phase in which hearts were arrested with cold St. Thomas' II cardioplegia solution and stored at 3°C ± 1°C for 8 hours (S); a Langendorff reperfusion phase (LR) and finally a working mode reperfusion phase (WR). To assess mechanical function three groups of hearts were studied, each undergoing L, S, LR and WR: a group received no intervention; a group underwent isoflurane PC and a group underwent isoflurane PC and treatment with 5-hydroyxdecanoate (5-HD), a selective mitochondrial K_{ATP} antagonist during the S phase only. Other groups of hearts were frozen at the end of S to assess metabolic parameters.

RESULTS

Isoflurane PC effectively protected the heart with LV work recovering to 68% of that observed in the untreated group. The presence of 5HD during the S phase abolished the protective effect on mechanical functional recovery of isoflurane PC. In groups of hearts studied only during L and S, glycogen content was preserved by isoflurane PC but this effect was not seen when 5-HD was present during S. HMR 1098, a sarcolemmal K_{ATP} channel-selective blocker, did not antagonize the metabolic effect of isoflurane.

DISCUSSION

Brief exposure to isoflurane (in this study 10 min) is effective in enhancing mechanical functional recovery in hearts subject to prolonged hypothermic cardioplegic arrest and storage. Isoflurane appears to trigger a protective effect that is mediated by the opening of mitochondrial, but not sarcolemmal K_{ATP} channels. Alteration in energy substrate metabolism during the storage interval may be one mechanism of isoflurane-induced PC.

Modulation of Non-inactivating K^+ Channels in mouse KCNK2 transfected HEK cells by halothane and Isoflurane.

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INTRODUCTION

Except $GABA_A$ and glycine channels, newly discovered tandem pore potassium channels are also activated by volatile anesthetics.[1,2] KCNK2 is a member of novel class of K^+ channels with four transmembrane segments and two pore domains in tandem.[3] Usually, KCNK2 channel is expressed at the highest level in the brain.[4] The goal of this study is to test the effect of clinically relevant concentrations of volatile anesthetics on the currents through the K^+ channels in the mouse KCNK2 transfected HEK cells.

METHODS

Mouse KCNK2 cDNA was transiently transfected to HEK cells with FuGENE 6 transfection reagents and whole cell recordings were made from transfected HEK cells using patch clamp techniques with predesigned pulse protocol. Voltage pulses were from –90 to 90 mV in 10 mV increments from a holding potential of –20 mV.

RESULTS

Mouse KCNK2 transfected HEK cell exhibits rapid rising, non-inactivating, outward-rectifying currents. Patch clamp experiment showed the presence of an outward-rectifying K^+ selective channels with a conductance of 1.312 ± 0.59 nS (n = 16) at positive potentials. These channels are insensitive to conventional K^+ channel blockers. Clinically relevant concentrations of halothane (448 μM) increased two pore domain K^+ channel outward currents from control value by 218 % in standard saline perfusate (n = 4, $P < 0.05$, paired *t*-test). Recordings of 822 μM of isoflurane increased outward currents by 172 % in standard saline perfusate (n = 12, $P < 0.05$, paired *t*-test). Channel activity enhanced during the duration of the exposure period to volatile anesthetics returned to the baseline activity level quickly upon wash.

DISCUSSION

These outward-rectifying whole cell I-V curve is consistent with the properties of tandem pore K^+ channels. Anesthetic activation of K^+ channels in mouse KCNK2 transfected HEK cell causes membrane hyperpolarization and increases currents through these channels. These increased currents could be associated with variations in the neuronal excitability.

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INTRATHECAL CARBONIC ANHYDRASE INHIBITORS BLOCK HYPERALGESIA INDUCED IN RATS BY PENTOBARBITAL BUT NOT BY PROPOFOL

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INTRODUCTION

Systemic administration of barbiturates or propofol reduces nociceptive reflex latency (1). Systemic administration of the carbonic anhydrase inhibitor (CAI), acetazolamide, blocked nociceptive reflex enhancement by pentobarbital(2). Here we have examined the role of spinal carbonic anhydrase (CA) in the reduction of of nociceptive reflex latency by systemic administration of pentobarbital and propofol.

