Rocuronium Vs Vecuronium During Fentanyl Induction in Coronary Artery Surgery

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Introduction. The purpose of the study was to determine the hemodynamic effects and conditions of ventilation and tracheal intubation after paralysis with either rocuronium (R) or vecuronium (V) during induction of anesthesia with moderate dose fentanyl.

Patients and Methods. After IRB approval and written consent, 20 patients undergoing coronary artery surgery were randomized to receive, in a blinded fashion, R, 1 mg/kg (n= 11), or V, 0.15 mg/kg (n= 9). Premedication was with lorazepam. Anesthesia was induced with an infusion of fentanyl, 0.1 ug/kg/min, followed by a bolus of 15 ug/kg. The muscle relaxant was given 90 sec after the fentanyl induction, and the trachea was intubated 90 sec later. Ease of bag-mask ventilation was evaluated every 15 seconds before and after the relaxant. Tracheal intubating conditions were evaluated according to jaw relaxation, status of vocal cords, and cough/buck response. Train of four monitoring of the facial nerve- orbicularis oculis muscle was done. Data were compared between groups with Student's t test and the Cochran-Mantel-Haenzel test. A p value < 0.05 was considered significant.

Results. Demographics and hemodynamics were similar between groups. Compared with V, patients receiving R were easier to ventilate, had faster loss of TOF, and better overall intubating conditions (Table)

Discussion. During conditions of the study, R produced similar hemodynamics and better conditions for bag-mask ventilation and tracheal intubation compared with V.

Table 1. Difficulty with bag-mask ventilation at 30 and 60 sec

Degree of Difficulty and Peak Airway Pressure	Rocuronium (n= 10)	Vecuronium (n=9)
Severe, > 30 cm H_2O	1, 0	2,1
Moderate, 25 -30 cm H_2O	1,1	4,3
Mild, 20 - 25 cm H_2O	2,1	2,3
None, < 20 cm H_2O	6,8	1,2

Data are number(s) of patients. * $P < 0.05$ between groups

Table 2. Tracheal Intubation Conditions

Intubating Conditions*	Rocuronium (n=11)	Vecuronium (n=9)
Excellent	11	4
Good	0	2
Fair	0	3

Data are number (s) of patients. * $P < 0.05$ between groups

Multicompartment Pharmacokinetic Model for Fentanyl During Cardiopulmonary Bypass

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Introduction. We propose a pharmacokinetic model to simulate the changes in drug concentration produced during cardiopulmonary bypass (Cpb). Fentanyl is used as an example.

Methods. A multicompartmental model was developed taking into account the relative importance of hemodilution, sequestration of drug by the lungs [1], and absorption of drug to the Cpb circuit [2]. Available pharmacokinetic data was utilized [3]. Figure 1 shows a multicompartment pharmacokinetic model with the various rate constants, K_{ij}. Microsoft Visual Basic 3.0. was used to solve the pharmacokinetic equations. Information was transferred to Microsoft Excel 5.0 to generate the graphics.

Results. Figure 2 shows an example. After initiation of Cpb (110 min), there was an initial decrease in the plasma fentanyl concentration in the central compartment, C_1. Part of the drug sequestered by the lungs (C_2L) produced a "rebound" increase in the concentration in the second (C_2) and central (C_1) compartments after the Cpb was terminated (240 min). The concentration in the effect compartment, C_e, was also affected.

Discussion. The model takes into account not only the volume of distribution in the extracorporeal circulation, but also the capacity of different oxygenators to take up drug, and the ability of the lungs to sequester drug during Cpb. This model can be applied to other drugs by changing the pharmacokinetic variables and uptake by oxygenator for the specific drug.

References.

1. Bentley et al: Clin Pharmacol Ther 34: 703-706, 1983
2. Rosen et al: J Cardiothorac Anesth 4: 332-335, 1990
3. Koren et al: Anesth Analg 63: 577-582, 1984

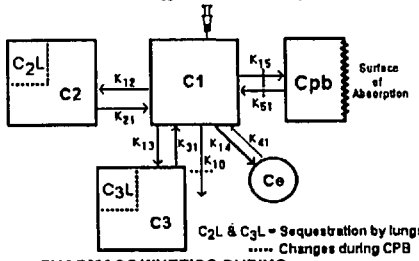

FIG. 1 PHARMACOKINETICS DURING CARDIOPULMONARY BYPASS

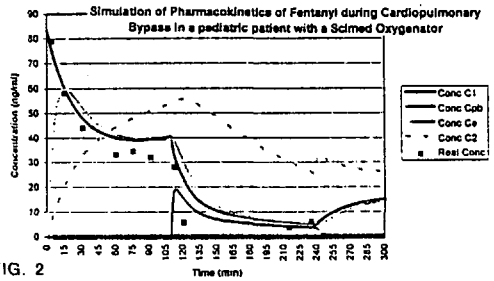

FIG. 2

Propofol and Ketamine Versus Fentanyl For Open Heart Surgery

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Introduction. The purpose of the study was to determine the cardiovascular effects of a propofol and ketamine combination (PK) during induction and maintenance of anesthesia, and postoperatively in the ICU. The PK combination was compared with a conventional fentanyl technique.

Patients and Methods. After IRB approval and written consent, 19 patients undergoing coronary artery surgery were studied prospectively. Patients were randomized to receive PK (n= 7), or fentanyl (F, n= 12), both supplemented with enflurane as needed. In the PK group anesthesia was induced with an infusion of P 100 ug/kg/min and K 25 ug/kg/min, followed by a bolus of P 1 mg/kg and K 2 mg/kg, 3 minutes later. The infusion was stepwise decreased by protocol, and maintained during the first 4 hours in the ICU at a rate of P 20 ug/kg/min and K 5 ug/kg/min. In the F group, anesthesia was induced with an infusion of 0.1 ug/kg/min, followed by a bolus of 15 ug/kg. The F infusion was maintained between 0.05 and 0.1 ug/kg/min during surgery and discontinued at the end of surgery. Tracheal intubation was facilitated with vecuronium or rocuronium. Hemodynamics were compared between groups at specific intervals with Student's t or Chi square. A P value < 0.05 was considered significant.

Results. The groups were similar except for a lower preoperative ejection fraction in the PK compared with F group (46 vs 59 %). Compared with the PK group, more patients in the F group required inotropes during weaning from bypass (50% vs none). Blood pressure(MAP), heart rate (HR) and cardiac index (CI) are shown in the Figure.

Discussion. The PK combination produced stable hemodynamics and no ischemia. It appears that the use of K opposes the hypotension and depressed cardiac contractility often associated with P. Advantages of the PK combination include absence of opioid rigidity during induction, profound hypnosis, rapid recovery profile, excellent analgesia and no recall. We will continue to enroll patients into this clinical study.

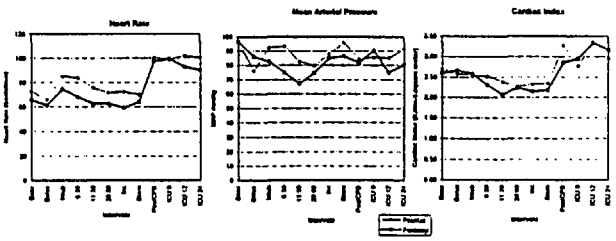

Figure. HR, MAP and CI at baseline, 1 min after induction, 1 min after intubation, 6.5, 11.5, and 20 min after induction, 1 min after incision and sternotomy, 15 min after bypass, and after admission to the ICU (0, 12 and 24 hrs).

A

RESPIRATORY OUTCOMES IN PATIENTS ANAESTHETIZED WITH HIGH DOSE OR LOW DOSE NARCOTIC FOR AORTOCORONARY BYPASS SURGERY (ACB)

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INTRODUCTION

Anaesthetic techniques for elective ACB have been altered with substitution of high dose narcotics to balanced anaesthesia and lower dose narcotics. Little attention has been focused upon postoperative respiratory function.

METHODS

We studied a convenience sample of 33 patients using Sufentanil 3.6 $\pm$ 8.7 μg/kg (October 1994 to March 1995). Patients were compared to a matched cohort of 112 patients using Sufentanil 17.6 $\pm$ 8.7 μg/kg selected from a database of 268 patients who underwent aortocoronary bypass surgery from January 1991 to July 1994. Matching was based upon FVC $\pm$ 5%, gender, and age ($\pm$ 5 years). Groups were compared by two-way ANOVA.

RESULTS

Demographics were comparable between groups: age (54.7 $\pm$ 9.2 versus 65.5 $\pm$ 8.5 years), gender (M = 23, F = 10 versus M = 74, F = 38), EF (57 $\pm$ 15 versus 58 $\pm$ 12%), and pump time (109 $\pm$ 21 versus 103 $\pm$ 28 min). Hospital and ICU stays were shorter ($p<0.05$) in the low narcotic group (6.5 $\pm$ 1.6, 1.3 $\pm$ .4 days) versus the high narcotic group (10.8 $\pm$ 10, 2.8 $\pm$ 3 days). Atelectasis score (range score 0-10) was less ($p < 0.05$) in the low dose (2.8 $\pm$ .3) versus high dose narcotic (4.1 $\pm$ 2.4) on the day of extubation. Incidence of lobar collapse (1 versus 27) was significantly increased ($p < 0.05$) in the high dose narcotic group. Improvements in chest x-ray findings are not related to spirometry in either group (FVC 1.02 $\pm$ 0.30 versus 1.05 $\pm$ 0.36; FeV_1 0.78 $\pm$ 0.022 versus 0.75 $\pm$ 0.29). Fluid balance was significantly ($p < 0.05$) lower in the low dose narcotic group (-1.4 $\pm$ 1.2 versus 4.0 $\pm$ 2.1 l). Hemodynamics were similar between both groups: heart rate (89 $\pm$ 13 versus 91 $\pm$ 14), mean blood pressure (80 $\pm$ 10 versus 82 $\pm$ 12 mmHg), CVP (10 $\pm$ 3.6 versus 12.5 $\pm$ 4.2 mmHg). Gas change was also similar between groups: A-aO_2 gradient (156 $\pm$ 78 versus 148 $\pm$ 88). Pain score (range 0-10) was equivalent in both groups at the time of extubation 4.1 $\pm$ 1.8 versus 4.1 $\pm$ 2.2.

CONCLUSION

Chest x-ray atelectasis was diminished in the low dose narcotic group. This difference was not be related to spirometry, pain or hemodynamics but may be related to diminished use of fluids. Balanced anaesthesia and low dose narcotics may not only result in decreased time of hospitalization but as well result in some improve physiological respiratory outcomes.

B

Cardiopulmonary function with PEEP at sternotomy.

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INTRODUCTION.
The value of adding positive end-expiratory pressure (PEEP) to improve gas exchange during sternotomy for coronary artery bypass grafting (CABG) has been questioned [1]. The authors reported that lung compliance was reduced and that this *may* have undesirable effects on gas exchange. The purpose of our study was to determine the effects of PEEP on simple bed-side indices of gas exchange and lung mechanics to study this point further.

METHODS.
With Ethics Committee approval, ten ASA III patients scheduled for CABG were included in this study. The measured parameter were : expired oxygen concentration (F_EO_2), tidal volume (V_T), peak inspired pressure (PIP), PaO_2, Pa and P_{ET} CO_2, and cardiac index (CI). These measurements were made a) before sternotomy, b)after sternotomy and c) after sternotomy, with the pleura intact and 5 cm H_2O PEEP applied. We excluded patients who had an upsloping capnograph.

RESULTS. These are given in the table,which shows means(sem).

	Before	After Z PEEP	After 5 PEEP
PaO_2/F_EO_2	313(39) A vs B < 0.01	375(43) B vs C ns	355(38) A vs C < 0.05
Pa-P_{ET} CO_2	6.0(.9) A vs B ns	6.1(1.2) B vs C<0.05	9.3(1.3) A vs C<0.05
Pa CO_2	35.3(1.5) A vs B ns	35.2(1.9) B vs C< 0.05	40.1(2.3) A vs C < 0.05
P_{ET} CO_2	28.8(1.0) A vs B ns	28.7(1.0) B vs C ns	30.5(1.4) A vs C <0.05
V_T/PIP	59.6(2.5) A vs B ns	63.5(4.9) B vs C<0.05	45.3(3.3) A vs C<0.05
Cardiac Index	2.26 (.14) A vs B ns	2.22(.15) B vs C ns	2.16(.19) A vs C ns

Oxygenation improved with the sternotomy but without further change with the addition of PEEP. The sternotomy did not influence the lung mechanics index, which decreased significantly with PEEP. Cardiac index was constant throughout.
The institution of PEEP caused an increase in Pa and PET CO2, with a more marked influence in PaCO2 (14 vs 6%). Thus, Pa-PETCO2 increased very significantly.

Conclusions
Our results confirm that PEEP ,applied after sternotomy, reduces compliance, but, however, does not significantly affect oxygenation. The Pa-PETCO2 is markedly increased by PEEP.

References. (1) Anaesth Analg 1995;81:279-86

THE USE OF PROPOFOL FOR REPAIR OF CONGENITAL HEART DEFECTS

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INTRODUCTION: Extubation of cardiac surgery patients early in the postoperative period requires an alternate anaesthetic regimen. We conducted a pilot study to evaluate the use of propofol by infusion after cardiopulmonary bypass to supplement a reduced narcotic dose in children undergoing elective repair of congenital heart defects.

METHODS: After ERB approval and consent were obtained, fifteen children aged 8 months to 12 years undergoing repair of congenital heart defects with cardiopulmonary bypass (CPB) were enrolled in the study. Patients were premedicated with midazolam 0.75 mg/kg p.o. Anaesthesia included intravenous fentanyl (up to 20 mcg/kg) and pancuronium 0.15 mg/kg for paralysis and was maintained with isoflurane supplemented with intravenous midazolam (up to 0.2 mg/kg) as needed. On weaning from CPB, a propofol infusion was started at a dose of 50 mcg/kg/min and titrated as required. A morphine infusion was also started at a dose of 10 to 40 mcg/kg/min.

On sternal closure, residual neuromuscular blockade was reversed and ventilatory support was weaned. The patients were transported to the intensive care unit (ICU) with ventilation assisted as needed. The propofol and morphine infusions were continued.

Ninety minutes after arrival in the ICU, the patients were assessed using pre-established criteria for readiness for extubation. If clinical conditions prohibited extubation the patients were assessed every two hours as to appropriateness for extubation. Patients still intubated after six hours were judged to have failed early extubation.

Hemodynamic variables and inotrope use were measured throughout the study period. The time to extubation was recorded and any respiratory complications were noted. The length of stay in the ICU and time to hospital discharge were also recorded.

RESULTS: Of fifteen patients enrolled, one was withdrawn due to pulmonary hypertension. Ten patients were extubated within the 6 hour study period. These included children with ASD II (5), ASD with pulmonary stenosis (1), ASD with PAPVD (2), univentricular heart (1) and DORV (1). Three patients had prolonged intubations due to surgical complications. One patient remained sedated over 9 hours despite minimal doses of narcotic, representing the single failure of the technique. One patient was temporarily reintubated without sequelae after being extubated inappropriately. No other patients suffered respiratory complications. There were no hemodynamic complications associated with the use of propofol. Heart rates did not change significantly after initiation of propofol infusion. Mean arterial pressures increased over the first twenty minutes of propofol infusion but this was felt to be due to stabilization after CPB. There were no adverse reactions to propofol. The mean (SD) times to extubation and ICU discharge, excluding patients with surgical complications, were 178 (152) minutes and 0.45 (0.31) days respectively.

DISCUSSION: This protocol provided adequate anaesthesia with stable hemodynamics for the transition from the operating room to the ICU. Propofol's short duration of action allowed rapid awakening which facilitated early extubation. There were no complications directly attributable to the appropriate use of propofol. The technique was readily accepted by both anaesthesia and ICU staff. The timing of extubation and ICU discharge are dependent upon multiple variables. Further study is planned to evaluate the impact of propofol on extubation and discharge times.

THE INFLUENCE OF EPIAORTIC SCANNING ON AORTIC CANNULATION FOR CARDIAC SURGERY.

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INTRODUCTION: Significant atherosclerosis of the ascending aorta is present in over 1/3 of cardiac surgical patients aged 50 years or older. Atheroemboli from the ascending aorta have been identified histologically in 37% of patients with severe aortic disease following cardiopulmonary bypass(CPB).[1] In a large series post-CPB stroke was found to be age related with an incidence of 0.9% in patients <65yrs, 3.6% in patients between 65 and 74yrs, and 8.9% in those >75yrs.[2] 50-80% of significant atherosclerotic lesions in the ascending aorta are missed on intra-operative palpation.[3] Identifying severe aortic disease has important clinical implications because cardiac surgical technique, including cannulation, cross-clamping, and proximal coronary graft anastomosis, may be altered to avoid producing emboli and risk of stroke. The specific aim of this study was to evaluate an inexpensive hand-held B-mode scanner (Site-Rite II, Dymax Inc.) for the detection of ascending aortic plaque as compared to surgical palpation alone. **METHODS**: After Ethics committee approval, ten cardiac surgical patients were studied prospectively. The aorta was evaluated for the presence and location of atheromatous disease by the surgeon using palpation. Subsequently, a 9 MHz probe, Site-Rite II (Dymax), was systematically used to scan the ascending and transverse aorta. The scans were video recorded and independently reviewed by a radiologist to confirm correct interpretation. **RESULTS**: Of 10 patients studied, 2 had their palpation-selected cannulation site changed as a result of aortic scanning. In one patient, ultrasound(u/s) scanning was able to determine the optimal cannulation site, having previously identified diffuse aortic atherosclerosis by palpation. The other patient had unexpected plaque visualized at the selected cannulation site on the anterior wall of the ascending aorta that was not detected by palpation. The diagnostic efficacy and sensitivity of the u/s scan was confirmed in a third patient in whom the presence of plaque seen on u/s was subsequently confirmed at aortotomy. **DISCUSSION**: Based on the results of the scan, modifications in the usual cannulation site, cross-clamp site, and anastomosis sites were made in two of 10 patients. None of the 10 patients suffered postoperative stroke. This portable and inexpensive scanner provided a clear and accurate outline of ascending aortic plaque and positively influenced the technique of aortic instrumentation for CPB. **ACKNOWLEDGEMENT**: Dymax Inc. for the use of the Site-Rite II. **REFERENCES**:1. Blauth CI, et al. J Thorac Cardiovasc Surg 103:1104-12,1992. 2. Tuman KJ, et al. J Thorac Cardiovasc Surg 104:1510-7,1992. 3. Barzilai B, et al. Circulation 80 (I):I-275-9, 1989.

MEASUREMENTS OF NITROGEN OXIDES (NO_x) BY CHEMILUMINESCENCE

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INTRODUCTION

Nitric oxide (NO) plays an essential and widely-known role in organism where it is metabolised in nitrites (NO_2^-) and nitrates (NO_3^-). The measure of plasma, urine, synovial or spinal levels of NO_x offer a definite interest. The chemiluminescence technique is sensitive and specific for the NO detection and other NO_x following their reduction to NO. The key point in this procedure is to select the more appropriate reducing agent and temperature conditions.

METHODS

NO was measured by the 207B Sievers analyser™ combined with the MacLab™ data acquisition system. Its measurement involves its reaction with ozone which results in the emission of quantifiable photons ($NO+O_3 \rightarrow NO_2+O_2+h\nu$). The NO_2^- and NO_3^- were measured with the same technique after reduction to NO. A microreaction purge vessel equiped with a temperature regulator and a condenser allowed the samples introduction directly into the reducing solution. The reducing agents used were iodide sodium [NaI], molybdenum-iron mix [Mo(VI)+Fe(II)] and vanadium [V(III)]. Samples of NO_2^- and NO_3^- (100, 200, ..., 500 pmoles) were injected and NO measured after conversion by each reducing agent in identical conditions. Finally, the influence of temperature on reduction of 400 pmoles NO_x was estimated with an evolutive temperature scale (20, 30, ..., 90°C). Data were collected as areas under the response curve and compared to the standard response of NO gas to obtain the recovery factor (R).

RESULTS

1. The conversion of NO_2^- to NO was near complete (R>88%) with each dose for all three reducing agents at 20°C (P=0.99, *OneWay ANOVA*). **2.** The temperature affected the recovery of NO from NO_2^-: the best temperatures of NO_2^- conversion were between 50 and 90°C for NaI (R=100%), between 50 and 70°C for Mo(VI)+Fe(II) (R>97%), and 70, 80°C for V(III) (R> 92%). **3.** The conversion of NO_3^- was near complete (R>84%) with each dose for Mo(VI)+Fe(II) and V(III) at 80°C (P=0.97, *OneWay ANOVA*) and was insignificant (R<4%) for NaI (P<0.0003, *unpaired t-test*). **4.** The temperature affected NO_3^- conversion for Mo(VI)+Fe(II) and V(III): at low temperatures (<50°C), both were weak reducing agents {V(III): R<30%; Mo(VI)+Fe(II): R<15%}, and presented similar efficiency (R>84%) at 80, 90°C.

DISCUSSION

The most recent reducing agent available, V(III), is as efficient as Mo(VI)+Fe(II) for the conversion of NO_2^- and NO_3^-, since NaI was unable to reduce NO_3^-.

PROLONGED EXPOSURE TO NITROUS OXIDE INCREASES POSTOPERATIVE VOMITING IN CHILDREN

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INTRODUCTION Vomiting after general anaesthesia is very common among children. Brief exposure to nitrous oxide does not appear to alter vomiting by children after general anaesthesia[1]. The purpose of this study was to determine the effect, if any, of prolonged exposure to nitrous oxide on postoperative vomiting in children.

METHODS With local ethics committee approval, 229 healthy (ASA physical status I-II) children aged 2-12 yr who had elective dental restorations and/or extractions under general anaesthesia were investigated in this single-blind, randomized study. If indicated, subjects received 0.5 $mg.kg^{-1}$ midazolam p.o. 20-30 min preoperatively. Induction of anaesthesia was by inhalation of N_2O and halothane (Group N) or halothane alone (Group P) or iv with propofol (either Group). Anaesthesia was maintained with N_2O and halothane (Group N) or halothane only (Group P). Muscle relaxtion was achieved with mivacurium, when indicated. At the end of the surgery, residual muscle relaxation was reversed with atropine and neostigmine. The endotracheal tube was removed before the return of airway reflexes. The surgical technique was unaltered by this study and included the use of local anaesthetic agents for extractions. Postoperative pain was treated with acetaminophen. In-hospital, patients vomiting more than twice received dimenhydrinate. Patients were followed for 24 hr after surgery. Data were compared with ANOVA, Mann-Whitney-U test and Chi-square analysis where appropriate. Accepted alpha error was 0.05.

RESULTS The groups had similar demographic data. The length of anaesthesia was 80±26 min (mean±SD). Thirty-three percent of the patients in both groups vomited. The exposure to nitrous oxide among the 127 patients in Group N increased postoperative vomiting from 26% (Group P) to 39%, P<0.05. Both in-hospital (12% vs 25%) and post-discharge (18% vs 28%) vomiting were increased among the Group N patients, P<0.05. The incidence of vomiting was unaffected by premedication and induction technique.

DISCUSSION Prolonged exposure to nitrous oxide increases postoperative vomiting by children.

REFERENCES 1. Can J Anaesth 1995; 42:274-6.

MUSCLE SOUNDS IN ANAESTHETIZED PATIENTS

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INTRODUCTION

Contracting muscle makes low frequency sound [1,2]. The quieter sounds from resting muscle may be useful in monitoring neuromuscular function.

METHODS

The study was approved by the hospital Research Ethics Committee. Informed consent was obtained from 10 healthy adult patients, with no neuromuscular disorder, undergoing elective surgery under general anaesthesia.

Prior to induction, a 54gm accelerometer attached to a recording system was taped over the mid-biceps, with the arm on an arm board padded with foam at 15 degrees of elbow flexion. 30s recordings were made. The subject was asked to lift just clear of the pad a 1kg weight in the hand, and a recording made with the weight held steady (stage 1). A recording of the awake subject's resting muscle was next made, repeated after induction with thiopental (5mg/kg), and again after paralysis with vecuronium (0.015mg/kg) (stages 2, 3, and 4).

6s digitized signal was analyzed in Easyplot^{tm} graphics programme. FFT total power was compared using ANOVA.

RESULTS

All stages contained significantly different power from the others ($p < 0.01$) except 3 from 4. In these, the muscle signal was corrupted by arterial pulsation with a similar frequency content which clearly contained most of the power.

STAGE	MEAN ACCELERATION	95% Confidence Intervals For Mean
1	178 mm . s^{-2}	145 - 214
2	114	81 - 149
3	79	45 - 114
4	66	33 - 101

DISCUSSION

1-Arterial pulsations must be removed from resting muscle sounds if they are to be useful in assessing muscular or neuromuscular function. We are exploring several approaches to this.

2- Thiopental and vecuronium significantly diminish muscle sounds.

REFERENCES

1 Wollaston WH. On the duration of muscle action. Philos Trans R Soc 1810; 1:5.

2 Oster G, Jaffe JS. Low frequency sounds from sustained contraction of human skeletal muscle. Biophys J 1980; 30:119-128.

A

PREEMPTIVE ANALGESIA IN PEDIATRIC UROLOGIC PATIENTS

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INTRODUCTION The purpose of this study was to determine if preoperative institution of central blockade by the epidural route is a more effective means of controlling postoperative pain than postoperative institution of epidural analgesia as previously proven with intravenous anlagesics[1].

METHODS This study was approved by the Institutional Review Board and informed consent was obtained from the parents. Thirty consecutive patients presenting for ureteral reimplantation will be included in this study and randomly attributed to one of two groups. The patients, their parents and the person recording pain scores were all blinded to the technique used. All patients underwent general anesthesia. Induction was by mask with a 70% N_2O/O_2 mixture and halothane followed by fentanyl 2 $mcg \cdot kg^{-1}$ and vecuronium 0.1 $mg \cdot kg^{-1}$. Maintenance of anesthesia was with N_2O/O_2, isoflurane and fentanyl as required. A catheter was threaded 3 cm into the epidural space at the L3-L4 interspace before surgical incision and a test dose was given. A bolus of 0.5 $ml \cdot kg$ of bupivacaine 0.25% (maximum 10 ml) was then given to patients in group 1 followed by a continuous infusion of bupivacaine at 0.4 $mg \cdot kg^{-1} \cdot hr^{-1}$ which was commenced before incision. Patients in group 2 received a bolus of 0.5 $ml \cdot kg^{-1}$ of bupivacaine 0.25% (maximum 10 ml) upon closure of the muscle layer. Pain scores using the CHEOPS scale[2] were recorded every 4 hours postoperatively as well as analgesic requirements for a period of 24 hours. Statistical analysis was performed using the ANOVA single factor test, a $p<0.05$ was considered significant.

RESULTS Twenty-two patients were studied, 11 in each group. Patients' age averaged 3.3 years (range 10 months to 9 years) and the average weight was 18.3 kg (range 9 to 36.4 kg). There were no statistically significant differences between groups 1 and 2 for pain scores at 0 to 24 postoperative hours (Table). There was also no statistically significant differences on intravenous fentanyl used intraoperatively nor on analgesic requirements for the first 24 postoperative hours (Table).

	Group 1	Group 2	p
Pain score (0 hours)	5.8	6.8	0.25
Pain score (4 hours)	6.8	6.8	1.00
Pain score (8 hours)	6.3	5.6	0.55
Pain score (12 hours)	5.7	5.2	0.54
Pain score (16 hours)	5.7	5.8	0.93
Pain score (20 hours)	5.3	5.9	0.52
Pain score (24 hours)	4.4	5.1	0.18
Fentanyl ($mcg \cdot kg^{-1}$)	2.4	3.1	0.07
Meperidine ($mg \cdot kg^{-1}$)	1.2	1.9	0.12

DISCUSSION We conclude that institution of central blockade before surgical incision in pediatric patients undergoing ureteral reimplantation does not provide better postoperative analgesia nor does it reduce postoperative analgesic requirements when compared to a bolus injection at the end of the surgery.

REFERENCES

1. Anesth Analg 1994;78:205-209

2. Advances in Pain Research and Therapy, 1985, Raven Press, NY, pp. 395-402

B

Sedative Infusions During Surgery: Propofol Vs. Propofol-Ketamine

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Introduction. The objectives of the study were to compare the intraoperative effects and recovery characteristics of using either an infusion of propofol, alone or in combination with ketamine for surgical procedures requiring deep sedation.
Patients and Methods. After IRB approval and written consent, 19 patients undergoing elective oral surgery or gynecological procedures were entered into this randomized, double blinded study. Patients in the propofol group (P, n= 11) received a bolus of propofol, 300 ug/kg, followed by an infusion of 50 ug/kg/min. Patients in the propofol-ketamine group (PK, n= 8) received a mixture of propofol-ketamine, (bolus: P- 300 ug/kg, K-75 ug/kg; infusion: P- 50 ug/kg/min, K-12.5 ug/kg/min). Change in rate of infusion and titrated fentanyl were permitted for specific criteria. Vital signs, infusion rate, fentanyl requirements, anxiety, antegrade and retrograde memory, psychomotor function, and level of sedation were measured at specific intervals. Patients were contacted 24 hrs after surgery for a standard questionnaire. Data were analyzed with t tests and Chi Square. A p value < 0.05 was considered significant.
Results. Demographics, time to recovery, incidence of dreams, and psychomotor function were similar between groups. One patient (group P) had laryngospasm requiring positive pressure ventilation. Results are shown in the Table.
Discussion. Both P and PK infusions provided satisfactory sedation, although the requirement for fentanyl was higher in the P group.

Psychomotor Fuction	P (n=11)	P-K (n=8)
Baseline	11 (100%)	8 (100%)
5 minutes after Infusion	5 (45%)	4 (50%)
Postoperative	11 (100%)	7 (88%)
Anterograde Amnesia		
No recall	10 (91%)	4 (50%)
Recall after visual prompt	1 (9%)	3 (38%)
Patients requiring Fentanyl	7 (64%)	2 (25%)
Hallucinations/Dreams	1 (9%)	2 (25%)
Airway Obtruction	1 (9%)	0 (0%)

Data are number(s) of patients and percentage.

WHEN NO ONE IS THERE

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INTRODUCTION: One goal of anaesthesia practice is the reduction of cost without compromise to quality of patient care. This goal may be achieved by optimized time management. We investigated if a difference exists in the time spent both during and especially between cases, i.e. when no direct patient care is being administered, as related to attending anaesthetist.

METHOD: With institutional approval, 24 consecutive months of records were reviewed. Data acquisition was limited to cardiac surgeries because these procedures are always performed in one single operating theatre, by only two co-working surgeons, a select team of nurses, and without resident participation. Only data that met the following criteria was studied: a single anaesthetist completed consecutive cases on that given day, and an elective case was followed by an elective coronary artery bypass. Times were recorded from the O.R. Nursing Records. The difference in minutes from first "Patient OUT" to second "Patient IN" was defined as "turnover time". Data was analysed using ANOVA and 2-tailed t-test assuming unequal standard deviations.

RESULTS: Three hundred and four eligible cases were reviewed. Intra-operative duration did not differ significantly among the anaesthetists (ANOVA p=0.3311). However, a significant difference did appear in the turnover time between cases (p=0.0173). (See table)

CONCLUSION: This study demonstrates that turnover time is dependant upon the anaesthetist. We conclude that anaesthetists exert influence over the time spent between cases when no direct patient care is being administered. Reducing this "turnover time" can improve overall efficiency without compromising patient care.