METHODS

Experimental protocols were approved by the Faculty of Medicine Animal Care Committee. Twenty male Sprague Dawley rats (300-500g) were instrumented with chronic indwelling intrathecal (i.t.)(3) catheters whose distal ports were situated in the lumbar region. The catheters were injected with 10 µl of artificial cerebrospinal fluid (aCSF), either drug-free or containing either 50 µM ethoxyzolamide or 20 µM acetazolamide. Fifteen minutes after i.t. drug injection, animals received an intraperitoneal injection of 30 mg/kg of pentobarbital or 50mg/kg of propofol. A blinded observer measured nociceptive reflex latency sequentially in the four limbs before and ten min after the i.t. CAI injection and then 5, 15, 25, 35, 45 and 55 min after the i.p. anesthetic injection. Nociceptive reflex latencies were normalized with respect to the pre-anesthetic values. Data was analyzed with paired t-tests.

RESULTS

The administration of pentobarbital or propofol reduced the paw withdrawal latency to 60-70% of control values in both fore-and hind-limbs. Intrathecal administration of CAI blocked reflex enhancement in the hindlimbs but not in the forelimbs. CAI injection did not block reflex enhancement by propofol in the hindlimbs.

TABLE

Treatment Group	*n*	*Nociceptive Reflex Latency, % of Control Values* *Forelimbs*	*Hindlimbs*
Pentobarbital i.p.			
Ethoxyzolamide i.t.	8	62 ± 12	82 ± 9*
Acetazolamide i.t.	8	62 ± 11	94 ± 21*
Propofol i.p.			
Ethoxyzolamide i.t.	5	65 ± 6	68 ± 15
Acetazolamide i.t.	3	73 ± 4	75 ± 2

Mean values ± standard deviation * $P < 0.001$ compared to forelimbs

DISCUSSION

Spinal carbonic anhydrase is involved in nociceptive reflex enhancement pentobarbital, but not by propofol. The neural mechanisms for nociceptive reflex enhancement may be different for these two drugs.

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SMALL CONCENTRATIONS OF PENTOBARBITAL INCREASE NEURONAL EXCITABILITY IN RAT HIPPOCAMPUS BY ENHANCING $GABA_A$ RECEPTOR-MEDIATED DEPOLARIZATION.

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INTRODUCTION

Small concentrations of pentobarbital enhance synaptic transmission in the stratum radiatum-CA1 pathway of rat hippocampus (1). The cellular mechanism of the latter effect remains unknown. Here we have used intracellular recording techniques to directly examine the influence of small concentrations of pentobarbital on post-synaptic $GABA_A$ receptor-mediated excitatory depolarizing responses.

METHODS

Protocols were approved by the Faculty of Medicine Animal Care Committee. Experiments were performed *in vitro* using hippocampal slices prepared from male Sprague Dawley rats as previously described (1). The membrane potentials of individual CA1 neurons were recorded with a sharp microelectrode inserted intracellularly. Responses to stimulation of the stratum radiatum pathway were evaluated during perfusion of the slice with artificial cerebrospinal fluid. $GABA_A$ receptor-mediated depolarization was evoked by bursts of 4 stimuli (frequency 100 Hz, 20 V) applied to a tungsten electrode inserted approximated 15mm from the intracellular electrode(2). Excitatory glutamatergic transmission was blocked with 50 µM AP-5 and 10 µM CNQX. Depolarizing responses were quantified by the maximal amplitude of the depolarization, and its duration as shown by the time of the maximal response (T_{max}) and the time of the half-return to baseline ($T_{50\%max}$).

RESULTS

Stimulation of the stratum radiatum pathway in the presence of glutamate receptor blockade produced a biphasic potential consisting of an initial hyperpolarization, (5 mV, 75 msec duration) followed by a longer depolarizing response (characteristics summarized in the Table). The biphasic potential was abolished by the addition of 100 µM picrotoxin, consistent with $GABA_A$ receptor mediated depolarization (2). Thirty minutes of exposure to 5 µM pentobarbital increased both the amplitude and duration of the depolarizing response (Table).

TABLE. Summary of results from slices from 12 rats

$DPSP_A$ amplitude, mV		*T max, msec*		*$T_{1/2}$ max, msec*	
Control	*Pentobarbital*	*Control*	*Pentobarbital*	*Control*	*Pentobarbital*
5.9 ± 1.2	8.1 ± 4.1	208 ± 27	231 ± 33	310 ± 50	348 ± 74
P=0.019		P= 0.004		P=0.005	

DISCUSSION

The present results support the hypothesis that pentobarbital facilitates synaptic transmission in hippocampal pathways through enhancement of $GABA_A$ receptor-mediated postsynaptic depolarization.

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PATIENT CONTROLLED SEDATION (PCS) IN BURN PATIENTS

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INTRODUCTION

The first postoperative change of wound dressings after skin grafting, however, creates not only significant pain but also substantial anxiety. Propofol PCS seems a good alternative to routine intermittent nurse-controlled sedation using benzodiazepines or propofol.

METHODS

In all 12 (preliminary results of 20) patients, the procedure was the first change of wound dressings after skin grafting surgery, performed 5 days after surgery. All patients were familiarized with the propofol PCS. They were asked to press the control button whenever they felt uncomfortable or anxious. In part I (N=10), the PCS was set to administer a bolus of 0.3 mg/kg propofol with a lockout time of 5 min. The amount of attempts and the actual propofol boli were recorded. After analysis of the results of part I, PCS was set to determine the propofol bolus by initial doctor-controlled application to reduce BIS by at least 15 % (Part II). Before the procedure, all patients received either 3 times the hourly dose of a continuous morphine infusion or 0.1 mg/kg morphine + 10 % of the total oral morphine intake during the last 24 hours, but at least 0.15 mg/kg. BIS - monitoring was applied to all patients and recorded every 2 minutes. Pulse oximetry, ECG, noninvasive blood pressure and the respiratory rate (RR) were recorded every 2 min. Satisfaction scores (1=very unsatisfied, 6 very satisfied) were determined 1 hour after the procedure as well as mean pain during the procedure (0= no pain, 10=maximal pain). Data are presented as mean (SD).

RESULTS

From our first series of patients (N=10, 9 m, 1 f; age: 38 ± 16 y, burn surface: 14 ± 3 %), results show that PCS is feasible and safe for burn patients (RR 14 (2), no change in blood pressure, Sat O_2 more than 93 %). Satisfaction and pain scores were 5.4 (0,8) and 3.4 (2), respectively. The number of demands (6 vs 3 deliveries) and BIS values between 71 and 98 with a mean of 94 (8) showed an insufficient bolus and lockout period which was set too long. First results of part II (N=2) show a mean 0.35 mg/kg of propofol as an effective bolus (BIS reduced by 15 %). BIS during the procedure ranged between 62 and 98 with saturations of more than 94 % and 5 (2) demands during a period of 20 (2) min.

DISCUSSION

Our preliminary results suggest that propofol PCS is a good method to reduce anxiety and discomfort in burn patients during their first dressing change after skin grafting. BIS monitoring provides an objective method to determine an individualized bolus setting and seems superior to a fixed bolus of 0.3 mg/kg. No lockout period seems necessary for PCS and still provide safe respiratory conditions.

DEPTH OF ANAESTHESIA DOES NOT CHANGE ONSET OR OFF-SET OF NEUROMUSCULAR BLOCK AT THE CORRUGATOR SUPERCILII MUSCLE AND THE ADDUCTOR POLLICIS MUSCLE

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INTRODUCTION

This study investigated the influence of depth of anaesthesia on onset or offset of neuromuscular block (NMB).

METHODS

After approval of the local Ethics Committee and informed consent, 20 patients were included. Anaesthesia was induced and maintained using remifentanil/propofol-infusion. Intubation was performed without NMB. Hemodynamic monitoring consisted of an eosophageal Doppler probe (cardiac output) and non-invasive blood pressure. Patients were randomised into two groups. The propofol-infusion was adjusted to maintain BIS between 50 – 60 (Light, N=10), or between 30 and 40 (Profound, N=10). Remifentanil-infusion was adjusted to maintain a stable blood pressure and cardiac output. Neuromuscular monitoring consisted of phonomyography at the corrugator supercilii muscle and mechanomyography at the adductor pollicis muscle (TOF every 12 s). After establishment of the corresponding depth of anaesthesia, 0.2 mg/kg mivacurium was injected and onset, peak effect and offset of NMB measured. Data presented as mean (SD) and compared using t-test, $P<0.05$.

RESULTS

Age and weight did not differ between the groups. Onset time, peak effect and time to reach TOF-ratio of more than 0.8 in group 'Light' and 'profound' were 179 (46) s and 163 (40) s, 83 (21) % and 80 (19) %, 13 (4) and 14 (4) min, respectively at the corrugator supercilii muscle without any significant difference. The same parameters at the adductor pollicis muscle in group 'Light' versus 'Profound' were 227 (63) s versus 249 (68), 100 (0) versus 99 (1), 25 (5) min versus 28 (8) min, respectively. Although time to reach TOF-ratio of more than 0.8 was longer in the 'profound' group, it was not significant. Onset, offset and peak effect of NMB were significantly shorter and less pronounced at the corrugator supercilii muscle than at the adductor pollicis muscle. Mean cardiac output and blood pressure did not differ between the groups.