TABLE 1: Comparison of Pairs --- T-tests p-values

Anaesthetist	A	B	C	D	E
F	<.01	<.01	<.10	ns	ns
E	<.01	<.02	ns	ns	
D	<.02	<.10	ns		
C	ns	ns			
B	ns				

ns=not statistically significant (p>.10)

EFFECTS OF ETHANOL ON COMPLICATIONS AND OUTCOME FROM BLUNT TRAUMA: AN INTENSIVE CARE UNIT STUDY

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INTRODUCTION We hypothesized that intensive care would be complicated and prolonged when patients with blunt trauma had blood ethanol on admission.

METHODS Prospectively collected and archived data on all patients admitted to the intensive care unit for blunt trauma between January 1990 and December 1993 were reviewed, and data on the patient's course were recorded (Table). Data were evaluated for normality and analyzed by Student's *t* test, Mann-Whitney rank sum test, and Kruskal-Wallis one-way ANOVA on ranks.

RESULTS Of 292 patients, 140 had blood ethanol on admission. They did not differ from those without blood ethanol by any variable (Table), including costs of hospital and intensive care. Median quality of life score was the same for all groups: 2 (5 being the worst score). Durations of hospital and intensive care were not affected by ethanol or age. The number of women was significantly low and of men 21 to 40 years of age disproportionately high.

DISCUSSION Our findings are consistent with two studies examining the impact of acute ethanol ingestion: One showed it had no impact on risk of dying or duration of hospitalization[1] and the other showed it may blunt the response to norepinephrine during closed-head injury.[2] Further, because the study population consisted of significantly fewer women and a disproportionately higher number of men 21 to 40 years of age, a large subpopulation is delineated that requires intervention and, thus, has a significant impact on health care.

REFERENCES

1. JAMA 1993;270:51-56. 2. J Trauma 1991;31:1271-1276.

TABLE Patients with Blunt Trauma Admitted with (n = 140) or without (WO) (n = 152) Blood Ethanol by Year of Age (YOA)

		16-20 YOA		*21-40 YOA*		*> 40 YOA*	
		WO	*With*	*WO*	*With*	*WO*	*With*
Age (yr)		18	18	29	29	64	48
Gender (n)	Female	17	1*	20	16†	30	10
	Male	14	12	31	62	40	39
Trauma score		15	12	15	14	15	14
APACHE II on admission		8	9	6	6	9	7
Intensive care days (n)		2	2	2	2	4	3
Hospital days (n)		9	12	12	10	14	13
Complications (#/patient)		0.45	0.31	0.29	0.28	0.45	0.44

Values are median except gender and complications. APACHE, Acute Physiology and Chronic Health Evaluation. *P ≤ 0.02; †P ≤ 0.034.

A

ANAESTHESIA IN THE MEDIA: OUT OF THE OPERATING ROOM, INTO THE LIVING ROOM

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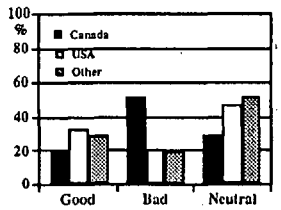
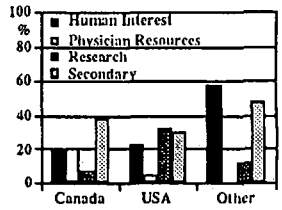
Introduction: Public understanding of anaesthesia is minimal. Preadmission clinics, intraoperative care and postoperative pain services are all important public relations interchanges.[1] In contrast, media coverage of awareness during anaesthesia, anaesthetists leaving the room, anaesthetic complications and deaths, create a negative image. The media is everywhere, penetrating the hidden realm of anaesthesia, and projecting it out of the operating room and into the living room. Promotion of our specialty through positive encounters with the media, may help us survive the current political storm of deficit reduction and health care restructuring.[2,3] This study examines references to anaesthesia in the newspaper media.

Methods: The newspaper data bases Infomart and Infoglobe were searched for *anaesth* and *anesth*. Articles were obtained from fifteen English newspapers spanning the years 1990–95. The articles were sorted by newspaper, date and page. Each article was categorized as good, bad, or neutral depending on the portrayal of anaesthesia. Content was analyzed for human interest, physician resources, research, education and specific perioperative events. Articles that made reference to anaesthesia secondary to another primary topic were classified as secondary. Statistical assessment was performed using chi-square analysis, and a p-value of < 0.05.

Results: A total of 213 articles were reviewed. In recent years the number of anaesthesia related articles has increased. Canadian events (64%) dominate the Canadian news. American (26%) and international (10%) stories are increasingly common. The overall number of "bad" (40%) articles exceeded the number of "good" (24%) or "neutral" (36%) articles. An even higher percentage of "bad" (51%) articles were found in Canadian stories. In the 61 articles referring to perioperative deaths, the surgical procedures were simple (87%) rather than complex (13%), and the majority of these patients were young and healthy.





Discussion: Anaesthesia will continue to make headlines. Headlines need not be dominated by stories of anaesthetic mishap and death. To promote a more positive public image, it is the responsibility of the anaesthetist to approach the media with stories of improved patient outcome and satisfaction.

References: 1. CAS Newsletter 10:1 1995.
2. ASA Newsletter 59:12–13, 36, 1995.
3. CMAJ 150:2015–2017, 1994.

B

DRUG ERRORS IN ANAESTHESIA: A SURVEY OF 650 PRACTITIONERS

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INTRODUCTION

Drug errors during anaesthesia contribute significantly to patient morbidity and mortality (1,2,3). Drug misidentification has been identified as an important factor (2,3). Errors in drug administration are likely undereported, thus it is not possible to track and correct recurrent problems (2). The purpose of this study was to 1) identify the factors that contribute to drug errors, 2) identify the features of drug packages and labels that practitioners consider important and 3) to investigate the reporting of drug errors and the potential value of a national reporting agency.

METHODS

A four page survey was mailed to all members (2266) of the Canadian Anaesthetists' Society. The respondents were asked to anonymously report their practice profile, describe previous drug errors, patient outcome and identify causative factors. Practitioners also rated the importance of packaging features that assisted with the identification of drugs. In addition, respondents were asked if the drug errors had been reported and if a national agency would have facilitated reporting. Future work includes sampling non-responders. Analysis by chi-squared testing was done using the SAS statistical computer program (version 6.10).

RESULTS

650 of 2266 surveys were returned (29%). The largest group of responders were in practice for > 20 years. The majority of all responders spent > 80% of their professional time administering anaesthetics (82%) and were FRCPC or board certified (86%). More than half of those surveyed practiced in a university setting (52%). 84% of respondents reported at least one drug error or a "near-miss" incident. The longer people were in practice, the more likely they were to report an error (p=.001). Most (85%) respondents felt that a standardized system of labeling would decrease the incidence drug error whereas 9% felt that all anaesthetic drug ampoules should look the same. 54% of respondents did not report their drug error to a colleague or an agency. 49% would have reported the error had a single agency existed.

DISCUSSION

The study demonstrates that most practitioners have experienced at least one drug error and that more than half of the errors are not reported. The vast majority of responders supported a standardized system of drug labels. Factors that contribute to the errors, as well as label features that are considered important will be presented. Half of the responders favoured a single reporting agency. While recognizing the limitations of a mail survey and the possible bias of a self-reporting population, the survey suggests the need for standardized labels for anaesthetic drugs as well as the utility of a "user-friendly" national registry for adverse drug events.

REFERENCES

1. Anesthesiology 60:34-42
2. Anaesthesia 45:3-6
3. Anaesthesia and Intensive Care 21:596-601

ACKNOWLEDGMENTS

We are grateful for the statistical help of Dr. J.P. Szali and Mr. M. Katic. Thanks are also due to the CAS Executive for their willing participation.

Effect of Peritoneal Ventilation on Mixed Venous O_2 in a Porcine Model of Hypoxemia

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Introduction: Peritoneal ventilation can greatly increase arterial PO_2 in hypoxemic rabbits[1]. Whether this alternative mode of oxygenation will work in larger animals or humans with a smaller relative peritoneal surface area and corresponding blood flow is unknown. We tested the hypothesis that the peritoneum can provide a gas exchange surface for O_2 uptake in a porcine model of hypoxemia. With the rationale that dopamine increases splanchnic blood flow, we also examined the effect of dopamine on O_2 uptake by the peritoneum.

Methods: All animals used in this experiment were managed in accordance with the Canadian Council on Animal Care Standards. Six anaesthetized pigs were ventilated with O_2 in helium. A modified 9.0 ID endotracheal tube was inserted into the peritoneal cavity. A closed circle system was used to ventilate the peritoneum with PEEP of 5 cm H_2O and minute ventilation of 120-180 mls/kg. Peritoneal O_2 uptake was recorded with a waterseal volumetric spirometer within the circle system. Measurements of peritoneal O_2 uptake and mixed venous O_2 saturation were made over 30 minutes of: 1) baseline FiO_2 0.20, no peritoneal ventilation, 2) FiO_2 0.20, peritoneal ventilation, 3) FiO_2 0.20, peritoneal ventilation, dopamine 5 μ/kg/min, 4) baseline FiO_2 0.15, no peritoneal ventilation, 5) FiO_2 0.15, peritoneal ventilation, 6) FiO_2 0.15, peritoneal ventilation, dopamine 5 μ/kg/min. All variables were assessed for normality of distribution using the Martinez-Iglewicz and the Kolmorgorov-Smirnov normality tests. Friedman's test was used to compare mixed venous gases. Peritoneal O_2 uptake was compared using a paired t-test.

Results: Peritoneal O_2 uptake was 9.1±3.1 and 11.9±3.0 mls/min when lung FiO_2 was 0.20 and 0.15 respectively, and 9.7±2.8 and 12.2±2.7 mls/min when FiO_2 was 0.20 and 0.15 and dopamine was infused respectively. Dopamine infusion was not found to increase the uptake of O_2 by the peritoneal cavity at FiO_2 0.20 or 0.15. Peritoneal ventilation did not increase mixed venous O_2 saturation in our hypoxemic animal model (table 1). The addition of dopamine did not increase peritoneal O_2 uptake or mixed venous O_2 saturation.

Table 1: Mixed Venous Oxygen Saturation

	Baseline	PV	PV &dopamine
FiO_2 0.20	60.8 (46.5-67.7)	69.9 (58.3-71.3)	64.2 (52.1-71.2)
FiO_2 0.15	32.7 (18.6-51.0)	29 (14.2-54.4)	30.1 (9.7-56.5)

[median (range), n=6]. Baseline = no peritoneal ventilation, PV = with peritoneal ventilation, PV & dopamine = with peritoneal ventilation and 5 μ/kg/min dopamine

Discussion: Peritoneal ventilation resulted in very small O_2 uptake by the peritoneum and therefore peritoneal ventilation did not increase mixed venous O_2 in our hypoxemic animal model. We conclude that peritoneal ventilation does not result in sufficient peritoneal O_2 uptake to provide a significant mode of extrapulmonary oxygenation in a large animal model of hypoxemic respiratory failure. At this time we cannot recommend human trials of peritoneal ventilation.

References: 1. Pediatric Research 35:82-84, 1994

OPIOID SUPPLEMENTATION OF NITROUS OXIDE-PROPOFOL ANAESTHESIA: EFFECTS OF DIFFERENT OPIOIDS ON RECOVERY

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INTRODUCTION

Computer simulations predict that under many conditions, recovery after infusions of sufentanil may be faster than after alfentanil, despite the shorter elimination T½ of alfentanil.[1] This is thought to be due to more extensive redistribution of sufentanil. These predictions have not been verified prospectively.

METHODS

After institutional approval and informed consent, patients aged 18-75 yr having elective intraabdominal surgery expected to last ≥1.5 h were randomized in a double-blinded manner to receive either alfentanil (A), fentanyl (F), or sufentanil (S). All subjects received diazepam 0.15 mg/kg *po*. Opioid loading doses 2 min prior to induction were 30.0, 3.0, and 0.3 µg/kg of alfentanil, fentanyl, or sufentanil, respectively; the initial opioid infusion rates were 20.0, 2.0, and 0.2 µg/kg/h, respectively. Anaesthesia was induced with propofol 2.0-2.5 mg/kg. Anaesthesia was maintained with N_2O 67%, propofol 2.0 mg/kg/h, and the opioid infusion, which was titrated to keep blood pressure and heart rate within 10% of preoperative values. The N_2O and propofol doses were kept constant. Vecuronium was used for NM blockade. Opioid and propofol infusions were discontinued 15 and 5 min prior to anticipated skin closure, respectively. At skin closure, N_2O was discontinued and NM blockade was reversed. Multiple variables quantifying the speed and quality of recovery were measured. Simulations estimated the percent decrease of effect site (biophase) opioid concentrations between end-infusion and extubation. Statistical analyses used ANOVA, the Kruskal-Wallis and X-square tests. Data are presented as mean±SD.

RESULTS

The 3 groups (A,n=13; F,n=15; S,n=15) were demographically identical. There were no differences in opioid infusion durations (A=112.7±64.2, F=113.9±63.4, S=97.7±47.6 min). Mean total opioid doses were A=10469, F=1061, and S=89 µg. There were no significant differences in the time from skin closure to adequate spontaneous ventilation (A=5.9±6.3, F=6.0±4.4, S=8.9±5.1 min), following verbal commands (A=10.1±8.3, F=9.1±8.0, S=9.7±5.2 min), or extubation (A=10.8±8.1, F=9.7±7.7, S=10.6±5.0 min). There were also no significant differences in the time to first morphine dose (A=25.9 ±13.2, F=26.7±13.3, S=31.2±14.6 min), or total morphine doses in the recovery room (A=10.2±4.6, F=10.3±4.4, S=8.7±4.4 mg). At discharge from the PACU there were no differences in visual analogue scores for pain (A=5.8±2.4, F=6.5±2.0, S=4.8±3.0), or satisfaction with recovery (A=2.8±2.4, F=3.8±3.2, S=2.6±2.4). Patients given sufentanil had lower visual analogue scores for nausea (A=3.7±3.1, F=4.6±2.8, S=2.0±2.5, $p<0.05$). Simulations estimated that the mean percent decreases in effect site opioid concentrations from the of the end of the infusions until extubation were A=41±7, F=36±11, and S=44±6%.

DISCUSSION

Previous simulations suggested that for opioid infusions lasting approximately 100 min with doses requiring a 40% decrease in effect site concentration for extubation, recovery after sufentanil would be slightly faster than after alfentanil or fentanyl.[1] Our results do not confirm this. When opioid infusions are used with low-dose propofol + N_2O, there are no significant differences in recovery times between alfentanil, fentanyl, or sufentanil. This lack of differences suggests that the most cost-efficient opioid be used preferentially.

REFERENCE

1. Shafer SL, Varvel JR. ANESTHESIOLOGY 1991; 74:53-63.

A

REDUCTION OF POST-OPERATIVE NAUSEA AND VOMITING WITH THE COMBINATION OF MORPHINE AND DROPERIDOL IN PATIENT CONTROLLED ANALGESIA

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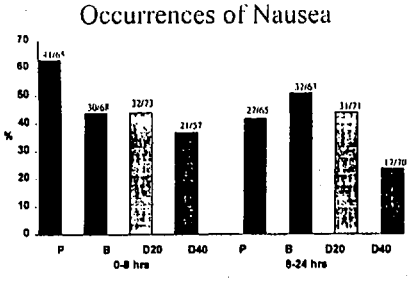
INTRODUCTION: Droperidol given intraoperatively has been shown to be effective in reducing nausea and vomiting in the early postoperative period.[1] This study was designed to determine whether the efficacy and duration of antiemetic prophylaxis could be increased by combining droperidol with morphine in patient controlled analgesia (PCA) infusions.

METHODS: With Research Ethics Board approval, 80 women scheduled for elective open-abdominal gynecological surgery consented to enter a randomized, double blinded, placebo-controlled study. Subjects were allocated to either a placebo group (P), or one of three experimental groups which received 1.0 mg droperidol IV as a pre-induction bolus, and either 0, 20 or 40 µg droperidol per mg of morphine by PCA (groups B, D20, and D40 respectively). The standardized anaesthetic included induction with morphine 75 µg/kg, propofol and succinylcholine, and maintenance with isoflurane, N_2O and vecuronium. Post-operative analgesia was provided with intravenous PCA with morphine boluses of 2 mg and an 8 minute lockout period. Rescue antiemetic therapy consisted of promethazine 12.5-25.0 mg every 6 hours as needed. Outcome measurements taken at 2, 4, 8, 12, 16, 20 and 24 hours post-operatively included nausea, pain and sedation scores (Wilcoxon rank sums), incidence of nausea and vomiting (Chi square) and the need for rescue antiemetics. Significance was set at $p<0.05$.

RESULTS: 71 subjects completed the study. The groups were similar in age, weight and duration of surgery, as well as total morphine used and pain scores. All droperidol groups showed fewer occurrences of nausea during the first 8 hours. Only the 40 µg droperidol group showed fewer occurrences of nausea, vomiting and rescue antiemetic use for the entire 24 hour period. All droperidol groups had slightly higher sedation scores than placebo, however mean scores were lower than 3/5 in all groups. No significant side effects were attributed to droperidol.



CONCLUSIONS: The combination of morphine and droperidol in IV PCA infusions safely and effectively decreases nausea and vomiting for 24 hours postoperatively after abdominal gynecologic surgery.

1. Br. J. Anaesth, 69, 46S-59S

B

A COMPARISON OF THREE PERIPHERAL REGIONAL ANAESTHESIA TECHNIQUES FOR OUTPATIENT KNEE ARTHROSCOPY

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INTRODUCTION: It is advantageous to perform outpatient knee arthroscopy under a peripheral regional technique.[1] The purpose of this study was to determine if any of three regional techniques provided better intraoperative patient/surgical conditions and postoperative pain control.

METHODS: After IRB approval and informed consent, 60 patients were prospectively randomized to one of three groups. The study was double-blinded. Group 1(IA) received portal injections (10cc 1% lidocaine), intraarticular lidocaine (20cc 2% lidocaine with 1/200,000 epi) and a placebo femoral nerve block (FNB). Group 2 (FNB) received a femoral nerve block (20cc 2% chloroprocaine with 1/200,000 epi), placebo portal injections and placebo intraarticular saline. Group 3 (FNB +IA) received a femoral nerve block, intraarticular lidocaine and placebo portal injections. The following were assessed: intraoperative pain (10 cm VAS); surgical operating conditions; intraoperative use of sedation and analgesia; patient satisfaction score and postoperative analgesia. Results are presented as mean ± standard deviation where appropriate. P values were calculated by student's T test or χ^2 where appropriate. P value <0.05 was considered significant.

RESULTS:

Intraoperative Results *=P value < 0.05 vs group 2

GROUP	Maximum Intraop. VAS cm 0= no pain 10= worst pain	Fentanyl (µg)	Surgical Conditions 1=excellent 4=poor
1. IA	3.9 ± 2.3	64.3 ± 63	1.4 ± 0.6*
2. FNB	4.9 ± 2.5	93.4 ±70	2.0 ± 1.0
3. FNB + IA	3.3 ± 2.7*	50.0 ± 56*	1.5 ± 0.7*

Mail Survey *=P value < 0.05 vs group 2

GROUP	Patient Satisfaction 1= very satisfied 5 = very unsatisfied	12 Hour VAS cm	24 hour VAS cm
1. IA	1.3 ±0.5	4.3 ± 2.6	3.5 ± 2.8
2. FNB	1.8 ± 1.0	3.4 ± 2.5	2.4 ± 1.8
3. FNB + IA	1.4 ± 0.6*	3.6 ± 3.0	2.3 ± 2.1

DISCUSSION: In conclusion, either FNB plus intraarticular lidocaine or portal infiltration and intraarticular lidocaine provide reliable intraoperative patient and surgical conditions for outpatient knee arthroscopy.

REFERENCES: 1. Ann R Coll Surg Eng 72: 104-107, 1990.

EFFECTS OF CO_2 AND EPINEPHRINE ON LIDOCAINE 1% IN AXILLARY BLOCK.

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INTRODUCTION

Axillary block is the most popular technique for brachial plexus block and lidocaine 1% is frequently used. This prospective, randomized, double-blind study was designed to verify the effect of CO_2 and epinephrine on lidocaine 1%.

MATERIAL AND METHOD

After ethic committee approval and informed consent, 66 patients scheduled for upper limb surgery with the use of tourniquet were divided into four groups : group 1 = lidocaine 1% CO_2, group 2 = lidocaine 1% CO_2 with epinephrine 1/200,000, group 3 = lidocaine 1% HCl and group 4 = lidocaine 1% HCl with epinephrine 1/200,000. All patients had normal renal function. Twenty five ml/m^2 of body surface was used and equally distributed on the four major components of the plexus after localization of the nerves with a peripheral nerve stimulator. Latency of analgesia, quality of analgesia, motor blockade and seric level of lidocaine (n = 39) (10 min, 20 min, 20 min, 40 min, 80 min, 160 min postblockade) were evaluated. The statistics used were anova and scheffe tests.

RESULTS

The patients were comparable according to the demographic data. The latency of analgesia, was not statistically different in the four groups (10 to 16 min), nor was the quality of the block. The duration of analgesia was prolonged in the epinephrine groups ($p < 0.0001$) and the seric levels of lidocaine were maximum 20 minutes following the block in the epinephrine-free solutions and 40 min in the epinephrine groups. The levels were higher in the two lidocaine-CO_2 groups and were lowered by epinephrine : at 20 min seric levels were : 4.1 µg/ml in gr 1, 3.5 µg/ml in gr 2, 3.5 µg/ml in gr 3 and 2 µg/ml in gr 4).

CONCLUSION

Considering that the cost of carbonated lidocaine is about 7 times higher than the cost of hydrochloride lidocaine and presents no evident advantage over the HCl form, with higher seric levels, the HCl form should be preferred in the conditions of the present study.

ACUTE L-ARGININE SUPPLEMENT AND CARDIAC SURGERY

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INTRODUCTION

Nitric oxide (NO) is a major regulator of vascular tone. Endogenous NO is produced by the enzyme nitric oxyde synthase in a reaction in which oxygen combines with L-arginine to produce NO and L-citrulline. Can an acute infusion of L-arginine have an hemodynamic influence on cardiovascular parameters during cardiac surgery and on NO production?

METHODS

After approbation by the human research committee and informed consent, 42 hypertensive and 42 normotensive patients were prospectively studied. In a double blind manner, half of the patients in each category were allocated to receive either an acute infusion of 150 mg/kg of L-arginine in 15 minutes after tracheal intubation followed by a perfusion of 500 mg/kg/24 hr throughout the surgery or an acute placebo infusion followed by a perfusion of NaCl 0.9%. The anaesthesia and monitoring were standardized. Invasive blood pressure, heart rate, cardiac output, systemic and pulmonary vascular resistance were measured before the beginning of anaesthesia, after tracheal intubation, before and after the acute infusion of L-arginine or placebo, during sternal opening, periaortic dissection, cardiopulmonary bypass (CPB) and at the sternal closure. L-arginine and L-citrulline levels in blood were measured before the beginning of anaesthesia, during CPB and during the sternal closure.

RESULTS

The cardiovascular parameters measured, either in the hypertensive or normotensive group, were not significantly affected by L-arginine infusion. The L-arginine levels were about 5 times greater during CPB and at the end of surgery in the L-arginine group compared to the placebo group. L-citrulline levels were lower at the end of the surgery than before anaesthesia in the control group but stable in the L-arginine group. However, the difference between the 2 groups for L-citrulline levels were not significant (Table).

	L-Arginine Group			Placebo Group		
	Before anaesth.	CPB	End surgery	Before anaesth.	CPB	End surgery
L-Arginine (µm/l)	86.2	477.5	491.3	80.1	73.2	99.5
L-citrulline (µm/l)	39.1	40.5	40.1	36.7	33.5	30.7

DISCUSSION

We conclude that acute infusion of L-arginine given at doses used in the present study does not influence hemodynamic responses during cardiac surgery, either in hypertensive or normotensive patients. L-arginine infusion possibly contributes to form more NO during surgery but clinical relevance of this phenomenon is not obvious in the present study.

A

A COMPARISON OF DIFFERENTIAL BLOCKADE DURING SPINAL ANESTHESIA USING 2% ISOBARIC VS HYPERBARIC LIDOCAINE

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INTRODUCTION

Five percent hyperbaric lidocaine solutions used for spinal anaesthesia have been widely criticized for their propensity to induce high level blocks with consequent hemodynamic effects. The purpose of this study was to define a pattern of differential blockade (sensory/sympathetic/motor) for isobaric (iso) vs hyperbaric (hyper) lidocaine and determine whether clinically observed untoward effects are imputable to baricity alone.

METHODS

After approval from our Ethics and Research committee, Hôpital Maisonneuve-Rosemont, Montréal, 40 normotensive ASA I and II patients were randomized in a double-blind fashion to receive spinal anaesthesia in the course of minor elective surgical procedures. The technique was performed in the left lateral decubitus position at the L2-L3 level. All patients received 60 mg (3 cc) of 2% lidocaine, either a standard commercially available isobaric solution or a preparation rendered hyperbaric by our pharmacist. Within 5 minutes of completion of local anesthetic injection, patients were turned to a supine position for the remainder of the study period. Differential blockade was assessed at regular intervals over a period of 30 minutes. The degree of sensory block was determined by cold perception and pinprick whereas motor impediment was evaluated using a modified Bromage scale (1 = complete paralysis and 4 = no paralysis). Sympathetic block was extensively studied using variations in vital signs, skin temperature changes (left foot and hand), cutaneous conductance responses and laser doppler flowmetry.

RESULTS

There was no difference in the maximum level of sensory block between the two groups whether assessed by pinprick (T5 iso ± 2.7 levels: T6 hyper ± 3.6 levels; p=0.11) or ice (T3 iso ± 2.3 levels: T4 hyper ± 2.7 levels; p=0.51). However, 2% hyperbaric lidocaine produced a more intense block on the initially dependent left (L) side when compared to its right (R) counterpart (L hyper > R hyper; pinprick $p < 0.001$/ice $p < 0.001$). The average maximum left unilateral spread remained the same whether hyperbaric or isobaric lidocaine was used (L iso = L hyper; pinprick p=0.40/ice p=0.34). Hemodynamic parameters, such as heart rate (HR) and mean blood pressure (MBP), consistently decreased over time but there was no significant differences between groups (HR p=0.897/MBP p=0.674). Furthermore, skin temperature variations and cutaneous conductance responses to electrical stimulation were similar in both groups. Motor blockade was complete at 15 minutes in the isobaric group (mean Bromage score = 1.000 ± 0.000) but remained incomplete upon study completion at 30 minutes in the hyperbaric group (mean Bromage score = 1.263 ± 0.562) with a p value of 0.005.

DISCUSSION

We conclude that the maximum cephalad spread of 2% lidocaine solutions used in our study was comparable regardless of baricity. The 2% hyperbaric solution tends to gravitate toward dependent areas. Lack of significant differences in vital signs, skin conductance and thermal responses between both groups suggest a comparable degree of sympathetic blockade. Hence, clinical use of either 2% hyperbaric or isobaric lidocaine for spinal anaesthesia offers a stable hemodynamic profile in healthy normotensive patients.

B

THE EFFECT OF CHRONIC EPIDURAL DEPO-MEDROL ON THE HYPOTHALAMIC-PITUITARY-ADRENAL AXIS

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INTRODUCTION: Epidural steroid injections (ESI) of Depo-Medrol and Triamcinolone have been shown to suppress the hypothalamic-pituitary-adrenal (HPA) axis.[1,2] This effect has been demonstrated with a single ESI or weekly ESI given for 3 weeks.[1,2] The effect of chronic ESI administration on the HPA axis has not been studied. This study looks at patients seen in our Pain Clinic who have been receiving epidural Depo-Medrol injections for treatment of chronic low back and radicular pain.

METHODS: This study was approved by the Human Ethics Committee. 35 pain clinic patients (pts) receiving epidural Depo-Medrol injections were enrolled. All pts provided informed consent. Eligible pts had at least 3 prior ESI with their last ESI being at least 12 weeks prior to entering this study. Pts had not received any local steroid injections for at least 12 weeks or any systemic steroids for at least one year prior to the study, had no history of HPA axis disorder and had no contraindications to ESI. Pts presented to the Pain Clinic between 8:00 and 9:00 am. Serum ACTH and cortisol levels were drawn and a one hour ACTH stimulation test (with Cortrosyn 250 ug) was done. A lumbar ESI with 80 mg of Depo-Medrol was then performed closest to the interspace of documented pathology. Pts returned 3 weeks later for an ACTH stimulation test. They were asked to return for repeat ACTH stimulation tests 6 and 12 weeks (or longer) after their ESI only if their test result was abnormal. A normal result was defined as a peak serum cortisol value of > =550 nmol/l at any time during the test.[3] Confidence intervals to predict normal response to ACTH stimulation at each testing interval were determined. Patient variables including age, wt, ASA score, number of previous ESI (in past year and in total), and frequency of ESI were analyzed for their ability to predict HPA axis supression. This was done using Fisher's exact and t test.

RESULTS: 18 ASA II, 17 ASA III, and 1 ASA IV pts were studied. Mean patient variables included:age-60 yrs, wt-81 kg, ESI in past year-3, total ESI-9, frequency of ESI-1 every 4 months, time from last ESI-15 wks. All pts had a normal ACTH stimulation test before the ESI. After the ESI, at 3 wks 29/34 (95% confidence interval(CI) 71-95%), 4 wks 30/35 (95% CI 74-98%), 6 wks 33/34 (95% CI 88-100%), 12 wks 33/34, and 15 wks 34/34 pts had a normal ACTH stimulation test (*3 and 6 wk interval actually 3.14 and 6.14 wks, at 4 weeks only 1 pt tested, 1 pt lost to f/u after 3 wks, 1 pt with a normal test by 6 wks may have received other exogenous local steroids). Serum ACTH values were not useful. The only pt factor that predicted an abnormal result at 3 wks was ASA score > =III (p=.02).

DISCUSSION: Patients who receive chronic epidural Depo-Medrol, mean of one injection every 4 months, develop transient suppression of their HPA axis, which is in agreement with the results of other studies in patients receiving single or short courses of ESI. These results suggest that as long as these patients receive benefit from ESIs, this interval allows recovery of the HPA axis within 3-15 weeks.

REFERENCES: 1) Anesth Anal 1994;79:501-5. 2) Anesthesia 1983;38:953-6. 3) Am J Med 1985; 79:679-84.

THE USEFULNESS OF ELECTROCARDIOGRAPHIC MONITORING IN HEALTHY YOUNG ADULTS HAVING MINOR SURGERY.

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INTRODUCTION: The ability of ECG monitoring to detect problems and prevent adverse outcomes has recently been questioned. A conclusion of the Australian Incident Monitoring Study was that "an ECG should always be available but need not be used for fit young patients unless specifically indicated"[1]. The aim of our study was to obtain detailed prospective data on the usefulness of ECG monitoring in these patients.

METHOD: In a prospective descriptive study an anaesthetist uninvolved with patient care continuously observed the ECG (Hewlett Packard 78354A, lead II, filter on) of healthy young adults having minor surgery. Records were kept of all arrhythmias and artifacts as well as all anaesthetic problems, their method of detection and ECG findings at the time.

RESULTS: 381 ASA 1 women aged 14-40 having dilatation and curetage, cystoscopy or vulval surgery as outpatients under general anaesthesia were studied.

ECG finding	no.	%	duration (sec) *median (range)*
sinus tachycardia	41	11	30 (5-180)
sinus bradycardia	2	0.5	(5-30)
atrial ectopics	6	1.6	4 (1-5)
ventricular ectopics	1	0.3	1
artifact ≥ 5 seconds	26	7	10 (5-45)
lead off	4	1	5 (5-90)

Problem	no.	detection	ECG at time
regurgitation	1	clinical	sinus rhythm
desaturation < 90%	2	oximeter	sinus rhythm
hypotension SBP<	1	NIBP	sinus rhythm
light anaesthesia	5	clinical	sinus rhythm
hiccoughs	1	clinical	sinus rhythm

DISCUSSION: Most of the 13.6% of patients with arrhythmias had heart rate changes which could be assessed with oximetry, the ectopics that occurred were brief and self limiting. The ECG yielded unhelpful artifact or became detached in 8%. Anaesthetic problems occured in 2.6% of patients, but none were detected by the ECG which showed normal sinus rhythm throughout these episodes. These findings support the Australian and New Zealand College of Anaesthetists guideline that ECG monitoring be available, but its use optional. Mandatory ECG monitoring, as recommended by the ASA and CAS, may not be useful in this patient group.