DISCUSSION

This is the first study investigating the influence of depth of anaesthesia onset, peak effect and offset of NMB after a bolus injection of a neuromuscular blocking agent. There was no significant difference of those parameters between patients in profound or light anaesthesia.

A NOVEL METHOD TO MONITOR NEUROMUSCULAR BLOCK AT THE LARYNX: PHONOMYOGRAPHY

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INTRODUCTION

This study presents a novel, simple method to monitor neuromuscular block (NMB)at the larynx and investigated agreement with the established method of using changes in cuff pressure of an endotracheal tube placed between the vocal cords.

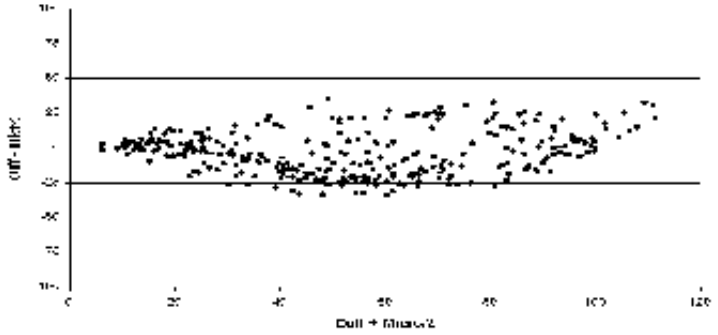
METHODS

After approval of the local Ethics Committee and informed consent, 14 patients were included. Intubation was performed without neuromuscular block using remifentanil/propofol and maintained using remifentanil/sevoflurane. The inflated cuff of the endotracheal tube was placed under direct vision between the vocal cords. In addition, a small condenser microphone was inserted into the throat and placed lateral of the tube near the vestibular fold to record the response of the adducting laryngeal muscles. Percutaneous stimulation of the laryngeal recurrent nerve was performed in routine fashion using superficial electrodes placed over the thyroid notch. Train-of-four stimulation was performed every 12 sec and supramaximal stimulation current determined. Mivacurium 0.1 mg/kg was injected IV. Onset, peak effect and offset of NMB was determined. Agreement between the two methods was determined using Bland-Altman test. Data presented as mean (SD) and compared using t-test, $P<0.05$.

RESULTS

Onset, peak effect and time to reach 25 % and 75 % of control twitch response for phonomyography versus cuff-pressure method were 138 (38) s vs 136 (38) s, 85 (9) % vs 85 (8) %, 7.6 (4.2) min vs 8 (4) min and 19 (11) min vs 21 (12) min, respectively without being significantly different. Mean bias was -2 % with limits of agreement of –24 and + 20 % of twitch height (T1)(cuff method minus phonomyography). (Figure).

Figure



DISCUSSION

Phonomyography is a novel, non-invasive method of monitoring NMB at the adducting laryngeal muscles. It shows good agreement with the established cuff pressure method but is easier to apply and is not affected by respiratory movements.

HERBAL MEDICINE USE IN AMBULATORY SURGERY PATIENTS IN CANADA

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INTRODUCTION

The use of herbal medication is increasing globally, with 22 to 26% of American preoperative patients using herbal remedies [1,2]. This study aims to determine the incidence and nature of herbal medicine use among patients in a busy Canadian surgical daycare unit.

METHODS

We undertook a prospective survey, in English and Chinese, of 575 patients attending our surgical daycare unit. The questionnaire inquired as to basic demographics, herbal medicine use, name and number of herbal medicines used, why, whether it was self-prescribed or not, and if the patient's family doctor was aware of their use.

RESULTS

485 of 575 patients completed the questionnaire (84%). 34% of patients surveyed in our unit responded affirmatively to herbal medicine use. 116 of 331 female respondents (35%) and 46 of 153 male respondents (30%) used herbal medication. The ingestion of herbal medicines was similar in the Asian and Caucasian respondents (38% vs. 35% respectively). The greatest consumers of herbal medicines were 31-45 years old, comprising 31.5% of users. 39% of herbal medicine users took them on a daily basis. 45 different identifiable herbs were being taken, with Echinacea being most common. 12% of patients taking herbal medication used more than two different herbal medicines daily and 7% used more than 3 preparations daily.

Less than half of the patients had told their family physicians that they were on herbal medicines and only one-third of patients were taking them on the advice of their physician. Thirty-five patients (22%) did not know the name of the medication they were taking.