REFERENCE: 1) Anaesth Intens Care 1993; 21:558-564

PROPOFOL VS. THIOPENTAL/LIDOCAINE COMBINATIONS FOR LARYNGEAL MASK AIRWAY (LMA) INSERTION - A DOSE FINDING STUDY

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INTRODUCTION

The insertion of the LMA requires a significant depth of anaesthesia. This is readily achieved with propofol 2.5 mg/Kg)[1]. Thiopental in the usual doses (3-5 mg/Kg) does not provide adequate conditions for LMA insertion[1]. Lidocaine suppresses respiratory and pharyngeal reflexes. Steinhaus[2] demonstrated that the combination of lidocaine/thiopental provided excellent conditions for intubation. The combination of lidocaine/thiopental may be an alternative to propofol for LMA insertion at a much reduced cost. The main purpose of this trial was to find an adequate dose of lidocaine to combine with thiopental for LMA insertion.

METHODS

This double-blind, randomized study was first reviewed and approved by the Institutional Review Board. Sixty healthy patients (ASA 1-2) ranging in age from 18-60, scheduled for elective surgery, participated in this trial. Patients were randomly divided into four groups of 15 each. Patients in group 1 received thiopental 5 mg/Kg plus lidocaine 2 mg/Kg, those in group 2 received a similar dose of thiopental plus 2.5 mg/Kg, those in group 3 received a similar dose of thiopental plus 3 mg/Kg of lidocaine and patients in group 4 received propofol 2.5 mg/Kg. Each patient received fentanyl 100 micrograms intravenously prior to induction. The study drug was injected over a thirty second interval. A conventional oropharyngeal airway was inserted and ventilation was instituted for one minute using a 50:50 mixture of nitrous oxide/oxygen and isofluorane 2%. If the LMA insertion was unsuccessful following the initial induction dose, an additional increment of the study drug was administered. The following variables were compared: the incidence of a) failed first attempt, b) failed second attempt, c) failure, d) desaturation, e) coughing, f) laryngeal spasm, g) hemodynamic changes, h) length of stay (LOS) in the PARR.

RESULTS

Patient characteristics were comparable among the four groups. Multiple pairwise comparisons of the variables selected revealed few differences (ANOVA, and Sheffe's Test for significant variables). Two significant differences were noted among the groups. 1. The incidence of laryngeal spasm was significantly increased in group 2 compared with groups 3 and 4 ($p < 0.05$). 2. LOS was significantly longer in group 1 compared with group 4 ($p< 0.05$).

CONCLUSIONS

The addition of lidocaine to thiopental, to facilitate LMA insertion, in doses ranging from 2-3 mg/Kg is safe and devoid of major hemodynamic changes in healthy patients. The optimal dose of lidocaine added to thiopental, to facilitate LMA insertion is 3 mg/Kg because the effects compared favourably with propofol and at much reduced cost.

REFERENCES

[1] Can. J Anaesthesia. 1993 140-149, 816-818.
[2] Anaesthesia, Vol. 37, No. 2, March-April, 1958.

EFFECTIVITY OF INTRAOPERATIVE WARMING TECHNIQUES

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INTRODUCTION

Perioperative heat-loss may show detrimental effects during the postoperative period [1]. To minimize heat loss during operations, different active methods may be used. We tested the effectivity of patient-warming devices during laparotomies.

METHODS

40 ASA I and II patients, who underwent laparotomy >2 h have been investigated. The patients were randomly assigned to one of the following groups (n=8): insulation with surgical drapes (CO), electric heating mattress (HM, ASTOPAD OPT 120), two different forced-air systems with upper body cover (BH, Bair Hugger, Augustine Medical) (WT, WarmTouch, Mallinckrodt), and a combination of forced air with heating mattress (CW). All warming devices were run at maximum performance and started after positioning of the patient. Anaesthesia was conducted totally intravenously. Mean body temperature (MBT) and total body heat (TBH) were calculated from lower oesophageal and 4 cutaneous temperature measurements. Rate of thermogenesis was calculated from continuous measurement of oxygen uptake (Deltatrac, Datex). A relative heat balance was derived from change in TBH divided by body heat production (BHP). The first two hours of open abdominal cavity were evaluated. Data are presented as median (min,max) value; the Mann-Whitney-U-Test was used to test for significance of group differences. Differences were considered significant when $p<0.05$.

RESULTS

All groups were comparable regarding anthroprometric' data, amount of infusions and body temperatures at the beginning of measurements. The MBT decreased -0.3 (-0.8,0.2) C° and -0.4 (-0.9,-0.1) C° for CO and HM whereas it increased 0.2 (-0.1,0.7) C°, 0.3 (-0.3,0.9) C° and 0.7 (-0.1,1.1) C° for WT, BH and CW. The relative heat balance was significantly different -0.2 (-0.5,0.0) and -0.2 (-0.5,0.0) for CO and HM versus 0.2 (-0.1,0.4), 0.2 (-0.1,0.4) and 0.4 (-0.1,0.5) for WT,BH and CW.

DISCUSSION

Forced air systems compared with conventional draping significantly decrease intraoperative heat loss. Changes in TBH in relation to BHP show, that forced air helps to conserve 20% or in combination with heating mattresses even 40% of the produced body-heat of which in in CO and HM 20% more is lost than produced. The sole use of the heating mattress shows no effect.

REFERENCES:

1. Current Anaesthesia and Intensive Care 2: 221-231

A

ASSESSMENT OF A NEW AUTOCELL BLOOD PROCESSING SYSTEM

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INTRODUCTION During major spinal surgery, use of homologous blood products is minimized through autologous transfusion, using both preop donation and intraop cell salvage. We evaluated a new autocell blood processing device (DAVOL), which works on the principle of ultrafiltration, by comparing it to our traditional centrifuge system (COBE). We assessed: 1) the quality and quantity of intraop shed blood processed and reinfused to the patient 2) homologous blood requirements 3) ease of use of the new device and 4) patient clinical status post-infusion..

METHODS With IRB approval, and following preop clinical evaluation, 12 consenting patients undergoing major spinal surgery were prospectively randomized to either the ultrafiltration or centrifuge blood processing system. Intraop anaesthesia management was standardized. The following blood tests were performed post-induction, 1 h post-autologous infusion and 24 h postoperatively, and on each batch of collected blood before and after processing: complete blood count, coagulation studies, complement levels, plasma free Hb and biochemistry. Volumes of blood collected and processed and intraoperative blood loss were recorded. The volumes of autologous and homologous blood infusions were recorded. Ease of use of the device was evaluated by a perfusionist who managed the blood processing systems. Patients were assessed post-op and any adverse effects were recorded. Paired T tests were used for statistical analysis. $P<0.05$ was considered statistically significant.

RESULTS There was no significant difference in recovery of red cells, white cells or platelets or in removal of protein or plasma free Hb between the two devices. The difference in laboratory parameters between post-induction, 1 h and 24 h post-infusion were not significant. The difference in blood loss, volume collected and % salvaged was not significant. (table)

	Ultrafiltration	Centrifuge
Total blood loss	1850 ± 1078	3033 ± 3960
Blood collected	2058 ± 794	2810 ± 3678
Volume processed	698 ± 349	791 ± 1103
% Salvaged	58 ± 13	51 ± 11

(% Salvaged = Volume processed/Volume collected)

Five patients in each group received preoperatively donated autologous blood as well as intraoperatively salvaged blood. One patient in the ultrafiltration group and two patients in the centrifuge group received homologous infusions. There was no difference in evaluation of ease of use of the two devices but technical problems with the ultrafiltration device arose in 2 studies. No patients sustained device-related complications.

CONCLUSIONS Given the small sample size, we found no significant difference between the ultrafiltration and the centrifuge systems in terms of the quality and quantity of salvaged blood, homologous blood requirements, ease of use, or clinical condition of the patients postop.

This study was partially supported by Davol Inc.

B

EFFECT OF POSITION, POSITIVE INTRATHORACIC PRESSURE, AND HEPATIC COMPRESSION ON INTERNAL JUGULAR VEIN AREA

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INTRODUCTION Studies using two-dimensional (2-D) surface ultrasound have showed that, with head rotation > 30° and moderate carotid palpation, the internal jugular vein (IJV) collapses almost entirely. In volunteers and awake patients, the Valsalva maneuver and modified Trendelenburg position increased IJV cross-sectional area (IJVCSA) by almost 50%. Anesthesiologists, however, often cannulate the IJV after anesthesia and mechanical ventilation are instituted. Therefore, we studied the effect of positive intrathoracic pressure and gentle hepatic compression on IJVCSA at various degrees of the Trendelenburg position.

METHODS With institutional review board approval, 15 adults undergoing general anesthesia, and mechanical ventilation were studied. After anesthesia and mechanical ventilation were instituted, the right IJVCSA was measured by planimetry with a 2-D, 5-MHz US surface probe using a calibrated phantom. At the end of the cricoid cartilage with the head rotated 10° to the contralateral side, images were obtained at 0 (supine control), 10°, and 20° of Trendelenburg before and after 10 sec each of hepatic compression and an end-inspiratory hold (anesthesia machine bag inflation to 20 cm H_2O). Data were compared by 2-way ANOVA with repeated measures and the Student-Newman-Keuls test.

RESULTS Ten sec of end-inspiratory hold and hepatic compression increased the IJVCSA ($P < 0.05$), but to a lesser degree with 10 or 20° of Trendelenburg (Figure).

DISCUSSION Increased IJVCSA is probably due to elevation of right atrial pressure, which decreases cephalic venous return. In situations when a steep Trendelenburg position cannot be achieved or is inadvisable, for example, morbid obesity, an end-inspiratory hold with the anesthesia bag or compression of the right upper quadrant of the abdomen can dilate the IJV and can thus improve the chance of successful cannulation.

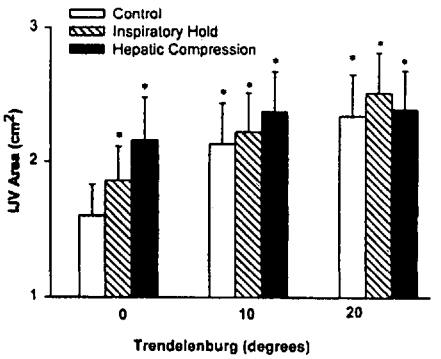

*Figure. Effect of different maneuvers on cross sectional area of the right internal jugular vein (RIJ). *P < 0.05 compared with control (supine position).*

A

EFFICACY OF MECHANICAL VENTILATION USING THE OXYLATOR EM-100

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INTRODUCTION
The Oxylator EM-100 (CPR Medical Devices) has recently been approved (HPB, FDA and TUV) as a ventilatory device for use during resuscitation. This pressure-limited valve device can deliver pure oxygen at a constant flow in manual or automatic mode. This study evaluates the efficacy of artificial ventilation provided in the manual mode.

METHODS
After approval by the Ethics Committee, twenty healthy volunteers were ventilated by two staff anaesthetists immediately after induction of anaesthesia and then after endotracheal intubation. Ventilation was accomplished by pressing the inspiratory flow button for 2 seconds, then releasing it for the following three seconds, and repeating this breathing cycle for one minute. Oxygen flow was measured with a heated Fleisch pneumotachometer and airway pressure with a piezoresistive transducer. These signals were recorded directly on computer. Data were analyzed with the Anadat software (RHT-Infodat). Paired t-tests with Bonferroni correction were used to compare data obtained during mask ventilation and after endotracheal intubation. The statistical significance level was $P < 0.05$.

RESULTS
The breathing frequency was not different during ventilation via mask or with an endotracheal tube (ETT): 12.0 ± 1.7 -vs- 12.1 ± 1.8 breaths/minute. The inspiratory time was also not different: 1.98 ± 0.19 -vs- 2.02 ± 0.20 seconds. Tidal volumes ranging from 0.87 to 1.36 litre were obtained. The expired tidal volume was slightly different between ventilation by mask and with a ETT: 1.07 ± 0.13 litre during mask ventilation -vs- 1.16 ± 0.11 litre with a ETT. During mask ventilation, the expired tidal volume represented 93.2 ± 7.7% of the inspired tidal volume and no difference was found between the two anaesthetists (93.0 -vs- 93.4%).

DISCUSSION
The Oxylator EM-100 provided an adequate ventilation which followed the JAMA recommendations for manually triggered devices (1). During mask ventilation using relatively large tidal volumes, an average of 93% of the inspired oxygen reached the lungs. Most of this difference is likely explained by leaks around the mask and possibly by some gastric inflation which was not identified. Providing a constant flow of oxygen in manual or automatic mode, the Oxylator is now being used in order to assess the proficiency of other health professionals in upper airways management and mask ventilation.

REFERENCES
1- JAMA 268(16):2200

B

Phonocardiographic Monitoring Sites:
Importance in On-line Cardiac Monitoring

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INTRODUCTION: Ascultation of heart during anaesthesia is a simple method of cardiac monitoring that provides information about cardiac contractility and other aspects of cardiac performance which some other methods do not provide [1]. Indeed, phonocardiography is capable of showing anaesthetic depression of the heart in that changes in the amplitude of the first heart sound are closely correlated with the maximum rate of rise of left ventricular pressure, a standard measure of cardiac contractility [2]. The advent of high-speed digital signal processing has opened new opportunities for noninvasive monitoring based on cardiac acoustical emmisions. In an effort to study the signal characteristics of the phonocardiogram (PCG) at various anatomical sites, the PCG from anaesthetised patients were recorded and studied.
METHODS: Three techniques of PCG acquisition were studied: use of a precordial stethoscope, use of an esophageal stethoscope, and use of a special endotracheal tube (Teves ETT) designed for PCG monitoring [3]. The stethoscope used on the chest wall (in the apex position) was a bell-shaped, weighted accumulator for which an air tight seal (using a piece of adhesive) was obtained. The esophageal stethoscope was a standard Portex unit placed clinically at a depth of maximal sound intensity. As well, a number of special ETTs with a large cuff and a wide bore inflation line (allowing the heart sounds to propagate to a port where a microphone is attached) was obtained from from Dr. Teves, the inventor of the device. These heart sounds were then all analysed using digital signal processing techniques in the MatLab programming environment on a Pentium computer. The first heart sounds (S1) were analyzed to provide signal-to-noise ratio estimates (a measure of signal clarity), maximum-to-minimum amplitude differences (an indicator of signal strength), and S1 power spectrum (an indicator of the signal frequency content).
RESULTS: Recordings of PCGs from 5 surgical procedures provided 89 segments of 15 to 30 seconds duration. The signal-to-noise (SNR) estimates calculated for the first heart sounds of each trial are given in the Table as mean±standard deviation. The esophageal stethoscope had the highest SNR estimates, the average values across recording sessions ranged from 7.8 to 26.0. The average SNR estimates for the Teves ETT ranged from 6.86 to 16.3 and those for the precordial stethoscope were lowest, ranging from 1.67 to 4.48.

Signal-to-Noise Ratio (SNR) Estimates for S1 Recordings

Location	*CASE A (n=15)*	*CASE B (n=22)*	*CASE C (n=21)*	*CASE D (n=19)*	*CASE (n=12)*
Chest	4.48 ± 3.2	4.25 ± 2.7	1.67 ± 0.97	3.57 ± 2.7	2.37 ± 9.4
Esophagus	26.0 ± 14.4	7.80 ± 5.8	21.4 ± 19.4	10.5 ± 9.2	12.1 ± 9.4
Teves ETT	8.40 ± 5.1	6.86 ± 3.2	16.3 ± 21.6	7.14 ± 7.50	12.1 ± 9.9

The signal strength at each site is reflected in the maximum-to-minimum difference in amplitude of the first heart sound. The esophageal stethoscope gave the greatest amplitude differences which ranged from 3.23 to 17.74 Pascals (Pa); the precordial site had differences ranging from 2.08 to 8.20 Pa; those for the Teves ETT were the lowest, ranging from 1.6 to 3.43 Pa.
DISCUSSION: The first heart sound obtained from the esophageal stethoscope had the best signal strength and clarity. However, the strength and clarity of the sounds obtained from the precordial stethoscope and the Teves ETT were satisfactory. Thus, from a signal analysis perspective there was little difference between S1s obtained from the different monitoring sites. Consequently a choice of PCG monitoring site should be based primarily on practical considerations such as patient safety or ease of use.
REFERENCES: [1] Tavel ME. Clinical Phonocardiography & External Pulse Recording. 3rd ed. Chicago IL: Year Book Medical, 1978 [1] Hansen PB, Luisada AA, Miletich DJ, Albrecht RF. "Phonocardiography as a Monitor of Cardiac Performance During Anesthesia", Anesth Analg, 1989;68:385-7. [3] Doyle DJ, Teves LY, Jhawar BS. "Phonocardiographic Monitoring Using A Special Endotracheal Tube", Canadian Journal of Anaesthesia 1990;37:S105

A LOW RESISTANCE, REUSABLE HEAT AND MOISTURE EXCHANGER FOR RESPIRATORY STUDIES.

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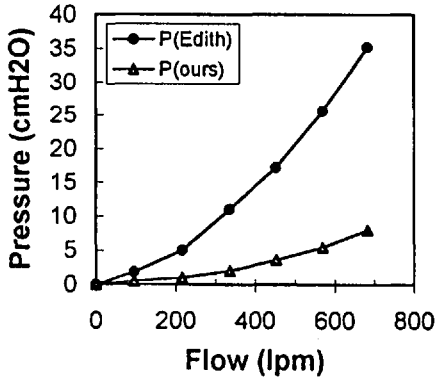
Introduction: Studies involving high minute ventilation when dry gas is inhaled, require the use of heat and moisture exchangers (HMEs) for humidification. Unfortunately, the resistances of commercially available HMEs cause unacceptably high airway pressures, and thus work of breathing, at high flows. We have therefore designed a new low resistance, reusable HME which can be assembled from readily available components.
Methods: The HME consists of a metal tube 15 cm long and 3.6 mm ID in which are snugly inserted two copper scouring pads, each made from a single ribbon of copper. We compared the resistance of our HME to that of the Engstrom Emma 1000® at several flows within the range of peak expiratory flow. We tested the new HME during a study involving 15 subjects inspiring dry gas at their maximum voluntary ventilation for 21 min.
Results: The deadspace of the device was 120 ml. The pressure-flow curves are shown in the figure. The resistance of the new HME was significantly lower than that of the Emma at all flows. The minute ventilation during the first minute was 114.5 ± 20 (mean ± SD) and was sustained within 70% of this for 21 min. At peaks flow of up to 480 l per min (lpm) achieved by some subjects, peak airway pressures were less than 5 cm H_2O. None of the subjects reported any subjective sensation of drying.
Discussion: Our HME was effective in allowing the subjects to inhale very large volumes of dry gas in comfort without the high airway pressures generated when using commercial HMEs. It is inexpensive and easy to assemble. It can be disinfected by several methods, including steam autoclave.



A B

EXTRAPULMONARY EFFECTS OF INHALED NITRIC OXIDE

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INTRODUCTION

Inhaled nitric oxide (inhNO) is an efficient treatment of pulmonary hypertension (PH). It was postulated that inhNO acted as a selective pulmonary vasodilator. In order to evaluate this selectivity, we have compared the cardiovascular, respiratory, and renal effects of inhNO and intravenous nitroglycerine (ivNTG) in two models of experimental PH in pigs induced either by hypoxia (FiO_2 = 0.15) or by phenylephrine perfusion (PE = 14.68 µg/kg/min), and in normotensive anæsthetized pigs.

METHODS

This research was approved by the Institutional Research and Animal Welfare comittee. Female pigs (22.2±0.67 kg; n = 30) were anæsthetised, paralysed and mechanically ventilated. The left ovarian vein was ligated and catheters were installed in both ureters, carotid artery and left renal vein. A continuous infusion of para-amino-hippuric acid (PAH) and inulin was maintained following suitable primes of each marker and blood samples from the two last-cited vessels allowed to measure PAH and inulin clearances and calculate respectively renal blood flow corrected for PAH extraction (RBFc) and glomerular filtration rate (GFR). The experimental protocol was divided into four stages of 20 minutes each (Table). Data analysis was performed within groups with Super ANOVA and Fisher's protected LSD *post-hoc* tests, and between groups with unpaired t-tests on the differences between two consecutive stages.

Table. Experimental design: inhNO: 40 PPM; ivNTG: progressive infusion with a mean dose of 94.43 µg/Kg/min.

Stages Time	I 30-50'	II 50-70'	III 70-90'	IV 90-110'	Sample size
Group					
A	Nil	Nil	Nil	Nil	n = 5
B	Nil	inhNO	inhNO	Nil	n = 5
C	Nil	Hypoxia	Hypoxia	Nil	n = 4
D	Nil	Hypoxia	Hyp-inhNO	Nil	n = 4
E	Nil	Hypoxia	Hyp-ivNTG	Nil	n = 4
F	Nil	PE	PE-inhNO	Nil	n = 4
G	Nil	PE	PE-ivNTG	Nil	n = 4

RESULTS

In the hypoxia model, inhNO and ivNTG were potent pulmonary vasodilators with effects on pulmonary pressure (-35.2% and -38.7%), PaO_2 (+14.9% and -3%NS), and systemic pressure (-2%NS and -21%), respectively. In the PE model, PH was dependent on left atrial pressure increase, secondary to systemic overload. Both treatments decreased similarly pulmonary hypertension (-14%), and ivNTG decreased systemic pressure (39.4%). Furthermore, the renal study of group ***B*** has shown that inhNO increased urine production (+70%), GFR (+92%) and RBFc (+119%). In hypertensive conditions, both treatments resulted in similar increases of diuresis, GFR and RBFc.

DISCUSSION

Due to absence of α1-receptors on pulmonary arteries, these results reflected a direct cardiac effect (positive lusitropic) of inhNO in PE model, indicating that selectivity is not absolute. Cardiac function and renal hemodynamics are influenced by inhNO postulating extrapulmonary effects on peripheral vascular beds with possible carrier forms intervention (nitrosohemoglobins, nitrosothiols, dinitrosyl-iron-complexes).

A

VENTILATORY PARAMETERS DURING PROPOFOL ANAESTHESIA IN CHILDREN: A COMPARISON WITH HALOTHANE

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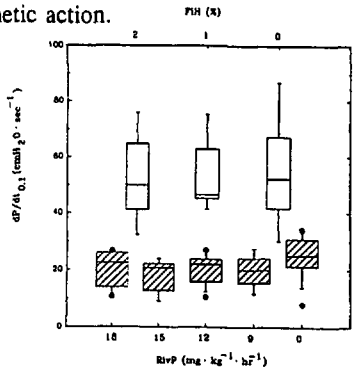
The purpose of this study was to describe the effect of propofol on ventilatory parameters in spontaneously breathing children and to compare these effects with those of halothane. **Methods**: Respiration was studied during a washout of propofol (Group P) or halothane (Group H). The inspiratory flow waveform, the CO_2 waveform and the occluded inspiratory pressure waveform were recorded at different inspired concentrations of halothane (F_iH) or propofol ($R_{IV}P$) in children undergoing elective dental restorations.

Data were analyzed for minute ventilation ($\dot{V}i$), and tidal volume (V_T), parameters of breath Timing [Total time (Ttot), Inspiratory time (Ti), and the ratio of the occluded to unoccluded Ti (Ti^{occ}/Ti)] and parameters of breath Amplitude. The airway was occluded at end expiration and the slope of the initial 100 msec ($dP/dt_{0.1}$) together with the occluded inspiratory time (Ti^{occ}) were obtained. A p value of 0.05 was considered statistically significant.

Results: We studied ten children in Group P (4.5 + 0.4 y, 17.5 + 1.2 kg, 0.707 + 0.03 m^2) and 10 patients in Group H (4.0 + 0.3 y, 17.1 + 1.4 kg, 0.686 + 0.04 m^2). For Group H flow ($\dot{V}$), pressure (Pao) and carbon dioxide tension (PCO_2) were recorded at three concentrations of FiH: 0%, 1% and 2%. For Group P data were recorded for five rates of $R_{IV}P$: 18, 15, 12, 9 and 0 mg · kg^{-1} · min^{-1}. There were intergoup differences in the preemergence values of Ttot, $dP/dt_{0.1}$ and Ti^{occ}/Ti. In group P the $\dot{V}i$, V_T and Ttot and $P_{ET}CO_2$ increased with propofol administration. The values of $dP/dt_{0.1}$ in Group P (hatched box plots) were about half those of Group H (open box plots). The ratio Ti^{occ}/Ti did not change with administration of the anaesthetic agent in Group P and fell in Group H.

Discussion: The pattern of ventilation in Group P differed from Group H in parameters of ventilatory Drive and Timing and may indicate a different mechanism of anaesthetic action.



B

INHALED NITRIC OXIDE (NO) DOES NOT DECREASE PULMONARY ARTERY (PA) SYSTOLIC PRESSURE IN PATIENTS WITH LEFT VENTRICULAR (LV) SYSTOLIC DYSFUNCTION

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INTRODUCTION

Nitric oxide, decreases mean PA pressure in patients with pulmonary hypertension and normal LV systolic function. Patients with reduced LV systolic function may not have a similar reduction in PA pressure with inhalation of NO.

METHODS

Patients eligible for the study had pulmonary hypertension (PA systolic > 35 mmHg) from valvular or myocardial disease. Doppler echocardiography was performed at baseline breathing 30% oxygen. Patients were randomized and crossed over in a blinded fashion to inhalation of either 20 ppm or 40 ppm NO. Final baseline period was repeated during 30% O_2. Patients with LV ejection fraction (EF) > 0.50 (Group 1, N = 11; 10 female, 1 male, mean age = 59.9 $\pm$ 3.9 years, mean EF = 0.62 $\pm$ 0.4%) were compared to patients with LVEF < 0.50 (Group 2, N = 8; 5 female, 3 male, mean age = 76.4 $\pm$ 8.0 years, mean EF = 0.29 $\pm$ 0.09). All patients had at least mild tricuspid regurgitation quantified from the equation 4 v^2 + RAP where V is the velocity of the tricuspid regurgitation and RAP is the right atrial pressure. * denotes p = 0.05 compared to baseline in Group 1 by two-way repeated measures ANOVA.

RESULTS

	30% O_2	NO 20 ppm	NO 40 ppm
	PA Systolic Pressure (mmHg)		
Group 1	52.3 $\pm$ 18.4	48.1 $\pm$ 14.9*	46.9 $\pm$ 14.0*
Group 2	52.8 $\pm$ 9.1	52.4 $\pm$ 10.1	51.6 $\pm$ 8.1
	Tricuspid Regurgitation (cm/sec)^2		
Group 1	42 $\pm$ 12	38* $\pm$ 11	37* $\pm$ 13
Group 2	42 $\pm$ 11	42 $\pm$ 10	41 $\pm$ 12

The table illustrates the sequential decrease in both pulmonary artery pressure and tricuspid regurgitation with increasing NO in those patients with EF > 50% but not those with EF < 50%.

CONCLUSION

NO does not decrease PA systolic pressure as measured by doppler echocardiography in patients with pulmonary hypertension and depressed LV. NO is rapidly absorbed by hemoglobin and any effect of inhaled NO on the systemic circulation should be small. The exact mechanism for the lack of efficacy of inhaled NO on diminishing pulmonary artery pressure in patients with depressed LV is unknown, but in these patients NO may be of limited therapeutic benefit.

MECHANICS OF EXPIRATORY MUSCLES IN SPINAL ANESTHESIA FOR PROSTATECTOMY*.

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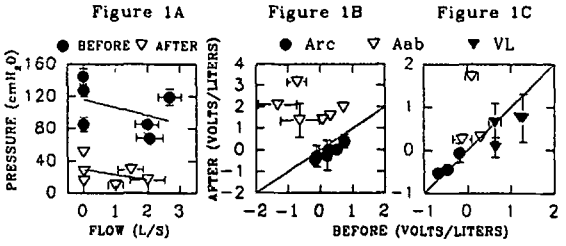
INTRODUCTION: The expiratory muscles play a major role during cough, a function often compromised by thoracic and abdominal surgery. In addition to their strength, the mechanical coupling (M-C) between the muscles of the rib cage (RCm) and those of the abdomen (ABm) should be an important determinant of their action. In this study, M-C of RCm and ABm was investigated in patients recieving spinal anesthesia up to T8 for elective prostatectomy, a procedure that blocks ABm while leaving RCm intact.

METHODS: We recorded the electromyogram (EMG) of ABm and RCm with surface electrodes, the maximal mouth (Pm), esophageal (Pes) and gastric (Pga) pressures with air-coupled transducers, the cross-section area changes of the rib cage (Arc) and abdomen (Aab) by inductance plethysmography and lung volume changes (VL) by integration of mouth flow during maximum static and dynamic expiratory efforts at full inflation as well as during expiratory reserve volume (ERV) maneuvers in 4 patients before and immediatly after surgery when maximum EMG of RCm was unchanged or increased, that of ABm was reduced by > 80%, and with a level of sensory block at T8. Spinal blockade was with Pontocaine 13-15mg.

RESULTS: In all subjects, the maximum Pm, Pes, and Pga were markedly reduced after spinal blokade (by about 70%) during both static and dyanamic contractions as seen by a downward shift of the maximum pressure-flow relationship (Fig. 1A). This reduction was associated with a marked overexpansion of Aab and a compression of Arc (Fig. 1B). By contrast, the effect of ABm blockade on VL, Aab and Arc during ERV maneuvers were much more modest (Fig. 1C) than on maximum Pes and Pga at residual volume which decreased by 83.8±9.8% and 96.8±1.6% respectively after ABm blockade.



Lines of linear best fit (Fig.1A) or of identity (Fig. 1B,1C) are shown. Symbols are means ± 1SD for individual subjects.

CONCLUSION: The paradoxical expansion of Aab during expiratory efforts coupled with the very marked reductions of expiratory pressures after blockade of ABm both suggest that RCm and ABm are mechanically coupled in series. In this case, the maximum expiratory pressure should reflect that of the weakest muscle group. This mechanism could explain the poor capacity to cough of patients after thoracic and abdominal surgery. The relatively smaller impact of ABm blockade on ERV could be explained by airway closure.

*This work was supported by a grant from the Association Pulmonaire du Québec and recieved approval from our Human Ethics Committee.

TRACHEAL INTUBATION USING A GUM ELASTIC BOUGIE FOR PATIENTS WITH RESTRICTED CERVICAL SPINE MOVEMENT

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Introduction: The placement of an endotracheal tube (ETT) using a laryngoscope is frequently difficult in patients with cervical spine instability. The gum elastic bougie has been shown to be an effective guide for tracheal intubation in patients with difficult airways.[1] The goals of the study were (1) to evaluate a difficult airway patient model using a rigid cervical collar, (2) to evaluate the effectiveness of the bougie to intubate patients with restricted cervical spine movement.

Methods: After obtaining IRB approval and informed consent, healthy surgical patients were recruited. Under general anaesthesia, an appropriate rigid cervical collar (Stifneck®, Laerdal, Armonk, NY) was applied. Laryngoscopic view grading according to Comack[2] was determined. The bougie was then hooked underneath the epiglottis and advanced into the trachea. An ETT was inserted over the bougie into the trachea. The time to insert the bougie and the ETT, total time to intubate, number of failures and trauma were recorded.