DISCUSSION

The incidence of herbal medicine ingestion in our unit was higher than previously reported, with a wide variety of preparations being taken mostly without the knowledge of the patient's family physician. It is of concern that some patients did not know the name of the herb that they were taking regularly. A high degree of vigilance is required by anesthesiologists to ensure that combining herbal medicine with Western medicine is not detrimental to the health of the patient

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A COMPUTER MODEL OF LARYNGOSCOPY AND LARYNGOSCOPE BLADE DESIGN

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INTRODUCTION

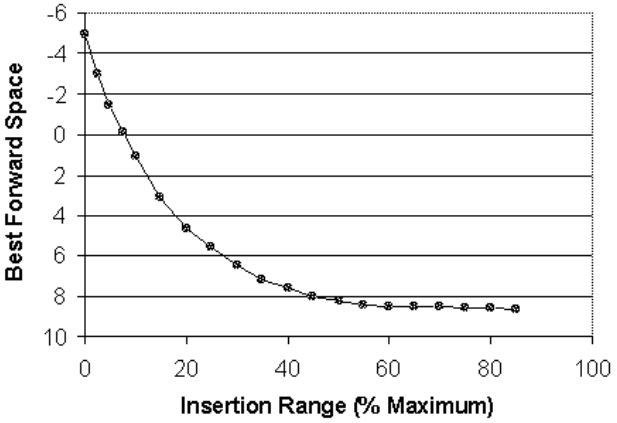
Numerous different laryngoscope blades are available, all intended to make endotracheal intubation easier and safer. To discover better blade shape and design features, a mathematical model of direct laryngoscopy was constructed and implemented in the C++ computer language. A quantitative evaluation function was developed for use with an optimization algorithm.

METHODS

Blade shape was modeled by a curve (of N+1 line segments) calculated using an algorithm taking N independent input variables. The oral and pharyngeal anatomy was also modeled, using three parameters (mouth opening, inter-incisor angle, and relative position of the mandible). For each insertion depth (hyoid to incisor distance), the forward space and eyeline deviation (modified from indices proposed by Marks et al.[1]) were determined and used to calculate an evaluation function. For each different choice of anatomical parameters and insertion range, the best function value over the (N-dimensional) space of all possible laryngoscope blade shapes was found using a simulated annealing optimization algorithm[2].

RESULTS

The best achievable forward space is strongly dependant on the required insertion range. Results of optimizing blade shapes given realistic anatomical parameters and a maximum eyeline deviation of five degrees are shown in the figure.



DISCUSSION

These results suggest that it is possible to design a better laryngoscope blade. Available blades look like the shapes returned by the optimization algorithm under the requirement of an insertion range of about twenty-five percent, which is consistent with the typical difference in size between blades of the same type. A blade constructed so as to achieve the effect of a blade modeled with zero insertion range is able to provide a larger forward space (into which to displace the tongue) without a corresponding increase in the eyeline deviation. The mathematical model used to obtain these results is quantitative, and is capable of calculating the effect of modifying the anatomical parameters. It is implemented in object-oriented C++ computer code, which is structured as a reusable framework for creating and testing other models, and for exploring different evaluation functions.

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DO HISTORY, PHYSICAL, AND SPIROMETRY PREDICT PULMONARY COMPLICATIONS?

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INTRODUCTION

Pulmonary complications are believed to be significant causes of postoperativc morbidity and mortality. The purpose of this study was to determine the elements of the history, physical examination and simple spirometry that predict of postoperative pulmonary complications.

METHODS

After obtaining ethics approval and informed consent, we studied 399 patients undergoing elective nonthoracic procedures in a tertiary-care teaching hospital, and anticipate accruing a total of 1200. Patients were assessed preoperatively during their visit to the pre-admission clinic. A focussed pulmonary history and physical exam were conducted along with simple spirometry. A history of smoking, recent upper respiratory tract infection, COPD, asthma, daily cough, or diminished exercise capacity, presence of wheezing on auscultation, elicited coughing spasm, forced expiratory time, maximum laryngeal descent and FEV1/FVC were recorded. The main outcome measures were death, respiratory failure requiring mechanical ventilation (including BIPAP), pneumonia, atelectasis, pneumothorax or pleural effusion, and delayed weaning from assisted ventilation.

RESULTS

Major pulmonary complications occurred in 2 (2%) of 99 patients who have completed follow-up. Both complications involved pneumonia which responded to antibiotics. A history of a daily cough was associated an increased likelihood of postoperative complications ($p<0.01$).

Variable	*Mean*	*Variable*	*Value*	*Variable*	*Value*
Age	54.3 y	Asthma	14%	FEV1	2.55 (.76)
Female/Male	51/48	Cough History	11%	FVC	3.38 (.92)
Ever Smoked	64%	Cough Test	5%	FEV1/FVC	0.75
Still smoke	42%	Recent URTI	13%	LOS	4.99 days
COPD	3%	Postop Comp	2%		

DISCUSSION

The incidence of risk factors for perioperative pulmonary complications has not been well documented. General attention to optimal patient condition at all times, particularly perioperatively, is prudent, but the patients at highest risk and therapeutic interventions of greatest benefit remain unknown. Consequently the need for deferral of elective surgery, institution of intensive care and modification of therapy are based on opinion more than objective data. This study suggests that the incidence of perioperative pulmonary complication may be lower than expected. A history of daily cough was more closely correlated with complications than other predictors. Follow-up of further patients in this study will add to the assessment of predictive value of the other components of history, physical, and spirometry.

EFFECTS OF ISOSULFAN BLUE ON PULSE OXIMETRY MEASUREMENTS

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INTRODUCTION

Isosulfan blue (IB) is used during cancer surgery to identify sentinel lymph nodes. Case reports and 1 small series1 have shown that SpO_2 values may decrease after IB injection, due to interference with pulse oximetry measurements because of its absorbance peak of 646nm. This study examines the effects of IB on SpO_2 in a large number of patients having different types of surgery, so as to more fully characterize this phenomenon. This information will allow anesthesiologists to identify changes which normally occur, and focus on deviations from these as potentially representing true hypoxemia.

METHODS

After IRB approval, anesthetic records of 552 patients having sentinel lymph node biopsy with IB from January 1, 1996 to January 31, 2001 were reviewed. The SpO_2 and corresponding FiO_2 values were recorded at: 15 mins before IB injection (preIB); IB injection; every 15 mins after IB injection for 120 mins. Data were excluded if the FiO_2 differed from the preIB period. Data are shown as mean+1SD (median;range). Chi-square, t-tests and ANOVA were used for data analysis. $P<0.05$ was considered statistically significant.

RESULTS

Patients had the following surgery: melanoma - 315; breast cancer - 208; colon cancer - 10; penile cancer - 7; uterine cancer - 7; vulvar cancer - 5. Mean SpO_2 at each time after IB was significantly lower than preIB for all patients as a group, and for the breast and melanoma subgroups ($p<0.05$). Mean SpO_2 values were lower for breast than melanoma surgery at all times after IB ($p<0.05$). All means were $\geq$ 97.8%. SpO_2 fell below preIB at least once for 290 patients (53%). SpO_2 decreases began at 29.0 ± 23.3 mins (30;5-120) after IB injection. The lowest SpO_2 was 98.3 ± 1.73% (99;90-100) and maximum decrease in SpO_2 from preIB was 2.2+1.4% (2;1-8). Fifty-three patients (9.6%) had a moderate fall in SpO_2 ($\geq$ 4% decrease from preIB). Melanoma and breast surgery subgroups are compared in Table.

TABLE

	BREAST (N=208)	*MELANOMA (N=315)*
Patients with any decrease in SpO_2	156 (75%)*	118 (37%)
Patients with moderate decrease in SpO_2	48 (23%)*	4 (1.2%)
Maximum decrease in SpO_2 (%)	2.7 ± 1.5(2;1-8)*	1.6 ± 0.89 (1;1-6)
Volume of IB injected (mls)	4.9 ± 0.65 (5;1-10)*	2.5 ± 0.85 (2;0.5-5)

* $p<0.05$ vs melanoma

DISCUSSION

SpO_2 values frequently fall after IB injection, but these changes are usually minor. Breast surgery had a higher incidence and greater extent of decreases than melanoma, which may be due to the greater volume of IB used.

REFERENCE

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POSTOPERATIVE COMPLICATIONS IN OBSTRUCTIVE SLEEP APNEA PATIENTS

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INTRODUCTION

Obstructive Sleep Apnea Syndrome (OSAS) affects up to 4% of men, 2% of women[1]. OSAS patients are vulnerable to respiratory complications postoperatively[2] (postop). The objective of this review was to examine the type and the rate of postop complications and, the role of Continuous Positive Airway Pressure (CPAP) treatment postop.