Results: Forty-seven patients (27M/20F) were studied. All but three patients were intubated successfully with this technique. The demographics and the results of the study are summarized in the table.

Discussion: A rigid cervical collar can effectively simulate a difficult laryngoscopy (81% laryngoscopic view III) for most of the patients. In addition, our data showed that tracheal intubation can be effectively and safely performed using a gum elastic bougie in patients with restricted cervical movement. These results suggest that the bougie can play a major role in airway management in patients with suspected cervical spine instability without removing the cervical collar in the emergency department.

References: 1. Anaesthesia 1993;48:630-3. 2. Anaesthesia 1984;39:1105-11.

Number of Patients	47 (27M/20F)
Mean Age (yr)	48.0 ± 17.9
Mean Height (cm)	167.5 ± 10.5
Mean Weight (kg)	74.5 ± 14.6
Laryngoscopic view (I /II /III /IV)	5 / 8 / 34 / 0
Time to insert bougie (sec)	28.6 ± 15.9
Time to insert ETT (sec)	14.7 ± 8.5
Total time to intubate (sec)	43.7 ± 19.5
Number of (1/2/3) attempts	(38 / 7 /2)
Number of failure	3
Number of Trauma	7

A

AIRWAY MANAGEMENT: A COMPARISON OF FACE MASK AND LARYNGEAL MASK AIRWAY DURING POSITIVE PRESSURE VENTILATION

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INTRODUCTION

The use of the laryngeal mask airway during positive-pressure ventilation remains controversial. Our study was designed to compare two airway management techniques, face mask (FM) and laryngeal mask airway (LMA), with respect to the effectiveness of positive pressure ventilation and maintenance of the airway.

METHODS

Patients undergoing elective surgery were studied. The study had the approval of the institutional research ethics board. After induction of anaesthesia, 2 airway management techniques (FM or LMA) were used with 3 different peak pressures (20, 25 and 30 cm of H_2O). during controlled ventilation. The order of the airway management techniques and ventilator pressure settings were randomized. Flow and pressure transducers were placed in the inspiratory and expiratory limbs of the breathing circuit. Calibration of the airway flow transducers was made with a spirometer while ventilating a test lung. Gastric insufflation was assessed by placing a stethoscope over the stomach during ventilation. Data collected included inspiratory and expiratory volumes as well as presence of gastric insufflation. Data was obtained during both airway management techniques. Leak was calculated by subtracting the expiratory from the inspiratory volume and expressed as a fraction of the inspiratory volume. Leak and volume were compared by ANOVA and frequency of gastro-esophageal insufflation was compared over different pressures by categorical modeling with ANOVA. A $P<0.05$ being considered significant.

RESULTS

Sixty patients were studied. There was a significantly greater leak with use of the LMA which increased with ventilation pressure (Figure I, $P<0.0001$). Expiratory volume was lower with the use of the LMA ($P<0.02$) but increased with ventilation pressure for both the FM and LMA (Figure II). The frequency of gastro-esophageal insufflation was 5%, 15% and 26.6% for the FM and 1.6%, 5% and 5% for the LMA for ventilation pressures of 20, 25 and 30 cm H_2O respectively. The frequency of gastric insufflation was significantly higher with FM ($P<0.01$).

Figure I. Leak

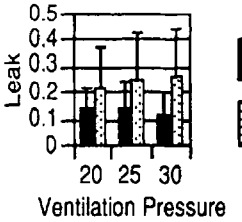
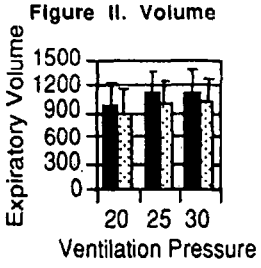


Figure II. Volume



DISCUSSION

Ventilation, as assessed by expiratory volume, was adequate in all patients. Ventilation using the LMA is comparable to ventilation using the FM with respect to leak fraction. However, gastro-esophageal insufflation was more frequent with ventilation using the face mask.

REFERENCES

1. Br J Anaesth 1983; 55: 801-5
2. Anesthesiology 1994; 80: 550-555

B

EFFICACY OF PROPOFOL IN REDUCING SODIUM NITROPRUSSIDE REQUIREMENTS TO CONTROL MEAN ARTERIAL PRESSURE AND SYSTEMIC VASCULAR RESISTANCE DURING CARDIOPULMONARY BYPASS

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INTRODUCTION

The purpose of this study was to determine if a constant infusion of propofol could reduce or eliminate the need for coadministered sodium nitroprusside (SNP) in controlling mean arterial pressure (MAP) and systemic vascular resistance (SVR) during cardiopulmonary bypass (CPB). Until recently it was recommended that the infusion rate of SNP not exceed 8 μg/kg/min in order to avoid clinical cyanide toxicity (1). More recently, however, it has been shown that SNP administered at rates higher than 2 μg/kg/min can result in dose-dependent accumulation of cyanide radicals (2). By reducing or eliminating the need for SNP the potentially toxic effects of its metabolites could be avoided, thereby, offering a safer alternative for managing elevated blood pressure during cardiac surgery.

METHODS

The study protocol was approved by the Institution's Human Experimentation Review Board and all patients gave written informed consent. Forty-three patients undergoing nonemergent cardiac surgery were randomized into one of two treatment groups to maintain MAP between 50 and 60 mmHg during CPB. Group A received SNP, maximum dose 4 μg/kg/min, as the first line agent with propofol as the backup agent (SNP protocol, n=21). Group B received propofol, maximum dose 200 μg/kg/min, as the first line agent with SNP as the backup agent (Propofol protocol, n=22).

RESULTS

The use of propofol as the first line agent was shown to significantly reduce the necessary infusion rate ($p<0.001$) and total dose ($p<0.001$) of coadministered SNP. While MAP and SVR could be controlled in all patients with the propofol protocol, 4/21 patients using the SNP protocol could not be controlled and other drugs were required. When using the SNP protocol 17/21 (81%) of patients required infusion rates of SNP >2 μg/kg/min for >10 minutes. In contrast, 0/22 (0%) of patients using the propofol protocol required an infusion rate of SNP >2 μg/kg/min for >10 minutes. In addition, it was shown that preoperative hypertension (n=11) has no statistical significance on the ability to control SVR, despite which protocol was used.

DISCUSSION

It is concluded that a constant infusion of propofol can significantly reduce and sometimes eliminate the need for coadministered SNP in controlling MAP and SVR during CPB.

REFERENCES

1. JAMA;265;847. 2. Anesth Analg;81;152-62.

A

THE COMPARATIVE EFFECT OF THREE PREMEDICATION REGIMENS ON ANAESTHETIC REQUIREMENTS DURING CORONARY ARTERY SURGERY

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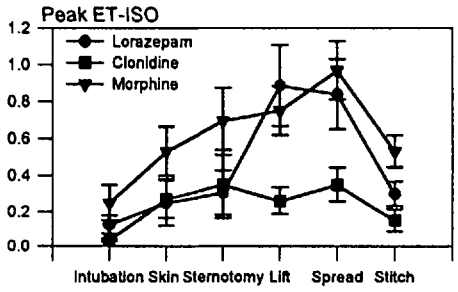
INTRODUCTION

The comparative anaesthetic-sparing properties of various preanaesthetic medications are poorly defined. Clonidine, when *added* to conventional premedication, reduces intraoperative anaesthetic requirements.[1,2] We compared clonidine, lorazepam, and morphine plus scopolamine, with respect to the dose of sufentanil causing unconsciousness, and intraoperative isoflurane requirements in patients undergoing heart surgery.

METHODS

After institutional approval and informed consent, 30 patients with ejection fraction ≥ 0.3 undergoing elective coronary artery surgery (CABG) entered this randomized double-blind study. They received either clonidine 5 μg/kg po (Group C, n=10), lorazepam 60 μg/kg po (Group L, n=12), or morphine 0.1 mg/kg plus scopolamine 6 μg/kg im (Group MS, n=8) 75 min preoperatively. Anaesthesia was induced with sufentanil 2.0 μg/kg iv over 12.5 min and vecuronium 0.1 mg/kg. After intubation, a pharmacokinetically-driven, computer-assisted infusion system targeted a constant sufentanil effect-site concentration of 0.75 ng/ml throughout the prebypass period. After induction, we treated mean arterial pressure (MAP) and heart rate (HR) > 120% of ward baseline with isoflurane, and then kept MAP as close to baseline as possible. MAP, HR and end-tidal isoflurane concentration (ET-ISO) were recorded Q 15 - 30 s by computer, and sampled for statistical analysis at control, intubation, skin incision, sternotomy, sternal spread, and aortic stitch. Data were analyzed by χ-square and analysis of variance.

RESULTS



The groups were demographically identical , except that females were over-represented in Group C *vs* Group M. There was no intergroup difference in prebypass sufentanil dose, or the dose of sufentanil causing unconsciousness (0.74 ± 0.23 μg/kg in Group C, 0.59 ± 0.15 μg/kg in Group L, and 0.66 ± 0.19 μg/kg in Group M). The incidence of isoflurane use did not differ between groups (Group C 7/10, Group L 11/12, Group M 8/8, p = 0.152). The average prebypass ET-ISO was 0.12 ± 0.11 % in Group C, 0.21 ± 0.16 % in Group L, and 0.36 ± 0.20 % in Group M ($p < 0.05$ for Groups C and L *vs* Group M). Peak ET-ISO and MAP were significantly lower in Group C compared to Groups L and M.

DISCUSSION

The choice of premedication does not influence the dose of sufentanil that induces unconsciousness but does significantly affect intraoperative isoflurane requirements. Both clonidine and lorazepam significantly reduce mean prebypass ET-ISO, by 67% and 43% respectively, compared to morphine-scopolamine. Clonidine *uniquely* reduces peak isoflurane requirements while providing superior hemodynamic stability. This property might be exploited to reduce cost, avoid anaesthetic toxicity, and enhance recovery in patients undergoing CABG.

REFERENCES

1. Anesthesiology 1987; 67:3-10 2. Anesthesiology 1987; 67:11-9

B

DOES SUFENTANIL DOSE INFLUENCE ISOFLURANE REQUIREMENTS DURING CORONARY ARTERY SURGERY?

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INTRODUCTION

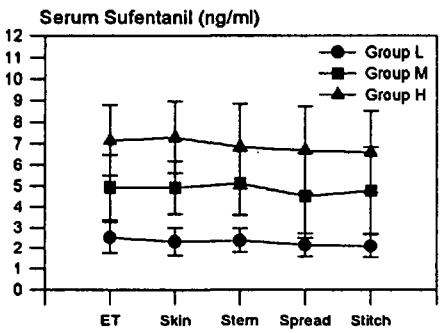
A previous study failed to define a dose-response to sufentanil during coronary artery surgery (CABG).[1] We reexamined this issue, using lower sufentanil doses and a pharmacokinetically-driven computer-assisted infusion system (CAIS) to keep sufentanil concentration at the effect site constant. The requirement for supplemental isoflurane was our index of the efficacy of three different doses of sufentanil.

METHODS

After institutional approval and informed consent, 42 patients undergoing elective CABG entered a randomized double-blind study. They were assigned to one of three groups, targeting effect-site sufentanil concentrations of either 1.5 (Group L, n = 14), 3.0 (Group M, n = 15), or 4.5 ng/ml (Group H, n = 13) during the prebypass period. Premedication was lorazepam 60 µg/kg. A Neurometrics® monitor yielded the electroencephalographic 95% spectral edge (SE95). Haemodynamics, SE95 and end-tidal isoflurane concentration (ET-ISO) were recorded every 10 - 30 seconds by computer. Anaesthesia was induced with sufentanil given iv by CAIS. Doxacurium 0.08 mg/kg was used for paralysis. Ward blood pressure (BP) and heart rate (HR) were averaged, and we kept BP between 80 - 120% and HR < 120% of baseline by titrating ET-ISO from 0 - 2.3%. Haemodynamics, ET-ISO, and blood for sufentanil radioimmunoassay were sampled at control, intubation, skin incision, sternotomy, sternal spread, and aortic stitch. Postoperatively, patients were asked about recall. Data were analyzed by χ-square and ANOVA.

RESULTS

The groups were demographically identical. The prebypass sufentanil dose was 6.8 ± 1.4, 14.1 ± 3 .1, and 20.3 ± 2.6 µg/kg, for Groups L, M, and H respectively. The CAIS produced stable prebypass serum sufentanil concentrations of 2.3 ± 0.6, 4.8 ± 1.7, and 6.9 ± 1.9 ng/ml, in Groups L, M, and H respectively, that were slightly higher than targeted. The groups did not differ with respect to HR, MAP or SE95 during the study. Supplemental isoflurane was required in 43% of patients, 7/14 in Group L, 7/15 in Group M, and 4/13 in Group H (p = 0.56). The average prebypass ET-ISO was 0.10 ± 0.14, 0.09 ± 0.15, and 0.08 ± 0.14 % (p = 0.58) for Groups L, M and H, respectively. ET-ISO and serum sufentanil were not correlated at any study interval. No patient had awareness.



DISCUSSION

No dose-response to sufentanil was apparent within the range of concentrations studied. When supplemental isoflurane was required, smooth haemodynamic control with low ET-ISO was invariably achieved. A constant serum sufentanil concentraton of 2.4 ng/ml redefines high-dose sufentanil anaesthesia. Higher concentrations are needless and wasteful. A CAIS maintains stable serum sufentanil concentrations in CABG patients.

REFERENCES

1. Anesthesiology 1990: 73: 5-11.

A

DOES SUFENTANIL DOSE INFLUENCE HAEMODYNAMICS DURING INDUCTION OF ANAESTHESIA FOR CORONARY ARTERY BYPASS GRAFTING?

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INTRODUCTION

Synthetic opioids cause dose-related haemodynamic changes in animals, secondary to vagal stimulation and/or reduced sympathetic tone.[1,2] Induction of anaesthesia with sufentanil in humans has also been associated with bradycardia and hypotension.[3] We tested the hypothesis that sufentanil causes dose-related haemodynamic changes in humans.

METHODS

After institutional approval and informed consent, 34 patients with ejection fraction ≥ 0.3 undergoing elective coronary artery surgery (CABG) entered this randomized double-blind study. They received either sufentanil 3 µg/kg or 15 µg/kg for induction. Premedication was lorazepam 60 µg/kg po. Bilateral fronto-mastoid electroencephalographic (EEG) electrodes connected to a Neurometrics® monitor yielded the EEG 95% spectral edge (SE95). Intravascular catheters were inserted and haemodynamic and EEG data were recorded every 5-10 sec by computer. After preoxygenation, anaesthesia was induced with sufentanil plus vecuronium 0.15 µg/kg iv over 5 min and the trachea was intubated. Ward blood pressure (BP) and heart rate (HR) values were averaged. We kept BP between 70% and 120% and HR between 35 bpm and 120% of this baseline with vasoactive drugs. Haemodynamic and EEG data were averaged at: Control (5th min of preoxygenation); Induction (1st min after complete sufentanil infusion); and Intubation (2nd min after intubation). Statistics included Student's t-test, χ-square, linear regression and analysis of variance for repeated measures .

RESULTS

There were 17 patients in each of two demographically identical groups. HR, mean BP and SE95 decreased significantly after induction, with no intergroup differences (Table). No patient required atropine, but 2 in each group received phenylephrine. Mean BP and SE95 were strongly correlated ($r^2 > 0.7$) in most patients.

	Group	Control	Induction	Intubation
HR beats/min	3 µg/kg	58±11	51±8*	55±9
	15 µg/kg	60±11	53±5*	52±6*
Mean BP mmHg	3 µg/kg	100±14	76±14*	88±17*
	15 µg/kg	101±11	78±12*	84±12*
SE95 Hz	3 µg/kg	19±4	5±2*	5±2*
	15 µg/kg	18±4	6±2*	5±2*

*p < 0.05 vs Control

DISCUSSION

Increasing sufentanil dose from 3 to 15 µg/kg alters neither the haemodynamic nor the EEG response to induction and intubation. Adverse haemodynamic responses to induction with sufentanil may not be dose-related. However, hypotension is temporally associated with the decline in SE95 that accompanies loss of consciousness. After lorazepam 60 µg/kg po, sufentanil 3 µg/kg with is sufficient to induce anaesthesia for CABG. Higher doses are needless and wasteful.

REFERENCES

1. Anesth Analg 1976;52:168
2. Anesthesiology 1984; 61:355-61
3. Anesthesiology 1986;64:521-3

B

SINGLE-DOSE MILRINONE AND DISCONTINUATION OF CARDIOPULMONARY BYPASS IN PATIENTS WITH PRE-EXISTING LEFT VENTRICULAR DYSFUNCTION

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INTRODUCTION Milrinone, a phosphodiesterase type III inhibitor with a serum half life of 45 min, increases contractility, facilitates ventricular relaxation, and produces vasodilatation. We studied the effects of a single dose of milrinone given before cardiopulmonary bypass (CPB) was discontinued.

METHODS With institutional review board approval, 21 adults who were scheduled for coronary artery bypass grafting between March and September 1995 and who had preoperative left ventricular ejection fraction > 0.3 and < 0.5 were randomized to receive, before discontinuation of CPB, either placebo (n = 10) or a single dose of milrinone, 50/mc/kg given into the bypass pump over 10 min (n = 11). Moderate hypothermia and blood cardioplegia were used for myocardial revascularization. Hemodynamic data were obtained with a pulmonary artery catheter; standard formulas were used for derived variables. Left ventricular (LV) fractional area of change (FAC) was determined automatically by transesophageal echocardiography (TEE) (HP SONOS 1500) with the use of acoustic quantification from the LV midpapillary short-axis view. FAC was recorded as the average of 5 cardiac cycles. All measurements were made within 5 min of discontinuing CPB and at the end of surgery (mean 70 min after CPB). Criteria for using a beta agonist (dobutamine) after discontinuing CPB were a cardiac index (CI) < 2.1 with a pulmonary artery occlusion pressure > 12 mm Hg or a poorly contractile LV on TEE. Data were compared between milrinone and placebo by Student's *t* and Mann Whitney tests.

RESULTS Preoperative demographic data were similar between groups as were duration of CPB and aortic cross clamping. With placebo, dobutamine was required by 80% (8/10) of patients and, with milrinone, by 27% (3/11). With milrinone, CI and FAC were higher and systemic vascular resistance index (SVRI) lower than with placebo ($P < 0.05$). These persisted until the end of surgery (Table).

DISCUSSION In patients with mild preoperative LV dysfunction, a single-dose of milrinone before discontinuing CPB significantly improved hemodynamics and decreased the need for a beta agonist, even beyond milrinone's serum half life.

TABLE Effects of Milrinone on Hemodynamic Variables

	Placebo		Milrinone	
	CPB	EOS	CPB	EOS
HR	102 ± 2	99 ± 2	96.5 ± 5	102 ± 3
MAP	77 ± 4	76 ± 2	68 ± 2*	76 ± 2
CI	2.2 ± 0.1	2.3 ± 0.1	3.4 ± 0.2*	3.3 ± 0.2†
SVRI	2293 ± 116	2280 ± 60	1398 ± 139*	1509 ± 153†
FAC	31.8 ± 1.0	32.3 ± 1.2	44.8 ± 1.6*	43.2 ± 0.9†

Values: means ± SEM. Abbrevs./units: CPB, CI, SVRI, and FAC, see text; EOS, end of surgery; HR, heart rate (beats/min); MAP, mean arterial pressure (mm Hg).
$P < 0.05$ compared with placebo at *CPB or †EOS.

A

EFFECT OF EDROPHONIUM ON HEART RATE IN CARDIAC TRANSPLANT PATIENTS AND IN THE DENERVATED CAT HEART

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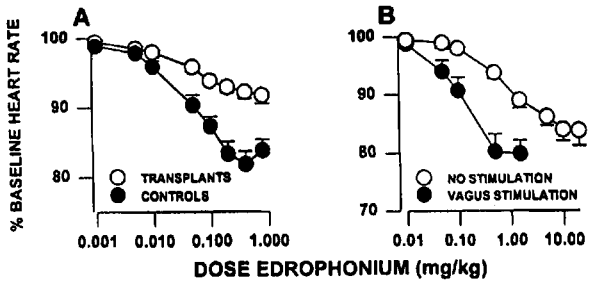
INTRODUCTION. The functional status of parasympathetic postganglionic neurons in the transplanted heart was assessed by determining the effect of edrophonium (EDRO) on heart rate in transplants and in patients with normally innervated hearts. In animal experiments, the effect of EDRO was studied in the absence and presence of cardiac autonomic input.

METHODS. EDRO was studied in patients at the conclusion of non-cardiac related surgery. Controls were ASA 1 or 2 (n=15). Transplants (n=10) underwent cardiac transplantation 8-120 months prior to study. EDRO was also studied in cats with blocked endogenous cardiac autonomic input (bilateral vagotomy, propranolol). In one group, parasympathetic drive to the heart was provided by electrical stimulation of the right vagus nerve (heart rate decreased by 38±1% of baseline, n=5). In another group, the vagus nerve was not stimulated (n=5). This study was approved by the hospital Ethics Committee.

RESULTS. In controls, EDRO evoked a decrease in heart rate to a minimum of 82±2% of baseline with 0.4 $mg.kg^{-1}$ (Fig A). Atropine 1.2 mg reversed the bradycardia and transiently increased heart rate to 152±6% of baseline. In transplants, EDRO evoked a bradycardia with the largest decrease (92±1% of baseline) produced by 0.8 $mg.kg^{-1}$ (Fig A). Atropine 1.2 mg transiently increased heart rate to 105±2% of baseline. In cats without vagus nerve stimulation, EDRO evoked a decreased in heart rate which reached a plateau of 84±2% of baseline at a dose of 5.0 $mg.kg^{-1}$. In cats with vagus nerve stimulation, EDRO evoked a bradycardia which reached a plateau of 79±2% of baseline with 1.5 $mg.kg^{-1}$ (Fig B).

DISCUSSION. EDRO decreased heart rate in transplants, suggesting spontaneous release of ACh from functional cardiac parasympathetic neurons. Differences in the dose-response curves for transplants and controls (Fig A) may be explained by additional ACh released by parasympathetic input, as similar findings were observed in cats under the analogous conditions of presence and absence of cardiac parasympathetic drive.



B

Video Feedback in Teaching Laryngoscopy

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Introduction: Videotape feedback has been used to enhance performance of trauma resuscitation[1] and anaesthetic induction[2]. We examined what effects videotape review might have on students' awareness of their performance of laryngoscopy.

Methods: Twenty consecutive medical students rotating through their Anaesthesia training period participated in the study. All had been shown a standard teaching videotape demonstrating the procedure. Informed consent was obtained from patients and students. Each student was videotaped for the duration of one attempt at laryngoscopy, from the right side of the patient's head & neck. Immediately after terminating laryngoscopy, the student was asked to fill out a questionnaire asking whether the sniffing position was achieved and maintained, estimated degrees of neck flexion and head extension, duration of laryngoscopy, and whether the patient's upper lips or teeth had been contacted during laryngoscopy. The same questions were answered upon review of the videotape. General comments about the student's comfort with the experience and its usefulness were also obtained. Continuous variables were compared with student's two-tailed unpaired t-test. Non-parametric data were analyzed by the Mann-Whitney U-test.

Results: Continuous data as mean ± SD.

	Initial	Post Video Review	P Value
Position Good	Yes: 100%	Yes: 55%	0.028
Movement	Yes: 45%	Yes: 55%	0.416
Neck Flexion (deg)	27 ± 13	27 ± 12	0.899
Head Ext (deg)	36 ± 16	22 ± 14	0.005
Duration (secs)	49 ± 22	71 ± 29	0.009
Lip/Teeth Contact	Yes: 55%	Yes: 60%	0.793

When asked whether the videotape had been useful to them, all 20 students replied that it was. Responding to "the most useful insight", 35% felt it had to do with positioning and 35% with technique in handling the laryngoscope.

Conclusion: Overall, students tended not to perceive errors in head and neck positioning until seen on videotape, especially overerestimating the degree of head extension. Of greatest clinical concern was the consistent, marked underestimation of the duration of apnea during laryngoscopy. Videotape feedback provides a useful, objective means of medical student teaching.

References: 1. J of Trauma 28: 435-40, 1988.
2. Anesth Analg 53: 698-9, 1974.

A

ANAESTHESIA PGY-1 SELECTION: CaRMS OBJECTIVE DOSSIER SCORES ARE NOT PREDICTIVE OF SUCCESS IN STUCTURED INTERVIEWS

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INTRODUCTION

Over the past four years, anaesthesia training programs have had to adapt to significant changes in the resident selection process because of the changes made to postgraduate medical education and the Canadian Resident Matching System (CaRMS). A recent study has identified that 83% of residency program directors regard the personal interview as the most important screening tool.[1] The interview itself is a time consuming and expensive process for both candidates and interviewing staff. The staff costs alone are estimated at forty three US dollars per hour.[2] The purpose of this study was to compare the ranking of anaesthesia PGY-1 candidates by an objective file grading scheme and a scored blinded structured set of interviews. Our hypothesis was that the blinded structured interview score would correlate with the scored information from the candidates' CaRMS dossier, and thus reduce or eliminate the need for many costly interviews.

METHODS

Thirty eight applicants to the anaesthesia residency at the University of Western Ontario were studied. Each applicant's CaRMS dossier was reviewed and scored by the investigators according to an objective, weighted grading scheme derived from a review of the existing literature. The Objective Dossier Score (ODS) included academic data, reference and dean's letters[3], anaesthesia clerkship and elective grades, and the candidates' personal statement[4]. The candidates were assessed in a structured personal interview by five members of the Postgraduate Education Committee, who were blinded to the contents of the CaRMS dossier. The interviews were scored independently using criteria shown to validate characteristics of a favourable interview.[5] The ODS were then compared to the interview scores (SIS) by regression analysis.

RESULTS

There was no significant statistical relationship between the ODS and the SIS with an R-squared value of 0.105.

DISCUSSION

The ODS was not predictive of the SIS in the group of PGY-1 applicants studied. The personal interview remains an important tool in resident selection. Despite the relatively high cost to residency programs and PGY-1 candidates, a simple grading of the CaRMS dossier does not suffice nor does it replace the personal interview.

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[1] CAN MED ASSOC J,Oct1, 1995, 153(7).
[2] Academic Medicine, March 1990.
[3] Anesthesiology 1982 57 No 3 A435.
[4] Anesthesiology 1884 61 No3A A458.
[5] Anesthesiology 1985 63 No 3A A483.

B

Importance of Anaesthetists' Traits
Ranking by Operating Room Nurses

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INTRODUCTION In recent years the importance of good working relations between all members of the operating room (OR) team has been emphasized. Personality traits of anaesthetists are known to be particularly important in this context [1, 2]. Establishing good relationships in the OR requires that one learns about the viewpoints of co-workers.

METHODS In to study the relative importance of various traits that characterize a "good" anaesthetist, 45 operating room nurses were administered a take-home questionaire asking them to rank in importance an alphabetically arranged list of 21 traits pertinent to anesthesia care. As well, the nurses were asked to assign an "importance score" [scale: 0 (completely unimportant) to 10 (of the highest importance)] to each trait. The responses were analyzed using the Excel spreadsheet, where mean and median trait scores and rankings were computed and graphed.

RESULTS The top five traits in average ranking were: knowledgeable (ranked first), safe, prepared, calm, and communicative (ranked fifth). The least ranked traits were: fast (rank 18), good character, sociable, neat and thrifty (rank 21).

CONCLUSION Operating room nurses value anaesthetists they perceive to be knowledgable, safe and prepared for clinical crises. Thriftness and sociability were viewed as being less important traits.

Trait	Rank	Mean Rank *(1-21)*	Mean Score *(0-10)*
Knowledge	1	4.42	9.47
Safe	2	5.22	9.64
Prepared	3	6.87	9.27
Calm	4	7.29	9.20
Communicative	5	7.33	9.24
Resourseful	6	9.07	8.60
Honest	7	9.22	9.11
Clean	8	9.91	8.93
Professional	9	9.96	8.76
Compassionate	10	9.98	8.58
Vigilant	11	10.0	9.09
Team Player	12	11.78	8.53
On-Time	13	12.3	8.38
Industrious	14	12.58	8.76
Slick	15	12.82	7.78
Organized	16	13.3	8.27
Fast	17	13.44	7.82
Good Character	18	15.27	7.27
Sociable	19	15.51	7.22
Neat	20	16.3	7.51
Thrifty	21	17.6	7.18

REFERENCES [1] Clarke IMC, Morin JE, Warnell I. Personality factors and the practice of anaesthesia: a psychometric evaluation. Canadian Journal of Anaesthesia 1994; 41:393-397. [2] Gough HG, Bradley P, McDonald JS. Performance of residents in anaesthesiology as related to measures of personality and interests. Psychol Rep 1991; 68:979-994.

TRACHEAL INTUBATION: HOW SHOULD IT BE DOCUMENTED?

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Introduction: Reliable documentation of difficult tracheal intubation is of paramount importance, both for anaesthetists and for studies attempting to identify risk factors associated with difficult intubation. If an outcome definition used to describe airway difficulties is reliable, it should consistently identify the level of difficulty such that patient classification does not change from intubation to intubation. Reliability of the current outcome definitions are not known. We examined the reliability of four outcome definitions by assessing their consistency in 3409 patients who had two or more intubations within one year.

Method: Following institutional approval, patients' intubation information, contained in a computerized data base, were reviewed and those who had more than one intubation within one year were identified. The data base, collected prospectively since 1991, contains the anaesthetists' classification of the intubation as either easy or difficult, the number of laryngoscopy attempts, and, since 1993, the best obtainable view at laryngoscopy. For each patient, two consecutive intubation episodes were paired together. Applying the criteria for four outcome definitions, each intubation episode in the pair was classified as either easy or difficult. The definitions of difficult intubation were #1) subjective classification as "difficult" by the anaesthetist; #2) >2 laryngoscopy attempts; #3) poor view at laryngoscopy (at best, only epiglottis visible); #4) both #2 and #3. A pair was excluded if any information indicated a change in airway status (e.g. trauma, pregnancy), or if either of the intubations were missing the required information for each definition. For all definitions, fibreoptic assisted intubations were classified as difficult. A pair was considered a match if both intubations in the pair had the same classification. The number of matches were used to determine the reliability of each definition using the Kappa statistic.

Results:

	Total Pairs[1]	Kappa[2] (+/- 95% C.I.)
Definition 1	2220	0.49 (0.45, 0.53)
Definition 2	1049	0.63 (0.57, 0.69)
Definition 3	944	0.81 (0.75, 0.88)
Definition 4	485	0.83 (0.74, 0.92)

[1]Refers to number of pairs remaining after all exclusions.
[2]Kappa:<0.4 = poor; 0.4-0.7 = moderate;>0.7 = excellent reliability

Conclusion: This study shows that it is not adequate to simply document whether an intubation was easy or difficult. To reliably describe the tracheal intubation, the best obtainable view at laryngoscopy (definition 3), either with or without the number of laryngoscopy attempts (definition 4), must be clearly recorded. This documentation can be a simple written description of the structures visible, which can be pre-printed on the anaesthetic record.

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A B

OBSTRUCTIVE AND NONOBSTRUCTIVE PULMONARY EDEMA IN THE POST ANAESTHETIC CARE UNIT

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Introduction: Knowledge of pulmonary edema in the early postoperative period has been limited to case reports and retrospective reviews.[1] Little has been known of its frequency, etiology, and risk factors. Using prospectively collected data from an anaesthesia database, we reviewed information on patient, surgical, and anaesthetic factors to learn more about pulmonary edema diagnosed in our PACU from 1991-1995.

Methods: After Ethics approval, our review of all pulmonary edema cases (defined as x-ray evidence of vascular redistribution associated with physical findings ± frothy sputum) over a five-year period comprised two patient groups: those showing evidence of acute upper airway obstruction (OBS) and those that did not (NO OBS). For comparison, a random sample of 200 PACU admissions (CTL) for the same time period was chosen. Characteristics and subsequent outcomes of these three groups were compared using the chi square statistic, Fisher's exact test and T test where appropriate ($P<0.05$).

Results: Pulmonary edema was diagnosed in 50 of 51,372 PACU admissions (0.1%). Eighteen of these cases were related to obstruction, 10 documented during emergence from anaesthesia, and 8 on arrival in PACU. Specific characteristics and outcomes are noted in the table below.

Characteristics and Outcomes

Characteristic/ Outcome	CTL	P. Edema NO OBS	P. Edema OBS
n	200	32	18
Age ≥50 yr (%)	44.5	90.6*	50.0
ASA 3-5 (%)	18.0	62.5*	11.1
Cardiac history (%)	8.5	53.1*	0
Current smoker (%)	21.0	18.7	50.0*
OR duration (hr)	2.5 ± 1.2	3.9 ± 2.2*	2.1 ± 1.0
RR length of stay (hr)	2.0 ± 0.5	4.0 ± 2.0*	4.1 ± 2.0*
Reintubation (%)	0	9.3*	27.7*
Unexpect ICU adm (%)	0	24.4*	44.4*
Hospital LOS (days)	7.3 ± 8.6	19.3 ± 37†	5.3 ± 5.8

* $P<0.05$ different from CTL † $P<0.05$ different from OBS

Fluid replacement (ml/hr) and choice and dose of anaesthetic drugs were not etiological factors.

Conclusion: Pulmonary edema in the PACU is a rare event. Those without evidence of obstruction were older and sicker and had longer OR duration. Patients who had pulmonary edema with evidence of obstruction post anaesthesia, one third of the cases, were essentially healthy except for a history of smoking. Pulmonary edema prolonged stay in the PACU and increased rate of ICU admission, but only extended hospital length of stay for those without obstruction.

Reference: Chest 1988;94:1090-1092.

A

BYPASSING THE POST ANAESTHETIC CARE UNIT: COST SAVINGS VERSUS PATIENT SAFETY

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Introduction: Historically, the PACU was developed to avoid morbidity associated with early postoperative problems. However, in this era of cost restraint, it is necessary to examine if all postoperative patients require the high-intensity nursing care in PACU or if there is a subgroup who could safely bypass the PACU.

Methods: From 1991-94, all patients having an operative procedure were admitted to PACU (n=43,916) with the exception of those transferred directly to a critical care unit. With Ethics approval, we used an anaesthetic database to obtain prospectively collected information on patient factors, surgery (40 procedures), perioperative drugs, observations of intraoperative problems and adverse events in the PACU. We identified PACU patients as "potential bypass" if they had four criteria: Aldrete PACU arrival score of 10, no PACU adverse events, no PACU drugs, and no PACU monitoring or investigations (e.g. arterial line, x-ray). Patients who did not have all four of the above criteria were the "PACU required" group. The characteristics associated with "potential bypass" were determined using a logistic regression model and expressed as relative odds - RO; $P<0.05$ with 95% CI. This enabled us to identify a specific patient subgroup who could possibly bypass the PACU. We next looked at this subgroup and determined the proportion and reasons for those who would not meet all four of our original criteria for "potential bypass". Duration of PACU stay for this subgroup was expressed as a percent of the total hours of PACU care (1991-94).

Results: Patients most likely to be in the "potential bypass" group were ASA physical status 1-2 (RO 2.2, 2.0 - 2.4), those with no intraoperative observations (RO 1.6, 1.4 - 1.8) and the surgical procedures and anaesthetic techniques noted in the table.

"Potential Bypass" Factors

Surgery	RO (95%CI)	Anaesthetic	RO (95%CI)
Eye	1.8 (1.6 - 2.0)	Neurolept	25.3 (23.1 - 27.7)
Therapy	3.4 (2.8 - 4.3)	IV/N. Block	15.0 (12.2 - 18.5)
Minor	2.4 (2.2 - 2.6)	Spinal/Epi.	1.0 (0.7 - 1.4)
Bronch	0.3 (0.2 - 0.3)	GA no ETT	2.4 (2.2 - 2.7)
Others	1.0 (Ref)	GA with ETT	1.0 (Ref)

A subgroup of 4,382 patients was identified (ASA physical status 1-2, for eye, therapy and minor procedures with neurolept analgesia and no intraoperative observations). However, 28% of this subgroup would not have had all four criteria for "potential bypass" (16.6% arrival score <10, 6.8% PACU drugs, 6.7% monitored or investigated and 5.7% PACU adverse events). PACU events were rare, 0.4% (n = 17) fluid for hypotension, 0.4% (n = 16) opioids for excessive pain, and 0.4% (n = 15) postop oxygen for SpO_2 <90% on PACU discharge. Potential savings if this subgroup had bypassed PACU would be 2,613 hours or 4.0% of total PACU care hours (less than one full-time equivalent salary).

Conclusion: By identifying a specific subgroup of patients who could bypass PACU, it may be possible to achieve modest cost savings, but there is also a small risk to patient care.

B

COST EFFECTIVENESS OF HIGH VS LOW DOSE TRANEXAMIC ACID ON BLOOD LOSS AND BLOOD PRODUCT REQUIREMENTS AFTER CARDIAC SURGERY.

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INTRODUCTION: The use of antifibrinolytic agents to reduce bleeding associated with cardiac surgery has been revived due to concerns of transfusion - acquired infections. Current recommended regimens are costly and often restricted to only high risk cases. Studies have shown the efficacy of tranexamic acid (TEA) in reducing blood loss and transfusion requirements post cardiac surgery. However, as with other agents, there are a variety of dosage regimens [1-2]. The aim of this study was to compare the efficacy and cost of a high vs low dose TEA regimen.

METHODS: Thirty patients scheduled for elective cardiac surgery were entered into this randomized, double-blind study. A standard anaesthetic and surgical technique was used. Patients were randomized into 2 groups each receiving 2 infusions bags. Bag 1 contained 50 ml of either TEA (5g) or placebo to be given intravenously over 1 hr after induction of anaesthesia. Bag 2 contained either 500 ml of TEA diluted to 1mg/kg/25ml or placebo. The initial 250 ml was given as a bolus over 20 min (i.e. 10 mg/kg) followed by an infusion of 25 ml/hr for ten hours (i.e. 1 mg/kg/hr). Group H (high-dose) received TEA/placebo and group L (lowdose) received placebo/TEA. Blood loss was recorded in the OR (BLOR) and in the ICU at 0-6hr;6-12hr;12-24hr and 24-48hr. Mediastinal shed blood was returned to the patient as indicated. There was a standard protocol for the administration of blood products in the OR and ICU. Data were compared to historical control group (Gp C) to demonstrate efficacy.

RESULTS: Twenty-eight patients completed the study (Gp H:14, Gp L:14). There was no statistical difference in demographic, intraoperative or total OR blood loss between treatment groups or either group compared to control. Blood loss, hct and cost of TEA and transfusion requirements are shown in Tables 1&2. No blood products were used in Gp H compared to: Gp L; 5RBC, 4 FFP and Gp C; 10 RBC, 6 FFP. No patient had a perioperative stroke or MI. Lengh of ICU stay was similar in all groups.

Table 1: Perioperative Data (Mean+SEM)

	H	L	C
BL(OR)ml	424.6±34.8	485.4±60.3	573.3±89.2
BL(0-6hr)ml	507.3±50.9*	769.1±82.9	832.7±85.7
BL(6-12hr)ml	207.0±31.5	248.3±55.6	227.5±22.7
BL(12-24hr)ml	225.6±21.4	256.6±27.8	303.9±30.9
BL(OR-24hr)ml	1367.4±95.7*	1759.4±153.5	1937.3±137.5
HCT(PRE-OP)	0.43±0.01	0.42±0.01	0.42±0.01
HCT(at72hrs)	0.30±0.01	0.28±0.01	0.25±0.01

Table 2: Pharmacy and Blood Product Cost

	H	L	C
Tranexamic Acid	$1946.00	$630.00	$0.00
Blood Products (0-72hr)	$0.00	$1605.00	$3070.00
Total Cost (Avg/pt)	$139.00	$159.64	$204.67

** $p < 0.005$ compared with Control & Gp L*

DISCUSSION: This study failed to demonstrate the efficacy of low dose tranexamic acid as described by Horrow et al[2]. Only patients receiving high dose tranexamic acid had a significant reduction in blood loss and blood transfusion requirement compared to a historical control. Therefore despite the reduced cost of the low dose regimen, its minimal effect on blood loss associated with cardiac surgery is outweighed by the additional cost of blood products. Therefore, we do not recommend the low dose regimen.

REFERENCES:1. J. Thorac Cardiovascular Surgery 1995;111;835
2. Anesthesiology 1995;82;383-392.

A

A MULTICENTER STUDY COMPARING THE CARDIOVASCULAR EFFECT OF SEVOFLURANE AND ISOFLURANE ANESTHESIA FOR ELECTIVE CORONARY ARTERY BYPASS SURGERY

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INTRODUCTION Due to progressive aging of the population, the proportion of pts with coronary artery disease (CAD) is likely to increase. For this reason, the safety of anesthetic drugs in pts with CAD has been the focus of intense scrutiny in years. The effects of newer inhalational anesthetic drugs such as desflurane and sevoflurane must be determined in pts with known CAD.

METHODS After obtaining IRB approval and written informed consent, 287 pts scheduled to undergo elective CABG were enrolled from 13 centers. All pts had an EF>45% and had no significant valvular disease Anesthesia was induced with midazolam (0.1 mg/kg), fentanyl (up to 15 mg/kg), vecuronium (0.1 mg/kg). After loss of consciousness, they received either sevoflurane (Group S) or isoflurane (Group I) up to 2 MAC end-tidal concentration to maintain stable hemodynamic (±20% from baseline systolic blood pressure and heart rate). The inhalational agent was administered from the time of loss of consciousness until the onset of cardiopulmonary bypass (CPB). Supplemental fentanyl (up to 10 mg/kg) was allowed prior to sternotomy. During and after CPB, anesthesia was maintained by a combination of fentanyl, midazolam and vecuronium without volatile anesthetic. Results are expressed as mean ± standard error of the mean.

RESULTS Satisfactory records were available in 272 pts, 139 in Group S and 133 pts in Group I. There was no difference between groups for demographics, ASA, NYHA and angina classifications. Surgical, CPB and aortic cross-clamping times were similar. Group S had a larger proportion of patients on ß-blockers (75 *vs* 62%) The overall surgical bypass graft assessment was not different between groups. Total dosage of both agents defined in MAC-h were similar in both groups but varied widely between centers (range Group S 0.53-1.93 MAC-h $p<0.001$ and group I 0.46-1.65 MAC-h $p<0.001$) but not within each center. The mean end-tidal MAC requirements for Group S were 0.63±0.02 and for Group I were 0.58±0.02 p=NS. The total pre-CPB fentanyl dose was for Group S 17.0±0.7 mg/kg and 16.7±0.7 mg/kg for Group I. Following induction of anesthesia, there was a significant but similar decrease in heart rate, systolic blood pressures, systemic vascular resistance and cardiac index in both groups that persisted throughout the pre-CPB period. The incidence of adverse hemodynamic events and use of vasoactive drugs did not differ between groups. Holter analysis failed to demonstrate any difference in the incidence and severity of myocardial ischemia during the pre- (Group S 12%, Group I 13%, p=NS) and intraoperative period (Group S 7%, Group I 11%, p=NS). Diagnosis of myocardial infarction, using both the ECG and creatine kinase myocardial isoenzyme fraction, yielded a 2.2% incidence for Group S while Group I had an incidence of 4.5%, p=NS. There were 5 postoperative deaths (1.8%), one of which was attributed to a cardiac cause.

CONCLUSION We have found that fentanyl-supplemented anesthesia, using sevoflurane compared to isoflurane prior to CPB, had a similar hemodynamic effect in pts undergoing elective CABG surgery. Both groups of pts had a similar incidence of intraoperative myocardial ischemia and postoperative morbidity and mortality. To be useful, newer inhalational anesthetic agents must cause no or minimal cardiac depression, and must have no deleterious hemodynamic or coronary effects. Sevoflurane appears to fulfill these requirements.

B

COMPARED EFFICACY OF APROTININ AND E-AMINOCAPROIC ACID IN CARDIAC SURGICAL PATIENTS AT HIGH RISK OF RECEIVING ALLOGENEIC BLOOD PRODUCTS

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INTRODUCTION Antifibrinolytics are administered to reduce transfusion of allogeneic blood products (ABP) after cardiac operations with cardiopulmonary bypass (CPB). Both aprotinin and E-aminocaproic acid (EACA) have been shown to be effective for this purpose (1). However, the cost of EACA is substantially lower and no study has compared the efficacy of these drugs specifically in patients at high risk of receiving ABP after CPB.

METHODS After approval by the Ethics committee, 59 pts scheduled for redo myocardial revascularization, redo valve surgery, or complex procedures gave informed consent and were randomized to receive EACA (10 g bolus + 1 g/hr until end of CPB + saline bolus in CPB prime), aprotinin (2 million KIU bolus + 500,000 KIU/hr until end of CPB + 2 million KIU in CPB prime) or placebo (saline bolus/infusion/bolus). CPB and anticoagulation were standardized and kaolin ACT maintained >400 sec. ABP were transfused according to predetermined criteria. Primary outcomes were % of pts transfused and total ABP administered in those pts transfused. Secondary outcomes were 24 hr chest drainage in the ICU and coagulation testing. Repeated measures ANOVA, Kruskal-Wallis and Chi-square were used as appropriate. $P<0.05$ was considered significant.

RESULTS Pt demographics and postoperative complications (MI, CNS, death) were similar in all 3 groups. Bleeding and transfusions are shown in the Table.

Group (n)	Placebo (20)	Aprotinin (19)	EACA (20)
% of patients transfused	85	53 *	70
Total ABP median (range)	4 units (1-25)	4 units (1-40)	3.5 units (1-37)
24 hr drainage median (range)	537 ml (125-1850)	325 ml (0-2825)	487 ml (125-2375)

* $P<0.05$ vs placebo; all other NS

D-dimers and fibrinogen degradation products (FDP) were decreased in both treatment groups ($P<0.05$ vs placebo) but prothrombin fragments F_{1+2} increased similarly in all 3 groups after CPB.

DISCUSSION These interim results confirm the efficacy of high-dose aprotinin in our high-risk population and suggest that, contrary to the initial hypothesis, EACA in the dosage used will not be as effective as aprotinin. With approval of the Ethics committee, the study will be resumed after 1) exclusion of the placebo group, and 2) modification of the dosage of EACA to determine if reduced bleeding and transfusions can still be obtained at a low cost for the institution.

(1) Ann Thorac Surg 1994;58:1580-8

A

THE EFFECT OF SURGICAL DISLOCATION OF THE HEART ON CEREBRAL BLOOD FLOW IN THE PRESENCE OF A SINGLE, TWO-STAGE VENOUS CANNULA DURING CARDIOPULMONARY BYPASS

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INTRODUCTION: This study was designed to investigate the hypothesis that during cardiopulmonary bypass (CPB) displacement of the heart in the presence of a single two-stage venous cannula impairs venous return from the superior vena cava (SVC) producing cerebral venous hypertension and secondary reductions in cerebral perfusion pressure (CPP) and cerebral blood flow(CBF).

METHODS: After ethics committee approval, 8 consecutive patients for coronary artery grafting were studied.All patients were anesthetized with opioid/benzodiazepine technique. Nonpulsatile CPB at 2-2.4L/m/min was managed using alpha-stat pH management, at mild hypothermia (nasopharyngeal temperature 32C), with haematocrits ranging from 0.2-0.34. Transcranial Doppler(TCD) measurements of middle cerebral artery flow velocity (MCAFV) [1] were made during stable CPB, before and during surgical dislocation of the heart,without change in pump flow rate or mean arterial pressure(MAP).MCA was identified through the right temporal window using a Medasonics II CDS 2mHz at depth 5-6cm producing optimal insonation. Central venous pressure(CVP) was recorded simultaneously from proximal SVC.

RESULTS: 8 patients, 2 female and 6 male, from 48-74yrs (mean=64yrs) underwent successful coronary artery surgery.Results quoted as mean ± SD are in the table.

	MAP (mmHg)		Proximal SVC (mmHg)		MCAFV (Peak) (cm/sec)		Dislocation (min)	%Δ CPP	%Δ MCAFV
EVENT	1	2	1	2	1	2			
Mean ± Std	47±6	45±6	5±4	8±7	48±12	34±6	9.0±3.4	-7±14	-28±7
Range	42 - 61	41 - 59	0 - 11	-1 - 19	36 - 71	25 - 44	5 - 16	6.5 - 19.5	6.1 - 46.6

(1= Stable CPB, 2 = CPB during cardiac dislocation)

All patients demonstrated a decrease in MCA velocity during retraction of the heart. Three of the 4 patients demonstrating the largest increase in SVC pressure had the greatest decrease in MCAFV and in CPP despite stable mean arterial pressure(MAP) and pump flow.

DISCUSSION:Acute SVC pressure rise during surgical retraction of the heart in the presence of a single two-stage venous cannula has been previously reported[2].The current study confirms that observation and demonstrates disproportionate decrease in MCAFV likely reflecting a decrease in CBF with dislocation of the heart.

ACKNOWLEDGEMENT: Medasonics for the use of TCD.

REFERENCES:[1]Am.J.EEGTechnol.35:201-221,1995;[2] CARDIAC ANESTHESIA PRINCIPLES AND PRACTICE, p.326,Lippincott 1994.

B

THE EFFECT OF TRANEXAMIC ACID ON BLOOD LOSS IN PATIENTS UNDERGOING REOPERATIVE VALVE REPLACEMENT SURGERY.

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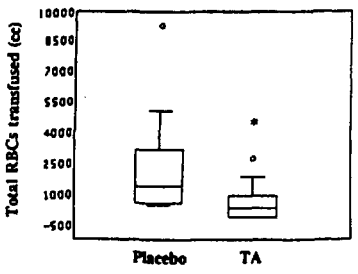
Introduction. Patients undergoing reoperative cardiac surgery are at risk for perioperative hemorrhage and increased transfusion requirements. The objective of this study was to assess the effect of tranexamic acid (TA), a synthetic antifibrinolytic, on blood loss and the need for transfusion of blood products following repeat cardiac valve surgery.

Methods. After ethics committee approval, 41 patients scheduled for reoperative valve replacement were enrolled in this randomized, double blind, placebo controlled study. Patients were randomized to receive TA (10g in 500 cc N/S) or placebo (N/S) as an IV bolus over 30 min prior to skin incision. Intraoperative blood loss was assessed by estimating blood volume on drapes, weighing surgical sponges and measuring suction bottle returns. Postoperative blood loss was measured from mediastinal chest tube drainage following surgery. Blood products were transfused according to a standardized protocol.

Results. Patient demographs were similar for age, sex, cardiopulmonary bypass time, cross clamp time, surgical time, preoperative hemoglobin, coagulation profile, or the number of valves replaced during surgery. 2 patients from the placebo group required reoperation for bleeding and were excluded from the efficacy analysis. The blood loss [median (range)] was as follows (*P<0.01,†P<0.05):

Analysis	Placebo	TA
Intraoperative (cc)	1656 (575-6270)	720(355-5616)*
Postoperative (cc)	795 (180-3900)	538(135-1465)†
Total (cc)	3044 (1035-8034)	1340(626-6991)*

The total red blood cells transfused [median (range)] was reduced from 1500 cc (0-9300) to 450 cc (0-2850) (*P<0.01, see figure with median, 90th and 10th percentiles, o=outliers). Hospital stay, complications, and in-hospital mortality rate were not reduced in the TA group.



Discussion. TA significantly reduced blood loss and the need for blood product transfusion in this study.

Conclusion. TA is effective treatment for patients undergoing reoperative cardiac valvular surgery.

KABI Pharmacia kindly supplied the TA used in this study.

A

THE EFFECT OF CANNULA CHARACTERISTICS AND BLOOD VELOCITY ON TRANSCRANIAL DOPPLER-DETECTED MICROEMBOLI DURING CARDIOPULMONARY BYPASS.

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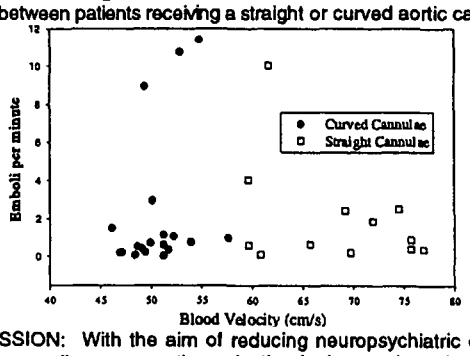
INTRODUCTION: Cerebral microemboli are responsible to a large extent for the neuropsychiatric deficits following cardiac surgery. Higher numbers of transcranial Doppler-detected emboli (TCD-emboli) are associated with greater neuropsychiatric deficits. The source of microemboli may include atheromatous material from the aortic wall which may become dislodged as a result of the jet of blood flowing from the aortic cannula used during cardiopulmonary bypass (CPB). Differences in cannula size employed for adult CPB and differences in total flows (to achieve a similar cardiac index) will result in different jet velocities of blood exiting the aortic cannula. This study was designed to determine whether the number of TCD-emboli in the middle cerebral artery (MCA) during CPB correlated with calculated blood velocity exiting the aortic cannula or the direction of flow as affected by the shape of the aortic cannula.

METHODS: Thirty-two patients undergoing elective first time coronary artery bypass surgery and weighing between 60 and 85 kg were studied. Cardiopulmonary bypass with 44 micron arterial filters and membrane oxygenators were employed. CPB management included maintaining nonpulsatile flows at 2.2 to 2.5 L/m²/min, and mean arterial pressure between 50 and 90 using either phenylephrine or isoflurane as necessary. Three aortic cannula types were used: 24Fr curved (n=19), 24Fr straight (n=6) and 22Fr straight (n=7) with internal diameters of 7.2, 6.6 and 5.9mm respectively. The right MCA was monitored for evidence of cerebral microembolization using TCD (Medasonics, Freemont, CA). A low profile 2MHz pulsed wave TCD probe was placed on the transtemporal window after induction of anaesthesia. TCD-emboli were identified on line, by their characteristic sound and behaviour, prospectively by a trained observer. The rate of TCD-emboli during the period of CPB with the cross clamp applied was calculated and compared to the blood velocity and between patients reciving either shape of cannula. The CPB flow and internal diameter of the arterial cannula were used to calculate the velocity of blood exiting the cannula.

RESULTS: The rate of TCD-emboli during CPB ranged from 0.02-11.4 emboli/min (mean 2.1). The blood velocities ranged from 46 to 77 cm/s. The rate of TCD-emboli was not related to the velocity of blood over this range. There was no difference in the rate of TCD-emboli between patients receiving a straight or curved aortic cannula.



DISCUSSION: With the aim of reducing neuropsychiatric deficits following cardiac surgery, the reduction in the number of cerebral microemboli is a goal. The use of straight or curved aortic cannula, or the use of a 24Fr versus 22Fr with attendant alteration in blood velocity exiting the cannulae does not seem to affect rate of TCD-detected microemboli. Thus these choices may not be important in achieving the goal of reducing the number of cerebral microemboli.

B

TARGET THERAPY COAGULATION ASSESSMENT, THE WAY OF THE FUTURE DURING ORTHOTOPIC LIVER TRANSPLANTATION?

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INTRODUCTION: Coagulation disorders represent one of the most challenging issues during Orthotopic Liver Transplantation (OLT). The computerized thromboelastograph (CTEG) is used to monitor whole blood coagulation and direct appropriate coagulation treatment during OLT[1]. In general, empirical pharmacotherapy, late pharmacological therapy and late specific blood product treatment represents the usual regimen of coagulation therapy during OLT. The purpose of this study was to evaluate if the aid of multiple CTEG with in vitro addition of different drugs or lyophilized blood products can promote earlier diagnosis and more accurately determine which specific treatment is required at specific moments of the OLT.

METHODS: After IRB approval, 10 patients presenting for OLT were included in the study. Any patient who received coagulation products before the study was excluded. Blood samples for this study were drawn in the beginning of stage I (Preanhepatic) and stage III (Neohepatic). Each sample of blood was divided and mixed with one of the four different constituents and studied in different CTEG channels. Channel 1 represents native blood and is considered the control CTEG. Channel 2 represents the blood mixed with lyophilized fresh frozen plasma (FFP). Channel 3 represents the blood mixed with lyophilized platelets (PLT). Channel 4 represents the blood mixed with heparinase (HEP). Channel 5 represents the blood mixed with Amicar™ (AMC). All experimental results were blinded from the anesthesiologist involved during this OLT. All experimental CTEG were examined after the surgery to determine if the results could have helped in directing therapy to optimize coagulation.

RESULTS; All 10 patients' results (20 different sets of CTEG or 80 experimental CTEG) were studied by 2 different anesthesiologists familiar with the CTEG and OLT. All the experimental CTEG were compared to the control CTEG (channel 1) during Stage I and III.

Stage I		Beneficial Information*
Normal CTEG :	5/10	1/5
Abnormal CTEG :	5/10	5/5

Stage III		Beneficial Information*
Normal CTEG	2/10	0/2
Abnormal CTEG	8/10	7/8

*Experimental results,if not blinded, would have rapidly guided more specific coagulation therapy.

Discussion: Multiple in vivo pretreated CTEG channels gave specific coagulation information, especially when patients had abnormal coagulation. On the other hand, the multiple CTEGs are time consuming and more costly than regular CTEG. Future studies are needed to compare if the information generated by the multiple CTEG channels will result in diminution of blood product use during OLT.

References: 1. Anesth Anal.1984,63; 246

A

POST-OPERATIVE CRITICAL OXYGEN DELIVERY IN HIGH RISK CARDIAC SURGICAL PATIENTS

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INTRODUCTION

The main function of the circulatory system is to deliver adequate O_2 (DO_2) to support tissue oxygen consumption (VO_2). As DO_2 decreases, O_2 extraction (O_2E) increases to maintain VO_2. If DO_2 continues to decrease, a point will be reached where increasing O_2E will no longer be able to maintain VO_2 and VO_2 will fall with further decreases in DO_2. The DO_2 at which VO_2 begins to fall is the critical DO_2. As VO_2 falls, tissue function becomes impaired and anaerobic metabolism may ensue. Lactic acid produced is buffered by HCO_3 producing CO_2 and H_2O. An increase in the veno-arterial CO_2 gradient (v-a CO_2) may indicate DO_2 below DO_2 critical DO_2 (DO_2 crit.) This study was designed to: 1) determine DO_2 crit in high risk post-operative cardiac surgical patients; 2) determine if SvO_2 could predict DO_2 below DO_2 crit; 3) determine if patients below DO_2 crit had elevated v-a CO_2 gradients.

METHODS

36 high risk cardiac surgical patients were studied immediately postoperatively. Institutional approval and written consent were obtained. During the study patients received midazolam for sedation, vecuronium for muscle relaxation and full mechanical ventilatory support. DO_2 was increased by a combination of improved oxygenation, fluids, RBC transfusion, and dobutamine per protocol. SvO_2 was continuously measured using an Oximetrix pulmonary artery catheter. Hemodynamic measurements, Hb, O_2 sat and arterial and mixed venous blood gases were obtained at regular intervals. DO_2, VO_2, O_2E and v-a CO_2 gradients were calculated and DO_2 vs VO_2 curves were constructed. In patients who had DO_2 vs VO_2 curves with a DO_2 crit point, DO_2 crit was determined using a quadratic model with plateau. An unpaired 2 tailed T-test was used for comparison between groups. Values are mean ± SD.

RESULTS

8 patients had DO_2 vs VO_2 curves with a DO_2 crit point. DO_2 crit = 379 ± 245 (ml/min/M^2). SvO_2 crit = 62 ± 14% with a range of 42-81%. Patients with a critical DO_2 point had a higher maximum v-a CO_2 gradient than those above critical DO_2 throughout the study period, 9 ± 3 vs 6 ± 2, p = .047.

CONCLUSIONS

8 patients demonstrated a DO_2 below DO_2 crit. While a DO_2 crit and SvO_2 crit could be determined for individual patients, a DO_2 crit could not be determined for this patient population and SvO_2 could not predict DO_2 below DO_2 crit due to the wide range of values obtained. Patients below DO_2 crit had a higher v-a CO_2 gradient than those above DO_2 crit.

B

Comparative effect of anti-inflammatory drugs on human leukocyte superoxide generation in vitro.

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Introduction:
The production of reactive oxygen species (ROS) is an integral part of the inflammatory response. It has been shown that reactive oxygen species can enhance the nociceptor activation[1]. While anti-inflammatory drugs have been used for pain relief in the postoperative period[2], , information regarding their effects on the superoxide generation is scanty. Therefore, we have investigated the comparative effects of different anti-inflammatory drugs on human leukocyte superoxide generation in vitro.

Methods:
After obtaining informed consent, heparinized venous blood samples were obtained from healthy patients. Stock solutions of luminol 33µg/ml (Sigma), opsonized zymosan (Cardinal Associates), and Hank's balanced salt solutions were prepared. Venous blood samples were so diluted as to give a white blood cell count of $1x10^5$ cells /ml. .Using appropriate controls, test couvettes containing luminol 200 µl, blood 50 µl, and experimental drugs 10^{-3} to 10^{-6} Molar were set up. The reaction was started by adding 50 µl of zymosan to each couvette. Superoxide generation was measured by luminol dependent chemiluminescence in a custom built luminometer which measured the emission of photons in a photomultiplier for 90 minutes. The data was analyzed for significance by Student's 't' test.

Results :
All the investigational drugs produced a significantly severe depression of superoxide generation at 10^{-3} molar concentration. Indomethacin and Ibuprofen caused this depression at 10^{-4} and 10^{-5} molar concentration also. None of the drugs caused a significant depression at 10^{-6} molar concentration. Ketorolac had the least effect of all the drugs tested. (Table 1).

Superoxide generation expressed as % of control

Drug	Control	10^{-6}M	10^{-5}M	10^{-4}M	10^{-3}M
Ketorolac	100 %	102 %	101 %	95 %	40 %
Ibuprofen	100 %	100 %	96 %	62 %	1.0 %
Indomethacin	100 %	99 %	77 %	4.0 %	0.4 %

Discussion:
These data illustrate that Indomethacin and Ibuprofen produced a significant dose dependent inhibition of superoxide generation at all concentrations except 10^{-6} M compared to the control activity. In contrast, Ketorolac produced a significant inhibition only at 10^{-3} molar concentration. Indomethacin had significantly greater depression of superoxide generation compared to both Ketorolac and Ibuprofen. Since superoxide radicals may contribute towards postoperative pain, the use of these drugs could benefit postoperative pain therapy.

References:
1. Dray.A., Inflammatory mediators of pain. Br J Anaesth 1995;75:125-31.
2. Elhakim M, Nafie M. I.V.tenoxicam for analgesia during Caesarean section. Br J Anaesth.1995; 74:643-46.

A

HEAVY VS LIGHT SEDATION IN THE CVICU AND MYOCARDIAL ISCHEMIA: IMPLICATIONS FOR EARLY EXTUBATION PROTOCOLS.

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*Supported by Zeneca Pharma Canada Inc.

INTRODUCTION: Intensive analgesia may reduce myocardial ischemia following cardiac surgery.[1] However, such levels of analgesia may preclude attempts to reduce the duration of tracheal intubation and early ICU discharge. Sedation may allow reductions in levels of analgesia while still permitting timely extubation but the safety of such an approach has not been determined. This randomized study examined the effects of light vs heavy propofol sedation on the incidence and degree of myocardial ischemia following cardiac surgery.