METHODS

Following Research Ethics Board approval, chart review of all patients with OSAS who underwent surgery between 1996-2000 at Kingston General Hospital was completed. Patients with a diagnosis of OSAS documented by a sleep study available for review, or preop use of CPAP and monitored postop were included. Data collected included: sleep study parameters, lowest SaO_2 (LSat), apnea/hypopnea index (AHI), Body Mass Index (BMI), surgical procedure, anesthetic time (T), ASA class, lowest postop SaO_2 (LSat) recorded, respiratory complications requiring airway intervention, and myocardial infarction (MI). Data were analyzed using ANOVA and chi-square.

RESULTS

48 patients were identified (12 females, 36 males). Mean and Standard Deviation values were: age 59.2(±14.6)yr, BMI 33.8(±8.3)kg/m², sleep study LSat 79.9(±14.0)%, postop LSat 90.2(±7.0)%, AHI 25.4(±34.7), and anesthetic T 182.4(±88.8)min.

Group Postop LSat	*No Postop CPAP*	*Postop CPAP*	*Total*
I. SaO_2 >90%	10 (62%)	18 (56%)	28 (58%)
II. SaO_2 85-90%	6 (38%)	9 (28%)	15 (31%)
III. SaO_2 < 85%	0 (0%)	5 (16%)	5 (11%)
Total	16 (33%)	32 (67%)	48

AHI (p=0.026), BMI (p=0.003), and anesthetic T (p=0.004) were statistically different between groups I, II, and III. There was no statistical difference in: sleep study LSat, type of surgery, and ASA class in groups I, II, and III. No patient required airway intervention and none had an MI.

DISCUSSION

All cases of severe desaturation (SaO_2<85%) occurred in the CPAP group. Use of CPAP in the post-op period did not prevent post-op desaturation in our patient population. AHI, BMI, and anesthetic T may be predictors of postop desaturation in OSAS population.

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EFFECT OF INHALED NITRIC OXIDE (INO) ON SURFACTANT IN PIGS

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INTRODUCTION

Nitric Oxide (NO) is known to possess both inflammatory[1] and anti-inflammatory[2] role in the lung and may influence other pulmonary functions. This study was designed to test whether inhale NO (iNO) affects the pulmonary surfactant content.

METHODOLOGY

To test this hypothesis, 30 pigs, weighing 30 to 40 kg, were randomized in two groups: one control group (without NO inhalation) and one group exposed to 20 ppm NO for two hours. Haemodynamics and respiratory compliance were measured. For the measurement of the surfactant content, broncho-alveaolar lavage (BAL) was undertaken by fibroscopy 2 hours after the beginning of anaesthesia. Saline (60ml) was injected promptly and then withdrawn slowly to obtain optimal BAL specimens. The lavage was performed in the right accessory lobe and the specimens were then centrifuged at 1500 rpm for 8 min for removal of the cellular material. The supernatant was then transferred into ultra centrifuging tubes and then centrifuged 15 minutes at 40 000g to separate the small aggregate fraction from the large aggregate fraction. This study was performed with the approval of the institutional animal care committee in compliance with the guidelines of the Canadian Council on Animal Care. Extraction of the large aggregate and small aggregate was done using the Bligh and Dyer's method[3].

RESULTS

The lung compliance of the pigs submitted to NO (n=15) was not significantly different from the compliance of the control group (27, 00 ± 4,58) ml/cmH_2O and (27,87 ± 5,34) ml/cmH_2O respectively. The airway pressure is similar for the two groups, 20,67 ± 3,22 cmH_2O for the control group and 20,73 ± 3,01 cmH_2O for the iNO exposed group. The content of large aggregate and the total calculation of surfactant, in the group with iNO, showed an increase of 36% (p=0.011)and 46%(p=0.012) respectively compare to the control group. The small aggregate didn't change significantly.

CONCLUSION

NO has regulatory effects on surfactant product, it is therefore possible that inhaled NO will replace the endogenous NO produced by upper airways bypassed by intubation.