METHODS: Following institutional approval, informed consent, and a standardized anaesthetic, patients undergoing uncomplicated CABG surgery (n=50) were randomly assigned on admission to the CVICU to receive light (L) (n=24) sedation (Ramsay Sedation Score of 2) or heavy (H) (n=26) sedation (Ramsay Score=4) utilizing propofol. A background sufentanil infusion and supplemental morphine maintained a VAS Score <7. The presence of myocardial ischemia was determined utilizing a Holter monitor, serial ECG's, and CKMB determinations. A variable termed 'the ischemic burden' (mean change in ST segments for all leads examined for each patient) was developed to allow between group comparisons using a t-test. Other variables were compared using Chi-Square or Repeated Measures ANOVA with $p<0.05$ taken as significant.

RESULTS: The groups did not differ with respect to demographics or OR course (Table). Target sedation and VAS scores were achieved, sustained, and differed between groups. There was no difference in incidence of myocardial infarction (L=3; H=3) or degree of ischemic burden (L=2.3±2.6 vs H=1.9±3.2 mm/patient).

CONCLUSIONS: Our results suggest that, provided analgesia is adequate (VAS Score <7), heavy sedation in the ICU does not lead to reductions in myocardial ischemia following cardiac surgery and light sedation levels as required for early tracheal extubation could safely be implemented.

TABLE: Demographic Variables.

	Demographic Variables	
	Low	High
• Age (yr)	66±10	63±10
• Sex (M/F)	18/6	21/5
• Cross-Clamp(min)	58±15	54±15
• Anaesthesia(min)	251±48	237±34
• Intubation(min)	1466±6736	1424±131
• Costs ($CDN)	6493±1617	6569±2290

Reference: Anesthesiology 1992;76:342-353.

B

What is Delaying Extubation After Heart Surgery?

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Previous publications suggest high intraoperative narcotic doses prolong mechanical ventilation after cardiac surgery[1,2]. Other anaesthetic, surgical and ICU related factors, including surgeon's preferance and ICU house staff/respiratory therapist's inexperience, may delay extubation. This study evaluated the effect of these factors on extubation time in low to moderate risk cardiac patients.

Methods:
28 low to moderate risk patients[3] with grade 1 or 2 LV function (exclusion: double valve, repeat operations, valve+cabg, creatinine>168mmol/l, COPD, diabetes, emergency surgery patients), admitted for heart surgery between April 1994 and March 1995, were evaluated. 21 parameters including patient demographics, intraoperative doses of each anaesthetic, cross clamp, bypass time, number of grafts, intraoperative fluid balance, postoperative morphine and midazolam, 24hr chest tube drainage, hemoglobin, maximum ICU dopamine dose, number of postoperative MI's, hours from ICU admission to extubation, and hours to ICU discharge, were collected. Descriptive statistics were done for patient demographics. A multiple regression analysis was used to assess any parameters predictive for duration to extubation. Data are shown with means and standard deviations. Predictors for extubation time were tested at the 0.05 level of significance.

Results:

CABG / Valve Patient Data		
N=28	mean	s.d
Age yr	60.2	9.13
Ht cm	170.8	8.10
Wt kg	77.5	11.10
EjFr %	59.2	11.25
Bypass time min	102.3	30.83

Intraoperative/Postoperative Drugs & Time to Extubation			
	mean	s.d	correlation coef. 'r'
Fentanyl ug	5649	1987	-0.19
Post-op Morphine mg	35.3	18.4	0.66
Post-op Midazolam mg	18.46	11.25	0.52
Time to Extubation hr	21.21	9.52	1.00

Multiple Regression: Post-op Morph vs Ext Time; p=0.07, R-sq=67%

Conclusion:
Intraoperative narcotic use in this study was very high. However, high doses of morphine and midazolam in the ICU were more significant (postoperative morphine was borderline but not statistically significant) in delaying extubation. Surgical factors were insignificant in influencing time to extubation in low to moderate risk cardiac patients.

References:
1.Anesthesiology 1994;81:A145.
2.J Cardiothorac Vasc Anesth 1993;7:135-136.
3.JAMA 1992;267:2344-2348.

A

MORTALITY ASSOCIATED WITH ORTHOGNATHIC SURGERY

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INTRODUCTION
Orthognathic surgical procedures, and in particular procedures involving postoperative fixation of the mandible, are commonly performed but there is little data on the incidence of mortality associated with this type of surgery. This patient population may be at particularly high risk for fatal complications related to airway management due to the frequent existence of congenital anomalies, the potential for multiple intubations and the need for postoperative mandibular fixation in a patient at risk for airway compromise from bleeding or swelling.

METHODS
Approval was obtained from the Office of the Chief Coroner of Ontario to undertake this review. A search of the records of the Chief Coroner's Office for the province of Ontario was undertaken from 1986 until the early part of 1995. All cases involving perioperative deaths, anesthetic related deaths or deaths related to oral surgery were reviewed.

RESULTS
An initial computer search of 291,944 records identified 466 which met our inclusion criteria. A complete review of 461 charts was undertaken. Five charts were unavailable for review. There was only one death identified associated with orthognathic surgery. This case was the subject of an inquest. The coroner's jury recommendations are summarized as follows;

1. Special training be provided to nurses on the special care requirements of maxillofacial osteotomy patients.
2. Staff assigned to post-operative maxillofacial osteotomy patients be made aware of important complications of this procedure by means of a preprinted protocol.
3. An appropriated communications device be developed to allow these patients to easily communicate their needs to the attending staff.
4. The responsible oral surgeon communicate directly to health care professionals any special needs of the patient.
5. Patients undergoing maxillofacial surgery require appropriate post operative monitoring.
6. Crash carts should include kits to perform tracheotomies.

DISCUSSION
The mortality after orthognathic surgery appears to be a rare event. It is possible ,although unlikely, that other deaths may have occurred over this time frame that were not reported to the Coroner's office or that there may have been other cases in the 5 that we were unable to review. Possible explanations for a very low mortality rate in this high risk population include increased vigilance on the part of health care providers to airway problems and thus expectant management perioperatively as well as the large physiologic reserve of these patients who are usually young and otherwise healthy. Unfortunately we have been unable to determine the total number of cases of orthognathic surgery done in Ontario over this time frame. It is impossible to know the frequency of minor and major nonfatal complications from this surgery based on this data.

ACKNOWLEDGMENTS
We would like to acknowledge the assistance of the Chief Coroner's Office of Ontario whose help made this report possible.

B

PREVENTION OF VOMITING AFTER STRABISMUS SURGERY: PROPOFOL VS ONDANSETRON

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INTRODUCTION Vomiting by children after strabismus surgery is common with up to 85% of patients suffering from emesis[1]. Several investigations have shown that ondansetron reduces vomiting after surgery[2]. A propofol-based anaesthetic is also effective[3]. We compared the effect of these two prophylactic antiemetic strategies on postoperative vomiting.

METHODS With Hospital Ethics Committee approval 303 healthy children of ages 2-14 yr undergoing elective strabismus surgery were enroled into this randomized single-blind study. After placement of routine monitors, the patients had an IV induction with propofol 2.5-3.5 $mg.kg^{-1}$ + lidocaine 0.5 $mg.kg^{-1}$ (Group P) or an inhalation induction with halothane and N_2O (Group O). Vecuronium 80 $\mu g.kg^{-1}$, was administered, if indicated. All patients were given 50 $\mu g.kg^{-1}$ midazolam and 20 $\mu g.kg^{-1}$ atropine IV. Group O patients received 150 $\mu g.kg^{-1}$ (maximum dose 8 mg) of IV ondansetron and their anaesthesia was maintained with halothane and N_2O. The Group P subjects received N_2O and propofol intraoperatively. Vecuronium was given when indicated. Upon completion of surgery, neuromuscular blockade was reversed with atropine and neostigmine. Postoperative fluid, pain and emesis management were standardized. Patients were followed for 24 hours. Data were compared with ANOVA and Chi-square analysis. Acceptable alpha and beta errors were 0.05 and 0.20, respectively.

RESULTS The groups had similar weights, ages, length of anaesthesia, and number of muscles operated upon. In both groups, the incidence of vomiting was the same, 26%. Only 11% of all of the patients vomited in-hospital. The length of stay in the day-care surgical unit was similar. Only 2% of the patients required a rescue antiemetic and no patients required admission to hospital.

DISCUSSION In conclusion, ondansetron and propofol-based anaesthesia were equally effective in decreasing vomiting after strabismus surgery in children.

REFERENCES 1. Anesthesiology 1983; 59: 579-83. 2. Anesthesiology 1994; 81: A22. 3. J Clin Anesth 1993; 5: 37-41.

A

DEXAMETHASONE DECREASES VOMITING BY CHILDREN AFTER TONSILLECTOMY

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INTRODUCTION As many as 75% of children vomit after general anaesthesia for tonsillectomy[1]. Anaesthetists are searching for techniques that will minimize this problem. Vomiting after cancer chemotherapy has been reduced after the administration of dexamethasone[2]. We studied the effect of dexamethasone on vomiting after tonsillectomy in children.

METHODS With Hospital Ethics Committee we studied 118 healthy children of ages 2-12 years undergoing elective tonsillectomy in this double-blind, placebo-controlled study. Patients were excluded if they had an allergy to a study drug. After establishing standard patient monitoring, induction of general anaesthesia was achieved by inhalation with N_2O and halothane or intravenously with propofol 2.5-3.5 $mg.kg^{-1}$. Mivacurium, 0.25 $mg.kg^{-1}$ was administered if a muscle relaxant was indicated. Anaesthesia was maintained with 70% N_2O, 0.75-2.0% halothane and 50 $\mu g.kg^{-1}$ midazolam (max. dose 3 mg). Before the surgery began, 150 $\mu g.kg^{-1}$ dexamethasone (max. dose 8 mg) or placebo, was administered in a double-blind fashion. All patients received 1.5 $mg.kg^{-1}$ codeine IM (intramuscular). Intraoperative IV fluids, emergence from anaesthesia, management of emesis, and post-operative pain and fluids were all standardized. Patients were followed for 24 hours after their surgery. Data were compared with one-way ANOVA, Chi-square analysis and Exact Tests, whichever was appropriate. An acceptable alpha error was set at 0.05. Data is presented as mean$\pm$SD.

RESULTS There were 61 patients in the placebo group. The groups were similar with respect to age, weight, anaesthesia induction technique, length of surgery and estimated intraoperative blood loss. Dexamethasone reduced vomiting from 70% (placebo) to 41%, $P<0.01$. Each episode of in-hospital vomiting prolonged discharge by 13$\pm$2 minutes, $P<0.001$.

DISCUSSION In conclusion, dexamethasone markedly decreases vomiting by children after tonsillectomy.

REFERENCES 1. Anesthesiology 1990; 73: A1245. 2. Lancet 1991; 338: 483-6.

B

REDUCING PAIN AFTER INGUINAL HERNIA REPAIR IN CHILDREN: CAUDAL ANAESTHESIA vs KETOROLAC.

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INTRODUCTION Currently, optimal analgesia after paediatric hernia repair has been reported to occur after supplementation of intraoperative local anaesthesia (LA) with caudal anaesthesia (CA)[1]. Alternatively, analgesics may be used to augment LA. Ketorolac, which has been observed to decrease pain after paediatric hernia repair[2], may be an effective supplement of LA. In the current study we compared augmentation of LA with either CA or intravenous ketorolac (K).

METHODS With informed consent and Hospital Ethics Committee approval, 113 healthy children aged 2-6 yr undergoing elective, outpatient, inguinal hernia repair were randomized to receive either CA + LA or K + LA in a single-blind fashion. General anaesthesia was induced by inhalation of N_2O and halothane or intravenously with propofol. All patients received 68% N_2O and 1.5% halothane intraoperatively. In the CA-Group (57 patients), the anaesthetist performed a caudal block with 1 $mL.kg^{-1}$ (maximum dose 25 mL) of 0.20% bupivicaine with 1/200,000 epinephrine. In the K-Group, 1 $mg.kg^{-1}$ ketorolac was administered IV. Both groups had a bandaid placed over the sacral hiatus. Standardized, local infiltration block under direct vision was performed by the surgeon intraoperatively. Patients were followed for 24 hr. In-hospital pain was assessed with mCHEOPS. Parents assessed pain with a linear analogue scale with anchors of O (no pain) and 100 (worst pain imaginable). Data were compared with a ANOVA, Mann-Whitney U test, Chi-Square Analysis or Fisher's Exact test. $P<0.05$ was considered significant.

RESULTS The groups were similar with respect to demographic data. In-hospital analgesic requirements and pain scores were almost identical in both groups. Four patients in each group required an analgesic in the post anaesthesia recovery room. Pain at home was significantly less in the ketorolac group (VAS score 12 ± 14 vs 21 ± 21, mean$\pm$SD), $P=0.05$. The groups had similar incidences of vomiting and time to ambulation and urination.

DISCUSSION Supplementation of local anaesthesia for paediatric inguinal hernia repair with ketorolac results in superior 24 hour analgesia when compared to the more expensive alternative, caudal block.

REFERENCES 1. Anesthesiology 1992; 77: A1156. 2. Anesth Analg 1993; 76: S50.

A

WITHHOLDING ORAL FLUIDS FROM CHILDREN UNDERGOING DAY SURGERY REDUCES VOMITING

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INTRODUCTION

Discharge criteria following day surgery in children have traditionally included the ability to retain oral clear fluids. Scrutiny of this criterion has recently indicated that children can be safely discharged after day surgery without being required to drink.[1] We hypothesized that withholding fluids postoperatively would decrease the incidence of vomiting without changing duration of hospital stay or frequency of hospital admission for children undergoing day surgery.

METHODS

With Research Ethics Board approval, we randomized 315 children between the ages of 1 month and 18 years. 182 children were required to tolerate oral fluids prior to discharge ("P.O. fluids" group). The parents and nursing staff for 133 children were encouraged to withhold oral fluids for 4 hours (if under 2 yrs of age) or 6 hours (if 2 yrs. of age and older) ("N.P.O" group). All patients received intravenous fluid volumes calculated to replace deficits from the preoperative fasting period and 4 or 6 hrs. postoperatively (depending on age) in addition to maintenance fluids and replacement of other losses. Vomiting was assessed by nursing staff in hospital and by telephone interview with parents on the first postoperative day.

DISCUSSION

95% of patients in "P.O fluids" group drank prior to discharge, while 4% of patients in "N.P.O." group drank. The incidence of vomiting in the "N.P.O." group was significantly lower than in the "P.O. fluids" group(41% vs. 54%) $p<0.05$. Vomiting in the hospital was reduced in the "N.P.O." group compared with the "P.O Fluids" group(23% vs. 37%) $p<0.05$; vomiting at home was not different. Patients known to be at high risk for postoperative vomiting (strabismus and tonsillectomy and/or adenoidectomy) had an equal incidence of vomiting (57% vs. 58%). When they were excluded the difference in the overall incidence of vomiting was more apparent (34% vs. 52%) $p<.05$. Duration of stay in the day surgery unit was not different for the two groups (143 +/- 67 min. vs. 138 +/- 66 min.). Two "N.P.O." patients required admission to hospital from the day surgery unit for nausea and vomiting; one "P.O. fluids" patient required admission for surgical complications.

RESULTS

We conclude that withholding oral fluids from children postoperatively reduces the incidence of vomiting. We recommend withholding oral fluids from all children undergoing day surgery except those undergoing strabismus and tonsillectomy and/or adenoidectomy.

REFERENCES

Anesthesiology, 76:528-533.

B

MODIFICATION OF PROPOFOL-INDUCED MOVEMENTS BY ORAL MIDAZOLAM PREMEDICATION IN CHILDREN

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INTRODUCTION Dystonic movements are common during induction of anaesthesia with propofol[1] perhaps from inducing inhibition of $GABA_A$ pathways[2]. In this study, propofol-induced movements were observed with/without previous midazolam because benzodiazepines potentiate $GABA_A$ receptor activity[3].
METHODS In a double-blind, randomized study and after informed consent, 24 children (2-7 yr, ASA 1-2) received placebo (P) or midazolam 0.5 $mg.kg^{-1}$ (M) *po* before brief surgery. Sedation and anxiolysis were observed 3 times before induction of anesthesia with propofol 5 $mg.kg^{-1}$ *iv* followed by propofol infusion, O_2:N_2O and local anaesthesia. Movements at induction and recovery were assessed by blinded observers and using videotape. Times to recovery (Steward Score=6; Vancouver Sedative Recovery Score=22; eye-opening; discharge) were recorded.
RESULTS Patients in both groups were similar in age, weight, premedication interval, dose of propofol and length of surgery. Preoperative anxiety was unaltered by midazolam but recovery was delayed (Table 1). Movements were seen in 79% on induction, and 29% on emergence ($P<0.05$) but were similar in P and M groups (Table 2).

Recovery (min)	Placebo	Midazolam
Eye opening	24 ± 7	43 ± 18*
Steward score (6)	27 (13-37)	55 (24-138)*
VSRS (22)	51 (30-100)	80 (50-130)*
Discharge home	69(48-132)	95(54-137)*

TABLE 1. Values: mean ±SD, median (range), *$P<0.05$

	Induction							Emergence						
Gp	0	1	2	3	A	B	All	0	1	2	3	A	B	All
P	3	1	3	5	3	6	9	8	2	0	2	1	3	4
M	2	2	3	5	5	5	10	9	1	0	2	0	3	3

TABLE 2. Movements. 0:none, 1:hands/feet, 2:1+flexion/extension, arms/legs, 3:1+2+internal rotation, shoulder/hip. Duration: A<, B> 30sec. *P* NS. Values: number count.
DISCUSSION Movements were more common on induction than emergence from propofol but were not modified by midazolam. These results do not support a role for $GABA_A$ receptors in propofol-induced movements.
REFERENCES
1. Borgeat A et al. *Anesthesiology* 1991;74:24-7.
2. Hara M et al. *Anesthesiology* 1993;79:781-8.
3. Goodchild CS. *Br J Anaesth* 1995;71:127-33

A

PROPHYLACTIC THERAPY FOR POSTOPERATIVE VOMITING IN CHILDREN AFTER ADENOTONSILLECTOMY: A COMPARISON OF DIMENHYDRINATE, ONDANSETRON OR PLACEBO.

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INTRODUCTION
Vomiting is a common problem after adenotonsillectomy and may result in delayed hospital discharge. Ondansetron prophylaxis reduces the incidence of postoperative vomiting (POV) in these patients.[1] Dimenhydrinate, a much cheaper alternative, significantly decreases the incidence of POV after other types of surgery.[2] To determine the effectiveness of dimenhydrinate for prophylaxis against POV following adenotonsillectomy, we compared the incidence of vomiting and retching (hereafter referred to as POV) after dimenhydrinate, ondansetron or placebo.

METHODS
After ethical committee approval and parental informed consent, 31 children, ASA grades I or II, between 2 and 10y were randomly allocated to one of three groups: 0.5 $mg{\cdot}kg^{-1}$ dimenhydrinate, 0.1 $mg{\cdot}kg^{-1}$ ondansetron or normal saline (placebo) at induction of anaesthesia. All drugs were administered in a volume of 0.2 $ml{\cdot}kg^{-1}$ normal saline. Monitoring included ECG, pulse oximetry, non-invasive blood pressure and end-tidal gases. Anaesthesia was induced with sodium thiopentone 5 $mg{\cdot}kg^{-1}$ and atropine 10 $\mu g{\cdot}kg^{-1}$ and endotracheal intubation facilitated with succinylcholine 2 $mg{\cdot}kg^{-1}$. Anaesthesia was maintained with 1-2% halothane and 66% N_2O in 33% O_2. Codeine phosphate 1.5 $mg{\cdot}kg^{-1}$ IM was given when the second tonsil was removed. All children had Lactated Ringer's solution (10-20 $ml{\cdot}kg^{-1}$) administered IV during surgery. At the end of surgery the pharynx was cleared of secretions and the child extubated in a deep plane of anaesthesia. On arrival in the recovery room all children received 25 $mg{\cdot}kg^{-1}$ of acetaminophen rectally. Intravenous morphine (50 $\mu g{\cdot}kg^{-1}$) was administered for pain. 'Rescue' dimenhydrinate (0.5 $mg{\cdot}kg^{-1}$) iv was administered for two or more episodes of POV in one hour. Oral fluids were offered only to those children who requested them. Parents were contacted by telephone the day after surgery to ascertain the incidence of POV after discharge. Data were compared using the ANOVA and Chi-square analysis as appropriate and $P< 0.05$ was accepted.

RESULTS
Age, weight, sex, duration of anaesthesia, morphine administration and length of hospital stay before discharge home were similar in the three groups.

POV	Dimenhydrinate	Ondansetron	Placebo
yes	8 (73%) †	3 (25%) *	7 (87.5%)
no	3 (27%)	9 (75%)	1 (12.5%)

Table - number of children with POV in the first 24h postop
† P=0.04 compared with Ondansetron,
*P=0.02 compared with Placebo.

DISCUSSION
Our results indicate that ondansetron 0.1 $mg{\cdot}kg^{-1}$ administered at induction of anaesthesia significantly reduces the incidence of POV after adenotonsillectomy and is more effective than dimenhydrinate.

REFERENCES
1. CJA 1995;42:848-51.
2. Anesthesiology 1994; 81(3A):A21

B

SEDATION IN PAEDIATRIC ONCOLOGY PROCEDURES: PROPOFOL VS MIDAZOLAM.

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INTRODUCTION Children with cancer must frequently endure painful therapeutic procedures during treatment. Sedation with different medications has been used to alleviate this distress. We compared the sedative and amnestic effects, the rapidity of recovery, and the adverse effects of intravenous sedation with either midazolam or propofol for lumbar puncture (LP).

METHODS Hospital Ethics Committee approval and parental consent were obtained. This was a randomized, crossover, balanced, trial of 34 children aged 3-14 yr undergoing LP as part of their oncologic treatment. One hour before the procedure, the LP site was covered with EMLA cream. Upon arrival in the procedures room with their parent(s), the patients were monitored with a pulse oximeter and blood pressure cuff. All subjects received 1 $\mu g.kg^{-1}$ of fentanyl iv. Two minutes after fentanyl, they were sedated with iv propofol or midazolam. The initial and supplemental doses of propofol and midazolam were 1 then 0.5 $mg.kg^{-1}$, and 0.1 then 0.05 $mg.kg^{-1}$, respectively. After achieving an adequate level of sedation the LP was performed. The following were assessed: respiratory rate, oxygen saturation, heart rate, recall (WADA testing before, during and after the procedure), pain (VAS and Oucher), anxiety (VAS), fear (VAS), parental acceptability, patient acceptability, nausea, vomiting, sedation scores, recovery scores, and adverse events. Data were compared with paired t-tests and Wilcoxon rank sum test.

RESULTS Three children did not crossover treatment and complete the study. Subjects ranged in weight from 15-80 kg. Propofol was similar or superior to midazolam among the subjects studied. Specifically, propofol had a beneficial effect on vomiting, parental acceptability, length of sedation, recovery scores, sedation scores and minor adverse effects, $P<0.05$. Among the small numbers studied, no clinically-significant adverse physiologic events were observed, except one patient in each group, had a brief oxygen desaturation to 80-84%.

DISCUSSION This study shows that fentanyl plus propofol is a better combination than midazolam plus fentanyl for iv sedation for LP in children.

A

EFFECTS OF PROPOFOL ON MEDULLARY VASOMOTOR CENTERS IN CATS

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INTRODUCTION
Propofol causes hypotension in some critically illed and geriatric patients. The mechanisms responsible for this depressant effect may involve both peripheral and central actions. The present study was to investigate whether propofol directly acts on the vasopressor areas of medulla in cats.

METHODS
Thirty-six adult cats of either sex were anaesthetized with α-chloralose and urethane, and the head was fixed in a stereotaxic instrument. Systemic arterial pressure (SAP), heart rate, cardiac contractility and vertebral nerve activity (VNA) were measured. Different doses of propofol were applied into femoral vein, vertebral artery or lateral cerebroventricle. For microinjections into the medulla, a three-barrel glass microelectrode with a tip diameter of 50 μm was filled with either NaCl (3M), propofol (0.001% to 10%) or L-glutamate(Glu, 0.25M). They were microinjected into the pressor dorsal medulla (DM), or ventrolateral medulla (VLM), or the depressor caudal ventrolateral medulla (CVLM) through a pneumatic pump, each in 30 nl. The above areas were identified first by electrical current, then confirmed by Glu (control). One hour later, propofol was microinjected and then shortly L-glutamate was microinjected again (treatment) for comparison.

RESULTS
Propofol (4 mg/Kg, i.v.) depressed SAP, heart rate and cardiac contractility in a dose-dependent manner. Adminstration of propofol from vertebral artery or lateral cerebroventricle (0.1 to 1 mg/Kg) produced more marked depressant effects. The inhibitory effects were rapid in onset and reversible. Intralipid™, the solvent of propofol, exerted no action per se. The pressor responses induced by either electrical current or Glu in DM and VLM were significantly reduced after microinjection of propofol. On the contrary, in CVLM, propofol potentiated the depressor responses elicited by Glu.

DISCUSSION
Findings show that propofol may directly modulate the vasomotor integrating mechanisms in medulla by inhibiting the vasopressor mechanism and augmenting the vasodepressor mechanism. These actions may, at least in part, contribute to the hypotensive effect of propofol.

B

CHANGES IN AUTONOMIC CARDIOVASCULAR CONTROL WITH INCREASING LEVELS OF PROPOFOL SEDATION

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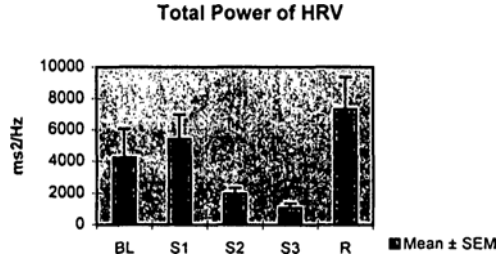
INTRODUCTION: General anaesthesia has been shown to impair autonomic cardiovascular control (ACC), presumably via depression of brainstem regulatory centres. Both a decrease and no change in baroreflex sensitivity have been reported with propofol,[1] and the effects of increasing levels of sedation and anaesthesia have not been studied. The purpose of this study was to quantify changes which occur in ACC and measures of cortical activity (electroencephalography) during two levels of propofol sedation and full anaesthesia.

METHODS: The protocol received Research Ethics Board approval. Eight ASA Class I volunteers aged 24-37 yrs. consented to receive propofol according to a pharmacokinetic model designed to attain light sedation (S1), heavy sedation (S2) and full anaesthesia (S3). At baseline (B), each level of sedation, and recovery (R), continuous traces of ECG, systolic BP and respiration were recorded for 12 minutes. These were analyzed using two techniques used to quantify ACC: spontaneous baroreflex sensitivity and spectral analysis of heart rate variability (HRV).

RESULTS: Plasma propofol levels in 3 subjects for S1, S2, S3 and R were 0.08-0.28, 0.43-0.75, 1.15-1.51 and 0.21-0.75ug/ml respectively. Mean total power of HRV tended to increase during light sedation and thereafter decreased in a dose-dependent fashion, although the appearance of these patterns varied across subjects. The relationship of baroreflex sensitivity and EEG measures to HRV data is pending further subject recruitment.



DISCUSSION: The increase in HRV at low levels of propofol may reflect a relaxation effect and decreased sympathetic tone. With deeper levels of anaesthesia direct drug-induced suppression of brainstem ACC may be responsible for the decrease in HRV.

REFERENCES:

1. Anesthesiology 80:534-544.

A

PRETREATMENT WITH PHENYTOIN ENSURES RECOVERY OF SYNAPTIC TRANSMISSION IN HIPPOCAMPAL SLICES AFTER ANOXIC INSULTS

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INTRODUCTION

Excessive calcium influx during anoxia leads to irreversible neuronal injury. A large portion of the intracellular pathologic calcium load occurs through reverse sodium/calcium exchange stimulated by increased sodium influx secondary to anoxia-induced depolarizations. This sodium leak likely occurs via incompletely inactivated voltage-gated sodium channels. The present abstract reports that pretreatment with phenytoin, by virtue of its sodium channel blocking properties, ensures the recovery of neuronal function after anoxia.

METHODS

Adult Wistar rats were anaesthetized and decapitated. The hippocampi were rapidly removed and transversely sectioned into 400 μm thick slices which were incubated at 30°C in artificial cerebrospinal fluid (ACSF). Subsequently slices were placed in a submerged recording chamber and constantly perfused with ACSF at 35°C. Population spikes were evoked by stimulation of stratum radiatum with a bipolar tungston electrode and recorded extracellularly in the pyramidal cell body layer of the CA1 region using a glass micropippette filled with 150mM NaCl. Slices were superfused with phenytoin 100 μM dissolved in ACSF or control ACSF before application of anoxia by switching to perfusate bubbled with 95% N2/5% CO2.

RESULTS

The table below shows the mean percent depression in population spike amplitudes during and after anoxia.

	% Depression from Baseline	
	Control ACSF (n=6 slices)	Phenytoin (n=7 slices)
Anoxia (30 min)	98 ± 1	97 ± 1.5
Post-Anoxia (120 min)	86.5 ± 10	12.6 ± 5.2*

[Data are presented in mean ± SEM. * Indicates statistical significance ($p<0.05$, Mann-Whitney test) between control and phenytoin 100 μM post-anoxia.]

DISCUSSION

These preliminary results suggest that phenytoin in relatively high concentrations ensures recovery of neuronal electrophysiologic activities after anoxic insults. However, it does not protect cellular function during oxygen deprivation. The mechanism of phenytoin neuropreservation is probably due to selective blocking of slow persistent sodium currents that are activated by anoxia-induced depolarizations (1,2). Blocking these non-inactivating sodium conductances may decrease calcium influx by preventing activation of calcium channels and attenuating reverse sodium/calcium exchange.

REFERENCES

1. J Cereb Blood Flow 1995; 15:425-432.
2. TiPS 1995; 16:309-316.

B

EVALUATION OF ZOLPIDEM, TRIAZOLAM AND PLACEBO AS HYPNOTIC AGENTS THE NIGHT BEFORE SURGERY

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INTRODUCTION

Transient insomnia typically affects sleepers because of environmental conditions or stressful situations.[1] Such circumstances include travelling across time zones, having to sleep in strange environments and forced shift work. Patients hospitalized for diagnostic procedures or minor surgery frequently experience this form of insomnia. Short-acting hypnotics have been used in the management of insomnia, but may be associated with memory and motor impairment.[2-4]

METHODS

This double-blind, randomized, placebo-controlled trial was conducted at six Canadian sites. After Ethics Committee approval, patients hospitalized for minor surgery subjectively evaluated their sleep quantity and quality. Each patient received either zolpidem 10 mg, triazolam 0.25 mg, or placebo and was allowed to sleep for a maximum of 8 hours. Outcome measures to evaluate efficacy included a morning questionnaire addressing sleep induction, maintenance and duration, visual analogue scales evaluating sleepiness and ability to function and a sleep observation form for study personnel. All continuous variables were analyzed by ANOVA and pairwise comparisons were undertaken when significant overall treatment effects were observed.

RESULTS

Compared to the placebo group (n=118), in the zolpidem group (n=120) and the triazolam group (n=119), the following parameters were significantly different ($p<0.001$): sleep latency was shorter, total sleep time longer, patients fell asleep more easily, number of awakenings fewer. There were no differences between any groups in next-morning sleepiness or ability to concentrate. Both drugs were well tolerated, with adverse event incidence rates nearly identical to placebo.

DISCUSSION

In patients suffering from transient insomnia, a single night-time dose of zolpidem 10 mg improved sleep to a degree comparable to the short-acting benzodiazepine triazolam 0.25 mg and to a greater extent than placebo. Both drugs were well tolerated and did not produce any residual effects.

REFERENCES

1. JAMA 1984; 251: 2410-4.
2. Lancet 1991; 337: 827-31.
3. Sleep Res 1991; 20: 58.
4. Psychopharmacol 1992; 107: 83-8.

A

BLEEDING AND COAGULOPATHY ASSOCIATED WITH MAJOR SPINAL SURGERY

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Introduction: Blood loss associated with major spinal surgery can be greater than the patient's estimated blood volume. Although the exact mechanism is unknown, consumptive coagulopathy has been postulated. To determine the incidence and aetiology of the coagulopathy, we prospectively measured intraoperative coagulation profiles of 10 patients undergoing major (>2 levels) elective spinal decompression, instrumentation and fusion.

Method: After institutional approval, ten patients (ASA I, II) with no pre-existing coagulopathy and no preoperative drugs that interfered with coagulation were studied. A coagulation screen (PT, PTT, fibrinogen, D dimer, platelet count) was done hourly after induction of general anaesthesia. Assay of coagulation factors II, V, VII - XII were performed when an abnormality was detected in the coagulation screen. These were expressed as percentage of normal. Intravascular volume was maintained with colloid, crystalloid and appropriate blood products based on clinical judgement. Blood loss was estimated from suction drainage and sponges. No intraoperative salvaging of blood or antifibrinolytics were used. The patient's temperature was maintained with forced air warming and fluid warmers. All results were available to the attending anaesthetist.

Results: Five of the ten patients developed a coagulopathy (defined as PT > 40 seconds and PTT > 14 seconds) and in this group of patients, there was an average total blood loss of 8.14 ± 3.04 L. The duration of surgery was 7.25 ± 1.9 hrs. At the time of the abnormal coagulation, there had been 2.74 ± 0.91 L of blood loss and 4.6 ± 1.3 units of packed cells transfused. The average number of packed cells transfused prior to fresh frozen plasma (FFP) transfusion was 6.2 ± 2.9 units. Of the five who developed a coagulopathy, three developed a thrombocytopenia, (platelet count <100,000/mm^3). Factor assays measured before FFP infusion indicated a global decrease in all of the factors (see table).

There was no evidence of DIC (a combination of increase in PT, PTT, D dimers; decrease of platelets, fibrinogen; and decrease in Factor V, VIII levels compared with other clotting factors) in any patients.

The group who did not develop a coagulopathy had total blood loss of 2140 ± 981 ml and duration of surgery was 4.25 ± 0.9 hrs.

Factors	Factor levels - % normal	Range
II	45.5 ± 13.7	30 - 57
V	50.5 ± 17.1	30 - 70
VII	55.5 ± 14.8	39 - 69
VIII	78.8 ± 31.3	53 - 120
IX	68.5 ± 27.0	41 - 104
X	50.5 ± 20.6	31 - 74
XI	37.0 ± 9.0	30 - 50
XII	44.0 ± 10.2	33 - 84

Conclusion: The incidence of coagulopathy in this population is high (50% in our study). The coagulopathy which developed was consistent with dilution (global decrease in all coagulation factors, platelets and fibrinogen without elevation of D dimer) rather than consumption. Our findings indicate that dilutional coagulopathy in this group may occur earlier than previously recognised.

B

MIDAZOLAM INCREASES THE AFFINITY OF THE $GABA_A$ RECEPTOR FOR PROPOFOL

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INTRODUCTION

GABA is the major inhibitory neurotransmitter in the CNS and a variety of anaesthetics enhance $GABA_A$ receptor function. The general anaesthetic, propofol, has several effects on the $GABA_AR$; low concentrations potentiate GABA-activated currents whereas high concentrations directly activate the receptor[1]. In contrast, the benzodiazepine, midazolam, potentiates GABA-evoked responses but has no agonistic properties. Propofol and midazolam also synergisitically enhance hypnosis during the induction of anaesthesia[2]. This synergism may result from the interaction of propofol and midazolam on the $GABA_AR$. The purpose of this study was to determine if midazolam influences the ability of propofol to directly activate the $GABA_AR$.

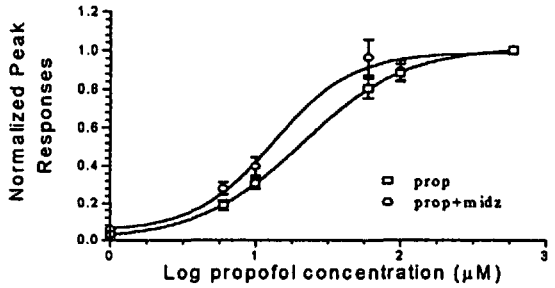
METHODS

$GABA_AR$-mediated Cl^- currents were recorded from cultured, embryonic mouse hippocampal neurons as previously described[1,3]. Whole-cell recording methods were used to examine the effects of midazolam on propofol-activated responses. Peak currents were measured using the pClamp program (Axon Instruments) and dose response curves were fit using a logistic equation.

RESULTS

Propofol induced an inward current in all cells, and midazolam enhanced the amplitude of the peak response to submaximal concentrations of propofol. The dose-response relations for the currents, recorded in the absence (□) or presence (○) of midazolam (0.5μM), are illustrated in Figure 1. Flumazenil (10μM) completely abolished the midazolam-induced potentiation. The EC_{50} and Hill coefficient for propofol and propofol+midazolam were 22.3 ± 4.3 μM and 15.9 ± 3.1μM and 1.26 ± 0.16 and 1.58 ± 0.29, respectively.

Figure 1 The effects of midazolam on propofol-mediated currents.



DISCUSSION

Recent evidence suggests that the agonist recognition site for GABA and propofol are distinct and associated with different $GABA_AR$ subunits. Furthermore, propofol's agonistic and potentiating effects are likely mediated through independent sites of action. Here we demonstrate that midazolam potentiates propofol's ability to directly activate the $GABA_AR$. This action may contribute to the clinically apparent synergistic interaction between these drugs.

REFERENCES 1. J. Neurosci. 14(12):7747-7760, 2. Br. J. Anaesth. 67:539-545, 3. J. Physiol. 432:483-508. 4. Soc. Neurosci. Abst. 1995:146.7. **ACKNOWLEDGMENTS** This work was supported by the IARS and MRC of Canada.

DOES NITRIC OXIDE REGULATE CORONARY METABOLIC DILATATION?

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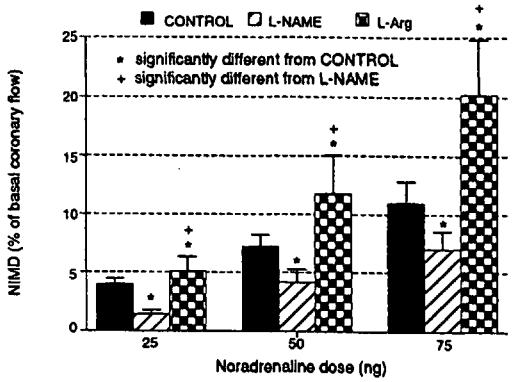
INTRODUCTION: Nitric oxide (NO) has been shown to play a key role in reactive hyperemia[1] and autoregulation[2]. The aim of this study was to observe if NO couples metabolic demand to coronary flow during a different coronary response: noradrenaline-induced metabolic dilatation (NIMD).

METHODS: Isovolumically, spontaneously-beating isolated rat hearts (n=12) were perfused at 60mmHg constant pressure (Langendorff technique) with modified Krebs-Henseleit solution. Coronary flow responses to 25, 50, and 75ng noradrenaline were measured under control conditions, after inhibiting endothelial NO production with 50μM Nω-nitro-L-Arginine methyl ester (L-NAME) and after administration of 1mM L-Arginine (L-Arg), a precursor of NO. Data are presented as mean ± SEM and were analyzed using ANOVA and Tukey's test. Differences were considered significant if $P<0.05$.

RESULTS: Bolus noradrenaline doses resulted in a dose-dependent increase in left ventricular pressure followed by an increase in coronary flow. After L-NAME, basal coronary flow was significantly ($p<0.0001$) reduced to 81 ± 2% of control and NIMD decreased to 57 ± 5% (see figure). L-NAME reduced peak flow during NIMD but did not alter duration of the response. L-Arg returned flow to control levels (100 ± 4%) and increased NIMD to 166 ± 13% of control. Peak flow and duration of NIMD were both increased by L-Arg.



DISCUSSION: The results of this study demonstrate that coronary flow regulation during NIMD is partially mediated by NO. With respect to control, L-Arg caused an increase in NIMD, but not in basal coronary flow. L-NAME however, generated a decrease in both. Thus, within the coronary circulation NO may play a significant role in basal flow regulation as well as coupling metabolic demand to coronary flow.

REFERENCES: 1. *Eur J Pharmacol* 1993;238:53-58.
2. *Circ Res* 1992;70:1296-1303.

A B

EFFECTS OF PEEP OR SURFACTANT ON ACUTE LUNG INJURY CAUSED BY TRACHEAL INSTILLATION OF ACIDIFIED HUMAN BREAST MILK

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INTRODUCTION

We have previously demonstrated acute lung injury after tracheal instillation of acidified human breast milk into rabbits[1]. Because this injury may be severe, a clinical treatment is required. Therefore, we studied the effects of positive end-expiratory pressure (PEEP) or surfactant on the severity of acute lung injury induced by tracheal instillation of acidified human breast milk (HBM) in a rabbit model.

METHODS

With animal care committee and institutional approval, 24 anaesthetized, tracheotomized and ventilated rabbits were studied. After stable ventilation to normocapnoea was achieved, all rabbits were given intratracheal HBM 0.8 ml/kg titrated to pH 1.8 with hydrochloric acid. Rabbits were assigned to one of four therapies: 1. Control; no additional treatment after instillation of HBM, 2. PEEP-pre; ventilated with 5 cmH_2O PEEP before and after HBM instillation, 3. PEEP-post; 5 cmH_2O PEEP started one hour after HBM, and 4. Surfactant; 100 mg/kg surfactant instilled into the trachea one hour after HBM. $AaDO_2$ (alveolar-arterial oxygen partial pressure difference) and dynamic lung compliance were measured pre-instillation and at 4 hours. Data were analyzed by ANOVA and Student-Newman-Keuls test. $p < 0.05$ was accepted as statistically significant.

RESULTS

$AaDO_2$ increased and dynamic compliance decreased in all four groups (Table). PEEP-pre produced the greatest change in $AaDO_2$ but maintained compliance better than all other groups. Data are expressed as mean ± SD.

Treatment	Δ $AaDO_2$ (mmHg)	Δ Compliance (ml/mmHg/kg)
Control	209 ± 93	0.68 ± 0.14
PEEP-pre	340 ± 60*	0.27 ± 0.08‡
PEEP-post	184 ± 126	0.81 ± 0.24
Surfactant	133 ± 73 †	0.34 ± 0.26§

Δ = change at 4 hours compared to pre-injury.
*p< 0.05 compared to all other groups, † p< 0.05 compared to control, ‡ p< 0.05 compared to control and PEEP-post, § p <0.05 compared to control and PEEP-pre.

DISCUSSION

Tracheal instillation of acidified HBM induces an acute functional lung injury that may be exacerbated if PEEP is already present. PEEP-post reduced the change in $AaDO_2$ but did not affect dynamic compliance compared to control. Surfactant may provide the best option for therapy in this scenario.

REFERENCES

1. CJA 42: A54, 1995

ACKNOWLEDGMENT

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PHENYLEPHRINE INCREASES CEREBRAL BLOOD FLOW DURING LOW-FLOW CARDIOPULMONARY BYPASS

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INTRODUCTION

Low-flow cardiopulmonary bypass (CPB) has become a preferred technique for the surgical repair of complex cardiac lesions in children.[1] By reducing pump flow to 20% of full flow, blood return to the surgical field is minimized, facilitating repair. However, the reduction in cerebral blood flow (CBF) during low-flow CPB has been implicated as an important etiological factor in the high incidence of neurological complications following pediatric cardiac surgery. This study determined if deliberate elevation of arterial pressure with phenylephrine (PE) during low-flow CPB would increase CBF.

METHODS

After institutional approval, seven baboons were studied. Anesthesia was induced with ketamine 10 mg/kg i.m. After tracheal intubation, ventilation was controlled and anesthesia maintained with fentanyl 50-100 µg/kg, midazolam .2 mg/kg and isoflurane .25% end-tidal concentration. Femoral arterial and venous catheters were inserted. EKG, blood pressure, esophageal temperature, end-tidal CO_2 and isoflurane concentration were continuously recorded. Vecuronium was administered for neuromuscular block. After sternotomy, a 24 gauge catheter was inserted into the right common carotid artery and the ipsilateral external carotid occluded. Aortic and atrial cannulae were inserted and CPB initiated after heparinization. Baboons were cooled at a flow of 2.5 L/min/m^2 (full-flow) until esophageal temperature was 20°C. CPB was then reduced to 0.5 L/min/m^2 (low-flow). During low-flow CPB, PE was infused to double arterial pressure. CBF was measured before bypass, during low-flow CPB with and without PE and after rewarming. For each determination 700 µCi of ^{133}Xe in 0.8 ml saline was injected into the common carotid artery and flushed with 2 ml of saline. Single collimators detected radioactive washout with a Novo Cerebrograph 10a and CBF was determined by the initial slope corrected for Hct and temperature.[2] CBF values were compared by repeated measures ANOVA. $P < 0.05$ was significant.

RESULTS

Values for CBF are shown in the table. Low-flow CPB resulted in a 50% decrease in CBF compared to pre-CPB. PE to increase blood pressure from 23±3 to 46±3 mm Hg during low flow increased CBF from 14±3 to 31±9 ml/min/100g.

DISCUSSION

PE for deliberate elevation of arterial blood pressure markedly increased CBF during low-flow CPB. In clinical practice, PE infusion during CPB may reduce the risk of ischemic neurologic injury while preserving the surgical advantages of low-flow CPB.

REFERENCES: 1. *N Engl J Med* 1995; **332**:549-55
2. *Anesthesiology* 1994; **81**:959-64

	Pre-CPB	Full Flow	Low Flow	PE Low Flow	Rewarm Full Flow
CBF (mL /min /100 g)	27 ±7	50 ±17	14 ±3	31 ±9*	46 ±10
MABP (mm Hg)	67 ±10	49 ±15	23 ±3	46 ±3	71 ±17
Temp (°C)	35.3 ±1.2	35.5 ±1.2	20.2 ±1.2	20.5 ±1.1	36 ±1
pCO_2 (mm Hg)	31 ±6	33 ±5	34 ±3	34 ±8	31 ±5
Hematocrit (%)	33 ±4	18 ±5	18 ±5	18 ±5	18 ±5

n = 7, *$P < 0.05$ compared to Low Flow (mean ± SD)

ACUTE LUNG INJURY AFTER TRACHEAL INSTILLATION OF ACIDIFIED SOYA MILK, INFANT FORMULA OR HUMAN BREAST MILK

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INTRODUCTION

Gastric fluid characteristics and the risk and severity of lung injury have been used to develop preoperative fasting guidelines. However the severity of the lung injury may depend on the type of milk product aspirated, as well as the volume and pH[1]. The aim of this study was to determine whether tracheal instillation of different milk products affect the severity of acute lung injury.

METHODS

With animal care committee and institutional approval, 18 anaesthetized, tracheotomized and ventilated rabbits were studied. After stable ventilation to normocapnoea was achieved, the severity of acute lung injury after the intra-tracheal instillation of soya milk (Prosebee®), formula (Enfalac®) or human breast milk (HBM) was assessed using alveolar-arterial oxygen partial pressure difference ($AaDO_2$) and dynamic compliance. All milk products were titrated to pH 1.8 and a volume of 0.8 ml/kg was instilled. $AaDO_2$ and dynamic compliance were measured pre-instillation and at 4 hours post-instillation. Histopathology of the lungs was assessed by a pathologist who was blinded to the treatments. Data were analyzed using ANOVA and the Student-Newman-Keuls test. $p < 0.05$ was accepted as significant.

RESULTS

$AaDO_2$ increased and dynamic compliance decreased in all groups (Table). The severity of injury in the soya milk group was less than in the other two groups. Inflammatory cells were present in rabbit lungs in all groups. Data are expressed as mean ± SD.

Treatment group	Δ AaDO2 (mmHg)	Δ Compliance (ml/mmHg/kg)
Soya milk	157 ± 66*	0.32 ± 0.14†
Formula	308 ± 117	0.63 ± 0.24
HBM	209 ± 93	0.68 ± 0.12

Δ = Change at 4 hours compared to pre-injury.
* $p < 0.05$ compared to formula, † $p < 0.05$ compared to formula and HBM

DISCUSSION

The severity of acute lung injury after instillation of acidified soya milk was less than that induced by either formula or HBM as shown by change in $AaDO_2$ and dynamic compliance. It is unclear why soya milk produces a less severe lung injury, but it may be the preferable feed for infants where there is a potential for aspiration.

REFERENCES
1. CJA 42:A54, 1995

ACKNOWLEDGMENT
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TESTING THE RATERS: Inter-Rater Reliability During Observation Of Simulator Performance

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INTRODUCTION

Assessment of physician performance has been a highly subjective process. The anaesthesia simulator could be used for a more objective evaluation but its reliability for this purpose is unknown. We sought to determine whether observers witnessing the same event in an anaesthesia simulator would agree on their rating of anaesthetist performance (inter-rater reliability).

METHODS

The study had the approval of the research ethics board. Two one-hour clinical scenarios were developed each containing 5 anaesthetic problems. For each individual problem, a rating scale defined the appropriate score (no response to the situation: score=0; compensating intervention: score=1; corrective treatment: score=2). Video tape recordings for assessment of inter-rater reliability were generated through role-playing and recording of the two scenarios each three times. Thus each of the three possible scores for each problem were created (i.e. 2 scenarios x 5 problems x 3 scores = 30 data points). Two clinical anaesthetists reviewed and scored each problem independently. Both raters were uninvolved in the development of the study and the clinical scenarios, but had received training in the scenario content and scoring system. Each reviewed the 30 problems and did not communicate with each other about the study. The scores produced by the 2 observers were compared using the kappa statistic of agreement and a $K>0.75$ was considered excellent inter-rater reliability.

RESULTS

Each rater scored a total of 30 variations. Scoring by the observers of the scenarios is presented in table I. There was excellent inter-rater reliability ($K=0.96$, $P<0.001$).

Table I

Scoring of Observer 1

	Problem 1	Problem 2	Problem 3	Problem 4	Problem 5
Scen 1 Var 1	2	0	1	2	1
Scen 1 Var 2	0	2	2	1	0
Scen 1 Var 3	1	1	0	0	2
Scen 2 Var 1	0	2	0	2	1
Scen 2 Var 2	1	1	1	0	0
Scen 2 Var 3	2	0	2	1	2

Scoring of Observer 2

	Problem 1	Problem 2	Problem 3	Problem 4	Problem 5
Scen 1 Var 1	2	0	1	2	1
Scen 1 Var 2	1	2	2	1	0
Scen 1 Var 3	1	1	0	0	2
Scen 2 Var 1	0	2	0	2	1
Scen 2 Var 2	1	1	1	0	0
Scen 2 Var 3	2	0	2	1	2

Scen=Scenario Var=Variation

DISCUSSION

The use of videotapes allowed the scenarios to be tested by reproducing the same simulations exactly for each observer. There was excellent inter-rater agreement within the confines of the study. Rating of video recordings of anaesthetist performance in a simulation setting can be used for scoring of performance. The validity of the scenarios and the scoring system have yet to be determined.

This study was supported with a grant from the physicians of Ontario through the PSI foundation.

BREATHING PATTERN DURING MAXIMAL UNIMPEDED HYPERVENTILATION IN NORMAL SUBJECTS

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Introduction: Breathing strategies adopted by hyperventilating patients to defend against respiratory failure due to muscle fatigue are not well understood. Previous models induced respiratory muscle fatigue by adding resistive loads or arbitrarily specifying minute ventilation ($\dot{V}$), tidal volume (V_T), and/or respiratory frequency (f). To simulate more closely the endurance fatigue seen clinically, we asked normal subjects to sustain their maximum $\dot{V}$ without specifying the pattern of ventilation.

Methods: Nine untrained subjects aged 20-30 years hyperventilated for 22 min through a low resistance circuit designed to maintain a constant $P_{ET}CO_2$. Every 3 minutes we tested their maximum inspiratory pressure (PImax) and assessed breathing effort by asking the subjects to increase maximally their $\dot{V}$ ("sprint"). Data were averaged for 10 breaths in the first minute and at 3 and 21 min. Data were analyzed using ANOVA and Dunnett's test.

Results: Each subject's $\dot{V}$ in the minute preceding each "sprint" was 101 ± 3.1% [SE] of that following it, indicating sustained maximal effort. Clinically, all subjects developed abdominal paradox[1]. There was a progressive decrease in V_T, end inspiratory transdiaphragmatic pressure (Pdi), and tension time index (TTdi)[2] but not f (PImax) (See Table, mean ±SD). At 3 min, 4 subjects reached threshold value[3] f/V_T of >100. By 21 min, all but 1 did.

	1 min	3 min	21 min
$\dot{V}$ (%)†		78.3 ±11.3	71.6 ±8.3*
V_T, L (%)†	1.29 ±0.5	1.14 ±0.6 (86.9 ±20.5)	0.88 ±0.5* (70.0 ±21.8)
f, breaths/min	98 ±35	88 ±32	103 ± 21
f/V_T, breaths/min/L	93.9 ±58	102.4 ±70	142.0 ±58
Pdi, cm H_2O (%)†	57.6 ±25.8	45.1 ±13.6 (83.1 ±17.3)	34.6 ±11.5* (66.0 ±28.5)
TTdi (%)†	0.178 ±0.05	0.138 ±0.04* (80.6 ±20.2)	0.102 ±0.04* (59.7 ±22.0)
PImax, cm H_2O	-106.6 ±25.9	-101.3 ±14.9	-92.9 ±23.8

† % of 1 min value; *significantly different from 1 min ($P<0.05$)

Discussion: Our data show that with maximum breathing effort, even without inspiratory loads,[4] there is progressive abdominal paradox and inspiratory fatigue. Decreases in $\dot{V}$ reflected the decrease in V_T as f was sustained. Our data support the clinical observation that f/V_T >100 is a more sensitive bedside indicator of respiratory fatiguing process than V_T, f alone or PImax.

References: [1] Am J Med 1989; 308-316. [2] J Appl Physiol 1982; 53: 1190-1195. [3] Am Rev Respir Dis 1986;134:1111. [4] J Appl Physiol 1987; 63: 851-860.

A

PENTANE AND ETHANE: NON-INVASIVE MARKERS OF OXYGEN FREE RADICAL INDUCED LIPID PEROXIDATION DURING CARDIOPULMONARY BYPASS

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Introduction: Reperfusion injury following cardiopulmonary bypass (CPB) may produce significant organ dysfunction. This injury may be due to increased production of oxygen free radicals both in the coronary and systemic circulation during CPB. Pentane and ethane are volatile endogenously produced hydrocarbons which are validated, sensitive markers of oxygen free radical induced lipid peroxidation.[1] Although pentane and ethane have been measured in exhaled gas of humans and animals, there are no studies of pentane and ethane production during CPB, when ventilation ceases. The purpose of this study was to develop a technique to measure and quantify pentane and ethane production during CPB.

Methods: Ethics approval and informed consent were obtained from eight patients scheduled for elective cardiac surgery. Patients were anaesthetized with a moderate dose narcotic and benzodiazepine technique. CPB was instituted using a membrane oxygenator (Cobe CML Excel), and systemic flows were maintained > 2.2 $l/m^2/min$ throughout CPB. To determine the production of pentane and ethane during CPB, two separate 5 minute collections of exhaust gas from the membrane oxygenator were taken. The first collection began 10 minutes before aortic crossclamp (XC) removal, and the second collection began 30 seconds after XC release. Gas was collected into 2.8 L tedlar bags using a calibrated pump. Pentane and ethane were analyzed using gas chromatography with a flame ionization detector. At the midpoint of each gas collection, blood samples were obtained to measure malonyldialdehyde (MDA) and lipid peroxide (LPO), two other markers of lipid peroxidation. Data were analyzed using t-tests or Wilcoxon tests, and reported as mean ± SEM.

Results: Demographic data are shown in Table 1. Pentane and ethane were detected in all patients during CPB (Table 2). Normal values for this lab are: pentane 5.5±0.9 pmol/kg/min; ethane 11.2±0.9 pmol/kg/min; LPO 4.2±0.4 nmol/ml. Release of the aortic crossclamp and myocardial reperfusion resulted in higher levels of pentane in 6/8 patients and ethane in 5/6 patients, but these differences were not statistically significant.

Table 1

Age (years)	Male/Female	ACB/valve	CPB time (min)	XC time (min)
67 ± 2	5/3	7/2	70 ± 7	45 ± 5

Table 2

	Pentane (pmol/kg/min)	Ethane (pmol/kg/min)	LPO (nmol/ml)
Pre XC removal	7.4 ± 2.6	23.9 ± 15.1 *	9.1 ± 1.9 *
Post XC removal	15.5 ± 6.3 *	42.1 ± 20.1 *	5.9 ± 0.5 *

* $P<0.05$ vs. normal controls. N = 8 for pentane, N = 6 for ethane and LPO

Conclusions: We have developed a system for measuring pentane and ethane production during CPB. The levels of pentane and ethane detected are indicative of free radical damage and lipid peroxidation. Measurement of pentane and ethane production may be a simple, sensitive, non-invasive technique to determine the effect of interventions to reduce lipid peroxidation and oxygen free radical damage during cardiac surgery.

Reference: 1. Free Radic Biol Med 17:127,1994.

B

RANDOMISED CONTROLLED TRIAL OF EMLA®PATCH FOR REDUCTION OF PAIN ASSOCIATED WITH INTRAVENOUS CANNULATION IN ADULT SURGICAL OUTPATIENTS.

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INTRODUCTION

We studied: 1)the effectiveness of Eutectic Mixture of Local Anaesthetics (EMLA®)Patch for reduction of pain of intravenous cannulation for adult outpatient anaesthesia; 2) the efficacy of EMLA®patch in preventing vaso-vagal side effects; 3) the patient willingness to pay for it.

METHODS

This randomized, double-blind, placebo-controlled, parallel-group trial involved 50 consented ASA I, II or III Adult surgical outpatients, who were randomized to receive either EMLA® or placebo patch applied to the dorsum of the hand (intravenous canula site) for >60 <90 minutes. Following intravenous canula insertion, the patient rated the pain using a 100 mm VAS ruler. The blood pressure and the incidence and severity of vaso-vagal response were obtained. Pain and local skin reactions were evaluated by the investigator.

RESULTS

A statistically significant difference was found (P<0.01 for the patient, and P<0.05 for the investigator) in the assessment of pain immediately after insertion of the intravenous canula. The mean difference between treatment groups was 18.2mm with the lower pain scores for the EMLA®patch group. The mean application time for EMLA®patch was 66.8 min.There were notable differences in the number of vaso-vagal reactions (17 placebo vs 4 EMLA®). 88% of EMLA®patch patients were willing to pay for the patch in the future.

DISCUSSION

While EMLA cream is considered to be an effective analgesic for intravenous cannulation,the EMLA®patch is convenient to use and equally effective in children.This study demonstrates that the EMLA®patch, applied for 60-90 minutes on the dorsum of the hand, had a significant effect on reducing the pain of intravenous cannulation in adult outpatients and was convenient to use and well accepted.

REFERENCES

Acta Anaesthesoil Scand 1987;31:735-739.
Anesth Analg 1993;76:931-5.
CAN J ANAESTH 1994/41:1/pp59-63.

PATIENT ATTITUDES REGARDING PCA AND ASSOCIATED COSTS

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Introduction: Many treatment modalities are undergoing cost-effectiveness analyses. Patients however are not involved with this process. Our acute pain service maintains a quality assurance (QA) program to evaluate our care through the use of patient questionnaires. We recently modified our questionnaire to determine our patients' knowledge and attitudes towards PCA costs.

Methods: Patients receiving PCA at our institution have orders written by their attending anaesthetist and treatment initiated in the PACU. PCA therapy consists of morphine 1-2 mg, fentanyl 10-20 μg or demerol 10-20 mg with lockout intervals of 5-10 minutes. Basal infusions are not routinely utilized. Our pharmacy uses a syringe batch filler to prepare 100 syringes at a time. Patients are then followed twice daily by the acute pain service. We have estimated that the average total cost of this service is approximately $125/patient. QA questionnaires are distributed to all patients receiving PCA narcotics for more than 12 hours. Patients are asked to note the presence [yes/no(y/n)] of side effects (nausea/vomiting, pruritus, urinary retention), to indicate their satisfaction (sat) with regards to their PCA pain relief, their treatment of side effects, and to note the form of previous pain relief and their satisfaction with it. Patients are also asked to estimate the total cost of PCA, whether, if necessary, they would pay the cost, and what amount they would be willing to pay. Following IRB approval we reviewed the results obtained over a recent four month period. Chi-square analysis was used to compare responses.

Results: 133 QA questionnaires were distributed and 103 (77%) were returned. Cost estimates and the amount willing to be paid are shown in Table 1. A comparison of responses from those willing to pay and those not is shown in Table 2.

Table 1

	<$50	$50-100	$100-200	>$200
cost estimate n = 81	0	10	37	53
will pay n = 47	13	32	47	8

values are % of responders

Table 2

	PAY	NOT PAY
nausea/vomiting	23:29	16:19
pruritus	20:32	18:17
urinary retention	12:40	8:27
PCA pain relief sat	52:0	31:3*
side effect Tx sat	36:0	23:5*
previous pain relief sat	29:9	23:5
form previous relief (PCA:IM:don't know)	16:20:6	8:15:5

Number of patients responding (y:n). * p < 0.05

Discussion: Patients are aware of the costs involved with PCA therapy and a majority of these patients are willing to pay to obtain this service if necessary. Those not willing to pay are more likely to have had poorer pain relief and less efficacious treatment of their side effects.

THE ADDITION OF MORPHINE TO INTRA-ARTICULAR BUPIVACAINE DOES NOT IMPROVE OUTCOME FOLLOWING KNEE JOINT REPLACEMENT

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Introduction: We have recently shown that an intra-articular injection of bupivacaine improves range of motion (ROM) and decreases narcotic requirements when given following knee arthroplasty,[1] similar to that following knee arthroscopy.[2] The discovery of intra-articular narcotic receptors has led to additional improvement following knee arthroscopy when small amounts of morphine are added to the intra-articular bupivacaine injection.[3] To our knowledge this has not been investigated in patients undergoing knee joint replacement.

Methods: Following IRB approval and written informed consent 75 patients undergoing elective knee joint replacement were studied. Patients were excluded for: age > 75, weight > 110 kg., psychiatric history or alcohol or narcotic dependence. Patients were randomly assigned into 3 groups to receive in double-blind fashion an intra-articular injection of 31 ml made up of either: 30 ml of 0.5% bupivacaine with 1:200,000 epinephrine and 1 ml normal saline (N/S) (group BUP), 30 ml 0.5% bupivacaine with 1:200,000 epinephrine and 1 mg (1 ml) preservative-free morphine (group BUP-MORPH), or 30 ml N/S with 1:200,000 epinephrine and 1 mg preservative-free morphine (group MORPH) following wound closure and prior to tourniquet release. In addition, the wound drain was clamped for 30 min. after insertion. Postoperatively, patients received morphine 2-4 mg IV q5min prn in PACU until comfortable and then PCA morphine in a dose of 1 mg with a 6 minute lockout and no basal infusion on the ward. Assessments of pain intensity using a visual analog scale (VAS:0=no pain to 10=worst pain possible) and verbal rating scale (VRS: none, mild, moderate, severe, very severe) were made 1, 2, 4 and 24 hours following arrival in the PACU. Determination of side effects including nausea, vomiting, pruritus or urinary retention were made at the same times. ROM of the operative knee was made preoperatively and at hospital discharge. The number of hospital days before discharge was also noted. Statistical analysis included ANOVA for parametric data and chi-square and Kruskal-Wallis analysis for nonparametric data.