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CAN INHALED NITRIC OXIDE BE EFFECTIVLY DELIVERED TO THE PIGS BRAIN

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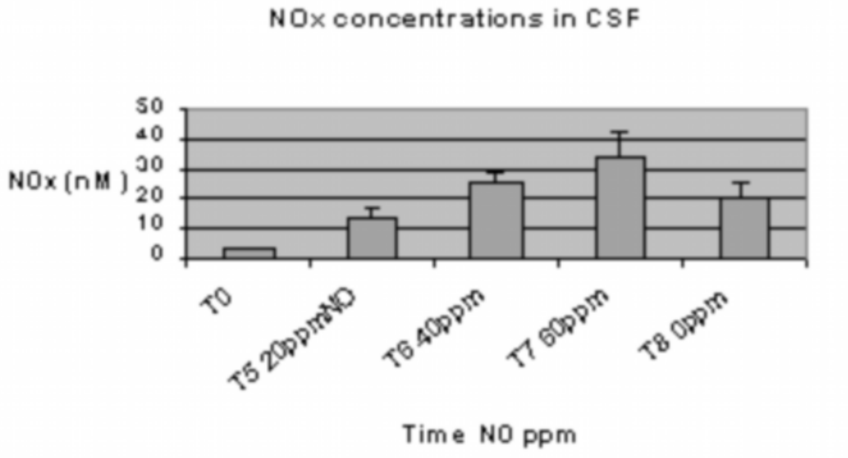
INTRODUCTION

Nitric oxide is known to be a potent pulmonary vasodilator and can be transported away from the lung[1]. Several proteins are possible transporters of NO, which is fixed to thiol groups[2]. We tested in this study whether inhaled NO can reach the brain in pig model.

MATERIEL AND METHODS

Three male pigs weighing 27, 29 and 30 kg were anesthetized and mechanically ventilated for 8 hours. Cardiovascular and respiratory monitoring were placed. A CSF catheter was placed in the cysterna magna. NOx were measured in CSF samples by chemiluminescence (Sievers).three base values were measured at the beginning of the experimentation and five hours later following ventilation without INO in order to exclude any effect of mechanical ventilation and anesthesia on CSF NOx levels. After 5 hours ventilation without INO, a dose-response to INO was started 20, 40 and 60PPM of INO were administered for one hour, followed by discontinuation of INO for one hour.

RESULTS



CONCLUSION

Diffusion of inhaled Nitric Oxide through the blood-brain barrier seems possible since the concentration of NOx measured in CSF is proportional to the dose of Nitric Oxide inhaled during the experiment. This confirms that inhaled NO can reach the brain and affect cerebral function.

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CAN inhNO ATTENUATE INFLAMMATION AND APOPTOSIS IN PIG LUNGS AFTER CPB

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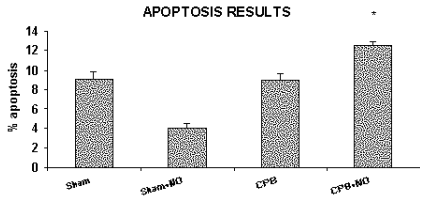
INTRODUCTION

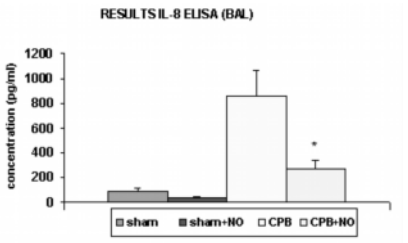
The occurrence of the systemic and pulmonary inflammation reaction during cardiac surgery with cardiopulmonary bypass[1,2] (CPB) has been established. This leads to tissue injury and apoptosis. Apoptosis is a process of programmed cell death that deletes individual cells in the course of development or cell turn over. Nitric oxide have been shown to inhibit inflammation and apoptosis in several type of cells. The aim of this study was to test whether **inhaled NO** can modulate inflammation and apoptosis in the lung.

MATERIEL AND METHODS

Twenty pigs weighing 30 to 40 kg were randomized in 4 groups. Two groups were subjected to a sternotomy (without CPB) while the two other groups were subjected to 90 minutes CPB with cardiac arrest and aortic clamping for 75 min. Half of all the groups were exposed to 20ppm of inhaled NO. After 24h of treatment, all animals were sacrificed and their lungs were harvested, perfused, embedded in paraffin, cutted and mounted on immunological slides. The samples were enzymaticaly labeled (TUNEL) for detection of apoptosis. All slides were visualized under fluorescent microscopy and analysed with the Metamorph 4.6 software. Il-8 concentrations were measured, on broncho-alveolar lavage (BAL), using ELISA Kit (Biosource, Nivelles, Belgium). A neutrophil count was also made on BAL.

RESULTS





After 24hours, the percentage of neutrophils was (11.0 ± 11.73)% and (13.6 ± 20.77)% in sham group and sham NO group respectively. In CPB groups, pigs exposed to nitric oxide had (9.0 ± 10.10)% of neutrophils while the CPB group without inhaled NO had greater values of neutrophils (18.4 ± 23.64)%. No statistical difference was found between groups.

CONCLUSION

Inhaled NO seems to reduce inflammation by decreasing cytokines synthesis, and can have both antiapoptotic and proapoptotic role depending of physiological and pathophysiological conditions respectively.

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