Results: There were no significant differences between the three groups in terms of demographic data, duration of anesthesia, or intraoperative narcotic use. The VAS scores and morphine requirements are shown in the table. There was a trend to a smaller fall in ROM in the BUP-MORPH group when compared with the BUP and MORPH groups (20±21 vs 28±13 and 30±18, p=0.12) and number of hospital days (8.2±2.0 vs 8.4±2.1 and 9.7±4.0, p=0.13). There was also no difference in side effects incidence or VRS scores amongst the groups.

VAS	BUP-MORPH	BUP	MORPH
1 hr	58 ± 20	68 ± 29	60 ± 19
2 hr	58 ± 19	58 ± 27	51 ± 20
4 hr	63 ± 23	64 ± 22	55 ± 20
24 hr	53 ± 24	55 ± 21	45 ± 19
MORPHINE (MG)			
0-1 hr	8.2 ± 5.2	9.6 ± 5.6	8.2 ± 5.5
1-2 hr	3.8 ± 2.8	4.9 ± 2.5	4.7 ± 2.6
2-4 hr	6.7 ± 4.2	7.5 ± 4.6	6.0 ± 3.5
4-8 hr	9.2 ± 6.2	11.9 ± 8.6	9.3 ± 6.1
8-24 hr	31 ± 17	35 ± 23	26 ± 12

values are means ± SD. NS differences

Discussion: The addition of morphine to an intra-articular injection of bupivacaine did not improve analgesia, decrease postoperative narcotic requirements, improve ROM or decrease hospital stay following elective knee joint replacement.

References: 1. J Bone Joint Surg (in press), 1996. 2. Anesth Analg 73:536-9, 1991. 3. Anesthesiology 79:475-80, 1993.

A

PATIENT CONTROLLED ANALGESIA IN THE ELDERLY SURGICAL POPULATION

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INTRODUCTION: The objective of this study was to determine the incidence of complications associated with patient controlled analgesia (PCA) in an elderly surgical population.

METHODS: A prospective study was conducted in which patients over 70 years of age receiving PCA were followed for up to 48 hours post operatively. Our PCA practice consists of primary assessment of the patient by an FRCPC anaesthetist and teaching by a specialized pain management nurse. Patient controlled analgesia consisted of morphine 1 mg intravenous bolus and a 7 minute lockout interval. The complications specifically noted were respiratory depression (respiratory rate <8), confusion/hallucinations, nausea (requiring treatment), vomiting, headache, fever, pruritis, urinary retention (requiring catheterization at discontinuation of PCA), new onset aggressive behaviour, and temperature (>38 C). The duration of PCA and the total dose of morphine was also noted.

RESULTS: The descriptive data of 135 patients are as follows.

Age Range	No.	Age (yr)*	Dose (mg)*	Duration (hr)*
70-79	98	74.1 ± 2.7	56.6 ± 43.8	36.4 ± 10.3
≥80	37	83.5 ± 2.8	41.9 ± 24.2	32.2 ± 12.7

*= mean ± Standard Deviation

Incidence of Complications

	Pt Age 70-79		Pt Age ≥80	
	Day1	Day 2	Day 1	Day 2
Respiratory Depression	0	0	2	0
Confusion	4	2	2	0
Nausea	13	2	6	0
Vomiting	10	2	3	0
Headache	0	0	1	0
Pruritis	0	0	0	0
Urinary retention	0	0	1	0
Aggressive behaviour	0	0	0	0
Temperature >38 C	34	32	8	0

DISCUSSION: Morphine requirements decreased with age. The complication rate was acceptable. We conclude that advanced age alone should not contraindicate PCA.

B

PATIENT CONTROLLED ANALGESIA (PCA) IN POST-OPERATIVE CARDIAC SURGERY

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INTRODUCTION

The purpose of the study is to assess the feasibility and efficacy of patient controlled analgesia (PCA) versus conventional narcotics in the early post-operative period after cardiac surgery.

METHODS

Patients undergoing first coronary bypass and/or valvular surgery are recruited. Age < 75 and in stable angina. Visual analogue score (VAS) is used for pain assessment and pulmonary function tests are compared with pre-operative values, both measured every 6 hours after surgery.

RESULTS

Preliminary data show comparable patient populations in the control and PCA groups for age, left ventricular ejection fractions and pre-op FEV_1. Quality of pain control, pulmonary function tests in both groups are not statistically differentin the early post-operative period ($p > 0.05$). The equi-potent morphine dosage requirement is higher in the PCA group at 6 hours, but not statistically significant afterwards.

Time in Hours	6	24	48
Visual Analog Scale of Pain (Range: 1 to 10)			
Control	2.4 ± 2.3	2.8 ± 2.8	1.4 ± 1.5
PCA	2.3 ± 2.6	2.0 ± 2.8	1.1 ± 2.0
FEV1 (litres/sec)			
Control	0.8 ± 0.3	1.1 ± 0.4	0.9 ± 0.3
PCA	0.9 ± 0.3	1.0 ± 0.4	1.2 ± 0.4
Morphine Equivalency Dosage (mg) in 6 hour intervals			
Control	6.7 ± 5.1	4.7 ± 5.9	0.9 ± 2.5
PCA	11.0 ± 8.1*	7.0 ± 7.9	1.2 ± 3.6

* Denotes statistically different from control ($p<0.05$)

DISCUSSION

There is no clear advantage in using PCA in the early post-operative period after cardiac surgery in terms of quality of pain control and pulmonary function tests. Repetition of instructions for PCA are often required post-operatively, necessitated by problems such as suboptimal learning due to pre-op anxiety and the effects of prolonged general anaesthesia, etc.

REFERENCES:

Searle et al. Can J Anaesth, 41: 198-205, 1994.

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A

LA CLONIDINE AUGMENTE T-ELLE LA DUREE DE L'ANALGESIE DANS LES BLOCS PLEXIQUES.

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INTRODUCTION :

La Clonidine. est un Agoniste alpha 2 adrénergique. ELle possède une action sédative, analgésique et hypotensive (1). Elle peut avoir une action par potentialisation de l'action inhibitrice du potentiel d'action induite par les anesthésiques locaux au niveau de la fibre C (2). Le but de cette étude est dévaluer l'intérêt de l'adjonction de la Clonidine à de la Marcaïne 0, 5 % et à la Lidocaïne 2 %, sur la qualité et la durée de l'analgésie dans les blocs plexiques.

METHODES :

Après approbation du Comité d'Ethique de notre Etablissement et obtention du consentement éclairé du patient, 120 patients qui avaient bénéficié d'une chirurgie des membres supérieurs, on été sélectionnés et répartis de façon randomisée en deux groupes de 60 chacun. le groupe I reçoit une association de Lidocaïne 2 % (2 mg/kg) et Marcaïne 0, 5 % (2 mg/kg). Le groupe II reçoit la même association d'anesthésiques locaux avec en plus 100 gamma de Clonidine. Les deux groupes n'ont pas de différence en ce qui concerne le type de chirurgie, l'âge, le sexe, le poids et la taille. La technique de bloc plexique utilisée est la technique de WINNIE BASSE. En post opératoire, dans les 48 premières heures, une évaluation horaire de l'analgésie est effectuée à l'aide d'une échelle visuelle analogique (VAS) par des infirmières ignorant la nature du mélange anesthésique. L'analgésie est jugée inefficace si le score du VAS est supérieur à 5. Une analyse de variance et un test t de student a été utilisé pour la comparaison de la durée de l'analgésie qui est exprimée en heure, avec une différence considérée comme significative si p inférieur à 0, 05.

RESULTATS :

L'analgésie est satisfaisante et il n'y a pas de différence dans les deux groupes lors de la réalisation de l'acte chirurgical. En post opératoire, il n'existe pas non plus de différence au niveau de la durée et de la qualité de l'analgésie entre le groupe I (9 + 2 heures) et le groupe II (10, 3 + 2 heures). La consommation d'antalgique est également identique.

DISCUSSION :

Le résultat de notre étude montre que l'adjonction de la clonidine ne prolonge pas la durée de l'analgésie dans les blocs plexiques. Son mécanisme d'action au niveau des nerfs périphériques reste encore mal élucidée, ce qui explique l'inconstance de son effet dans cette technique d'anesthésie.

REFERENCES :

Scheinin M, Sehwin DA : The locus Coerulus : Site of hypnotic action of alpha 2 adrénoreceptor agonist. Anesthesiology, 1992, 76, 873 - 875.
Gaumann D, Breunet P, Jirounek P : Clonidine enhances the effects of lidocaïne on C. fiber action potential. Anesthesia analgesia 1992, 74, 719-725

B

SUPRASCAPULAR NERVE BLOCK FOR PAIN RELIEF AFTER ARTHROSCOPIC SHOULDER SURGERY. IS IT EFFECTIVE?

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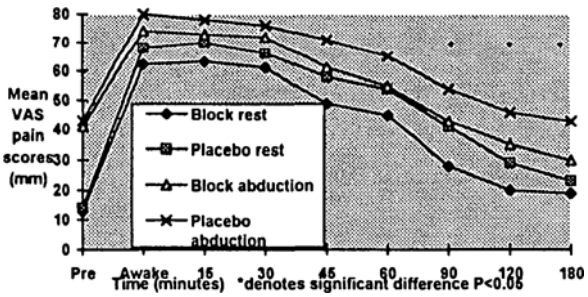
INTRODUCTION: Arthroscopic shoulder surgery is one of the most painful types of day surgical procedure (1). The aim of this study was to determine the efficacy of suprascapular nerve block (SNB) for pain relief after arthroscopic shoulder surgery.
METHOD: After institutional approval, prospective, arthroscopic shoulder surgery patients were studied in a double blind manner to receive, randomly, subcutaneous saline or a SNB before receiving a standard general anaesthetic. The SNB was performed with nerve stimulation and 10ml of 0.5% bupivicaine with 1 in 200,000 epinephrine. Postoperatively, pain was assessed by demand and consumption of morphine using a patient controlled analgesic system; visual analogue scale (VAS) for pain at rest and abduction at regular intervals; and with a standard 24 hour interview. Nausea; demographic; medical; anaesthetic and surgical data were also obtained. Student's t-test and Chi square test were used when appropriate. P<0.05 was considered statistically significant.
RESULTS: 40 patients, 20 in each group were studied. There was no difference in demographic, medical, anaesthetic and surgical data with no complications. The results are shown in the table and graph.

Table

Data	Placebo	Suprascapular nerve block
PCA demand (no)	31±20 *	18±19
Morphine use (mg)	11±5	9±4
Nausea (%)		
Hospital	40 *	0
24 hour interview	35 *	0
Total hospital recovery time (min)	248±77 *	202±57
Pain 24 hour interview(%)	0 mil.mod.sev.	0 mil. mod.sev.
Rest	5 60 30 5	25 60 15 0
Abduction	0 5 65 30*	0 30 35 35

Values are mean ±S.D. *Denotes significant difference P<0.05

Graph. VAS pain scores after suprascapular nerve block.



DISCUSSION: SNB provides a reduction in analgesic demand; reduces discharge time and incidence of nausea; reduces pain scores after 90, 120 and 180 min at rest and on shoulder abduction; and reduces pain at 24 hours on shoulder abduction. SNB is effective and safe for postoperative pain relief in arthroscopic shoulder surgery.
REFERENCES: 1. Anesthesiology. Vol 83 (3A):A46, 1995.
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A

INTRATHECAL MORPHINE: INFLUENCE ON RECOVERY OF CARDIAC SURGICAL PATIENTS

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INTRODUCTION: Preoperative intrathecal (IT) morphine has been shown to provide superior analgesia after coronary artery bypass graft (CABG) surgery[1]. While the benefits of neuraxial opioids on postop outcome are well documented for other procedures[2], this issue has not been addressed in cardiac surgical patients. We compared two groups of CABG patients to determine if postop recovery profile was influenced by the use of preop IT opioids.
METHODS: With approval of the ethics committee, charts for all patients at our institution given preoperative IT morphine for elective CABG surgery between Mar-Oct 1994 were retrospectively reviewed. Charts for matched elective CABG surgery patients who were also eligible for, but did not receive IT morphine purely by anaesthetist preference, were also reviewed. Criteria for inclusion of matched cases included absence of heparinization, morphine allergy or blood dyscrasias. All patients with periop conditions felt to adversely influence recovery were excluded (i.e., redo-CABG, ejection fraction <.4, periop takeback for rebleeding or insertion of intraop balloon pump). Data collected included demographics, periop events and doses of sedatives and analgesics. Recovery profile was assessed by time to extubation, first analgesia, ICU and hospital discharge, incidence of shivering, and time to sips, eating, sitting in chair and ambulation. Analgesic doses were reduced to equivalency for comparison, using accepted values. Data were compared using t-test and chi-squared analysis.
RESULTS: Demographic data were comparable for the IT morphine (n=28) and matched (n=30) groups including age, preop medications, coexisting disease, incidence of previous myocardial infarction, and number of coronary vessels diseased. No complications were reported with spinal injections (av. 1.4mg IT morphine). Duration of bypass, aortic cross clamping, and doses of benzodiazepines were similar, however intraop and day 1 doses of opioids were significantly reduced in the IT group. Analgesic doses for days 2-5 postop were similar. The IT group had a similar incidence, but required less meperidine for shivering (8.9+/- 18.3 vs. 20.8 +/- 30.9 mg, p<.03). Time to solids was earlier in the IT group (50 +/- 28 hrs vs. 78 +/- 35 hrs, p<.002), but time to sips, up in chair, walking, extubation, first analgesia, ICU and hospital discharge were equivalent.
DISCUSSION: We observed earlier recovery of gastrointestinal function, and reduced requirements for treatment of postop shivering, in patients receiving IT morphine versus parenteral narcotics. Early recovery from postoperative ileus with neuraxial vs. parenteral opioids has already been demonstrated in non cardiac surgery, presumably through reduced opioid effects on colonic motility[2]. The influence of IT morphine on the severity of postop shivering may be related to the avoidance of intraop high dose narcotics, and associated muscle rigidity. Our preliminary study therefore suggests a beneficial effect of preop IT morphine on recovery in CABG surgery patients.
REFERENCES: 1. Br J Anaesth 1988;60:639-644
2. Anesthesiology 1995;82:1474-1506

B

DOES PATIENT AGE INFLUENCE THE EASE OF ACCOMPLISHING SPINAL ANAESTHESIA?

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INTRODUCTION A common clinical perception among anaesthetists is that spinal anaesthesia is more difficult to perform in the elderly. We analyzed our practise to determine the validity of this perception.
METHODS All spinal anaesthetics administered by 18 FRCPC certified anaesthetists, with assistance from an anaesthesia technician, were recorded. Anaesthetics for hip fracture repair and C-section were specifically excluded. The age, height, weight, and sex of each patient was recorded. Multiple variables describing the performance of spinal anaesthesia were recorded including time to complete the technique, number of needle insertions, number of spinal needles used, patient position, number of interspaces tried, gauge of needle, approach taken to the dura, spinal needle manufacturer, length of spinal needle, paraesthesias or bloody CSF obtained, and success of the spinal anaesthetic. All data were recorded by the anaesthesia technician. For the purpose of this abstract, the anaesthetists were divided into three groups (n=6) based upon the frequency of prolonged attempts ($\geq$6 min) at spinal anaesthesia. The patients were divided into three groups as well- Group 1: patients under 50 years of age, Group 2: patients 50 to 69 years of age, and Group 3: patients over 70 years. Descriptive statistics, chi-square test, and multiple linear regression analysis were performed.
RESULTS Three hundred and eighty spinal anaesthetics were analyzed. Age of the patient did not influence the time taken to perform spinal anaesthesia in any of the anaesthetist groups. (p=.31)
CONCLUSION Spinal anaesthesia is not more difficult to perform in the elderly.

Anaesthesist Group	n	Percentage of Attempts $\geq$ 6 min (Mean $\pm$ Standard Deviation)
Fast	87	9.37 $\pm$ 5.05
Moderate	164	17.76 $\pm$ 1.51
Slow	129	40.25 $\pm$ 14.25

AGE	n	SUCCESSFUL SPINAL	FREQUENCY PARESTHESIA	BLOODY CSF
<50	127	94%	10%	6%
50-69	125	95%	6%	9%
>70	128	97%	4%	7%

A COMPARISON OF THREE NEEDLES IN SPINAL ANAESTHESIA WITH GLUCOSE-FREE 2% LIDOCAINE

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INTRODUCTION
Spinal anaesthesia is used commonly to produce analgesia for surgery below the umbilicus. New spinal needles designs are a factor for the increased popularity of spinal anaesthesia in recent years. A negative aspect of a spinal anaesthesia being however, transient neurologic toxicity after hyperbaric sub-arachnoid anaesthesia with 5% lidocaine

METHODS
After approval by hospital Human Research Committee, in a prospective randomized study, 60 patients were studied after informed consent. The patients were scheduled for surgery under the umbilicus and 80 mg of glucose-free 2% lidocaine was used in all patients. They were divided into three groups of 20 patients each, in regard of to the type of spinal needle used: group 1= 26g Quincke needle, group 2= 27g Whitacre needle, group 3= 29g Quincke needle. The spinal punctures were performed by two investigators only. Evaluated were: the easiness of the technique, the quality of analgesia, motor blockade, side effects including headaches, postoperative problems of dyesthesia and backache. Statistical analysis used were Kruskall-Wallis, Nann-Whitney and analysis of variance tests.

RESULTS
The patients were comparable in regard to demographic data. The quality of anaesthesia was inadequate in 4 patients (gr 1= 1, gr 2= 1, gr 3= 2). The easiness of the technique was superior in group 1 and 2, compared to group 3, where the needle had to be changed twice, the dural click not felt in 60% of the cases and the time to free flow of C.S.F. longer than the two other groups. Two blood patches were needed for postoperative headache (group 1= 1, group 3= 1) and two patients complained of dysesthesia in the legs (group 1 and 2). Six patients in group 1 had backache but only two in group 2 and 3.

DISCUSSION
Using 80 mg of glucose-free 2% lidocaine solution, there was a 6.6% incidence of inadequate anaesthesia, and among the three needles compared, the Whitacre 27g was found superior (greater ease of use and least side effect occurrence). 3% of the patients presented transient dysthesia in the legs in the postoperative period.

EPIDURAL TEST DOSE USE IN ANESTHETIC LITERATURE: HOW STANDARD IS THIS PRACTICE?

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Introduction: Epidural Test Dose(ETD) is almost uniformly advocated by anesthesiology textbooks as the standard method to prevent intrathecal or epidural intravascular injection. Per ASA closed claims analysis, convulsions with obstetrical regional anesthesia are clearly implicated with failure to use an ETD or an ETD of local anesthetic (LA) with no epinephrine.[1] We decided to review how consistently anesthesiologists documented use of an ETD in anesthesia journals that followed publication of the Closed Claims Study.
Methods: Two anesthesia journals were surveyed over years 1992 and 1993; *Anesthesia & Analgesia* and *Anesthesiology*. Analysis was conducted of adult and pediatric reports in which 1) lumbar, thoracic or caudal anesthesia was performed for surgery/analgesia (post op or obstetric), 2) reports were then classified as to whether ETD was performed(ETD group) or not(No ETD group) ; if no clear technical description was provided, reports were ascribed to the No ETD group. The ETD group was further classified as to ETD composition (Epinephrine or no Epinephrine). Only case reports of epidural anesthesia complications were included. Letters to the editor were excluded.
Results: A total of 77 reports met the review criteria; 18 case reports and 59 clinical studies. Of the case reports, ETD was used in 10 of 18 (55.6%). Of clinical studies, ETD was used in 32 of 59 (54.2%). Of the total of 77 published reports, ETD was reported in 42 (54.5%). Many studies and case reports described incremental local anesthetic titration, perhaps in lieu of ETD. Six of 27 (22.2%) reports where no ETD was technically identified, incremental LA titration was used; 5 of the 6 were obstetrical cases. Finally, epinephrine was part of the ETD in 29 of 42 reports (69%). In 8 of 10 case reports, ETD included epinephrine and it was used in 21 of 32 clinical studies (65.6%). Complications reported include; two catheter malpositions; 1 epidural vein cannulation (detected by ETD), 1 high block despite ETD(?subdural); However, the majority of studies did not document patients excluded for catheter malposition.
Discussion: Over or under reporting of ETD use is an obvious limitation to our survey. Editorial policy may result in different degrees of technique documentation. We are therefore broadening the survey. There are larger implications. To Quote the ASA Closed Claims Analysis, " 83% of the OB claims involving convulsions with regional anesthesia, resulted in neurological injury or death to the mother, newborn or both. In none of the claims was an epinephrine containing test dose known to have been given".[1] Yet, nearly half the reports we surveyed fail to describe an ETD; among reports using this safety measure, one third omitted epinephrine from the ETD. Paradoxically, given the recommendations of both reference texts and the closed claims analysis, both editorial and institutional review boards have inconsistently required an ETD in study design. Despite the limitations of the ETD, why has our specialty failed to reach a consensus over this important safety issue?

1) ChadwickHS, Posner K, Caplan RA, et al: A comparison of obsteteric and nonobstetric anesthesia malpractice claims. Anesthesiology 74: 242-9; 1991.

A

DEVELOPMENT OF A SCALE FOR THE MEASUREMENT OF ACUTE PRURITUS: VALIDITY

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INTRODUCTION Pruritus is a significant side effect caused by neuroaxial narcotics. However there is no valid and reliable scale available to measure this phenomenon. The purpose of this study is to assess the validity of a scale that has been devised to measure pruritus.
METHODS REB approval and verbal consent was obtained from each participant. A 16 item*, 7 point scale was developed to measure pruritus. Face validity had already been assessed since all items on the scale were endorsed by patients experiencing pruritus. Since there is no "gold standard" with which to compare this scale, construct validity was assessed. 172 women who received neuroaxial narcotics for post caesarean section pain were assessed with the instrument. At the same time, each woman filled out a visual analog scale (VAS) for pruritus. Using a homonculus designed to assess body surface area for burns, each woman indicated which part and how much of her body was affected. Finally, whether the woman requested medication to relieve pruritus was assessed. The correlation between the VAS scale, the % of the body affected and the score on the new instrument was calculated. The instrument score was compared between those who requested relief from pruritus and those that did not using an unpaired T test. A p value of 0.05 was considered statistically significant.
RESULTS The correlation between the new instrument and VAS scores for pruritus was 0.76. The correlation between the instrument and % of the body affected was 0.41. Patients who requested medication for pruritus had significantly higher mean scores than those that did not (N=43, 34.2$\pm$ 16.7 vs N=129, 22.9 $\pm$ 17.0, p=0.0003).
DISCUSSION This study demonstrates that the scale is a valid measure of pruritus. Face validity was shown by patient endorsement of the items. An important component of construct validity is that the scale shows appropriate correlations such as, in this case, VAS scores and % of body involvement. Further, patients with more distress, as shown by requests for medication, had significantly higher scores. Since this scale has also been shown to be reliable, it can be used to measure acute pruritus.
REFERENCE 1) Health Measurement Scales 2 ed. Oxford Medical Publications.
*Item list--irritating, itchy, disturbing, annoying, troublesome, restless, torturing, cruel, punishing, penetrating, pins and needles, prickling, tingling, flickering, insect bites, pinching

B

A COMPARISON OF IBUPROFEN VERSUS ACETAMINOPHEN WITH CODEINE FOR PERINEAL POST-DELIVERY PAIN

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INTRODUCTION: Women with vaginal births who sustain perineal trauma (episiotomy or tears) experience more pain postpartum[1]. The results from previous studies of analgesia for perineal pain are conflicting. Studies have been limited by small sample size, short observation periods, lack of uniformity in pain measurement, and site of pain examined[2]. A randomized double-blind controlled clinical trial was therefore designed to determine effectiveness, side-effects, cost and patient preference for treatment of **perineal pain** from episiotomy or 3rd and 4th degree tears.

METHODS: Following ethics approval and informed consent, 300 women who deliver vaginally are randomly assigned to receive either *Acetaminophen with Codeine* or *Ibuprofen* (400 mg) q4H prn. Randomization is stratified according to forceps use. Pain relief is assessed at 1st request for analgesia and at 1,2,3,4,12 & 24 hours by VAPS. Side-effects are documented. Patient preference and satisfaction with the medication is assessed at 24 hours with a "Quality of Life" tool; the *Feeling Thermometer* (score 0 - 100). Other measures to relieve perineal pain are assessed.

RESULTS: At interim analysis, enrolled patients are demographically similar. There is no significant difference in pain intensity, side-effects, and previous use of epidurals or epidural narcotics. However, nausea, dizziness, and constipation are higher in the acetaminophen group.

DISCUSSION: Inability to detect a difference in the primary outcome, pain relief, may be due to the small sample size to date. The trend for increased side-effects in the acetaminophen with codeine group agrees with previous studies.

REFERENCES:

1. Journal SOGC 1993;June 590-602
2. Reprod Med 1989;29:891-5

HAEMODILUTION FOR CAESAREAN SECTION

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Concern over transmissible disease has increased interest in ways to minimize homologous transfusion during elective surgery[1]. Although haemodilution (HD) has been reported previously[2] this technique has not been described in parturients. This study was designed to assess the safety and efficacy of preop HD in women with placental and uterine anomalies at risk for haemorrhage during caesarean section (c.s.).

METHODS: Following institutional approval and informed consent, 13 women (ASA I-II, preop Hgb > 100g/l), undergoing c.s. were studied. Using standard, aseptic donation technique, 1-2 units of blood were removed preop and replaced with an equal volume of Pentaspan®. ECG, SaO_2, NIBP and FHR were continuously monitored during HD. Hgb was measured preHD, postHD, pretransfusion, post transfusion and 24 hr postoperatively. Umbilical blood gases, Apgar scores were recorded. The blood collected was reinfused at the end of surgery or when required.

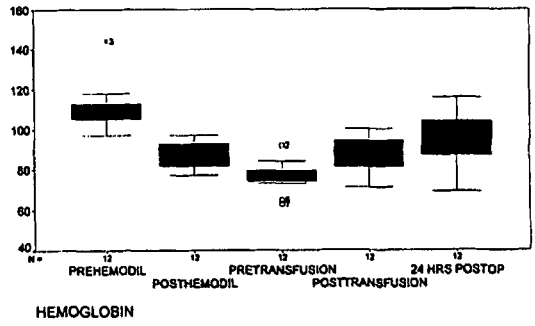
RESULTS: Table I includes patient details. All were stable hemodynamically and had no FHR abnormalities during HD. None received homologous blood and only 3 required previously donated autologous blood (PAB). Umbilical blood gases were normal and all 5-min Apgar scores were >7.

DISCUSSION: This study suggests that HD is well tolerated in parturients undergoing c.s. The combination of HD and PAB may limit homologous transfusion.

REFERENCES

1. Can J Anaesth 1994;41:52-61
2. Anesth Analg 1994;78:932-7

Weight kg (range)	82.8 (57.5-162)	# with PAB	8
Est. Blood loss mls (range)	1084 (600-800)	# given PAB	3



A B

A RANDOMIZED, DOUBLE-BLIND, PLACEBO CONTROLLED TRIAL OF EMLA FOR ANALGESIA PRIOR TO EPIDURAL NEEDLE INSERTION.

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INTRODUCTION EMLA, a eutectic mixture of local anaesthetics (prilocaine/lidocaine), is effective in relieving the pain of percutaneous needle insertion .[1] The fear and apprehension associated with such insertion can also hinder successful entry into the epidural space, when patient cooperation and maintenance of position are essential. Confidence in the anaesthetist may be lost if the patient perceives local anaesthetic infiltration to be painful. The possible role of EMLA in mitigating the pain of epidural needle insertion, and its influence on the success of entry into the epidural space, remains to be determined.
METHODS In this study, we sought to assess the effectiveness of EMLA in relieving the pain of superficial and deep infiltration,and that associated with advancement of the epidural needle when identifying the epidural space.After Ethics and Research Committee approval, 103 women scheduled for elective C/S or tubal ligation were randomized to one of 3 treatment groups in double - blind fashion, after giving informed written consent. Group 1 women received topical EMLA cream (2.5 g) applied to the back, over an area corresponding to the L2-L5 interspaces, 60-90 min before the planned procedure, followed by superficial infiltration with 0.5 mL saline, and deep infiltration with 3.5 mL lidocaine 1% . Group 2 received topical placebo cream,then superficial and deep infiltration with lidocaine 1%.Group 3 subjects had topical EMLA (2.5 g), and superficial and deep infiltration with 0.9% NaCl, using similar volumes and methods to previous groups. The pain of superficial infiltration, deep infiltration, and epidural needle insertion (18 ga Tuohy needle), was assessed using a 100 mm visual analogue scale (VAS). The anaesthetist assessed the patient's discomfort with superficial, deep and epidural needle insertion using the same score, and rated ease of block insertion using a standardized technique.
If the patient requested additional analgesia, or was judged to be experiencing pain, we gave additional local anaesthetic. (These patients scored a value of 100 mm for the pain of epidural needle insertion.) Data were analysed using standard statistical methods.
RESULTS 100 patients were acceptable for data analysis. Results are described in the Table.

	Group1n=34	Group2n=33	Group3n=33
VAS superficial	5.4 +/- 8.2	18.2+/-18.5	6.7+/-7.7
VAS deep	18.5+/-20.3	18.5+/-21.6	25.8+/-25.9
VAS epidural	19.9+/-33.9	23.3+/-36.2	41.7+/-42.1
Ease of block poor-fair / good-excell	4/29	8/25	10/23

DISCUSSION Topical EMLA cream applied 60-90 min prior to planned epidural needle insertion, along with deep lidocaine infiltration, provides better patient comfort and ease of block insertion than standard infiltration techniques.
REFERENCE 1. BJA 1985;57:326-28.

A

RANDOMIZED TRIAL OF LABOR ANALGESIA: A PILOT STUDY TO COMPARE PATIENT- CONTROLLED INTRAVENOUS ANALGESIA WITH PATIENT-CONTROLLED EPIDURAL ANALGESIA TO DETERMINE IF ANALGESIC METHOD AFFECTS DELIVERY OUTCOME.

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INTRODUCTION - Previous studies have given conflicting results about the effects of epidural analgesia on labor progress and outcome. A recent meta analysis revealed only 6 papers out of *1000* suitable for analysis of the question, 'Does epidural analgesia affect the progress and outcome of labor?'.[1] All these studies had methodological flaws. To date no study has compared two equivalent analgesic techniques administered by alternative routes. We undertook this pilot project to develop an approach to answer this important question.
METHODS - After approval by hospital research and ethics committee, 53 uncomplicated primiparous women in spontaneous labor were prospectively randomized to one of two analgesic methods after obtaining informed written consent. The PCA group received intravenous narcotic analgesia (meperidine, up to 1mg/kg loading dose, followed by 10 mg PCA boluses with a lockout of 10 minutes). The epidural PCA group (PCEA) had epidural analgesia initiated with 10-15 mL bupivacaine 0.125% with epinephrine, plus meperidine 25 mg, followed by PCEA for maintenance (bupivacaine 0.125% with epinephrine, plus meperidine 0.5 mg/mL, in 4 mL boluses with a lockout of 15 minutes).Strict definitions for diagnosis and management of labor, and dystocia in first and second stage, were established before the study commenced and were closely observed. Patients had the freedom to cross over to the alternate technique, or withdraw from the study at any point. Data collected included VAS pain scores, patient satisfaction score, measurement of motor and sensory block, duration of first and second stage labor, progress of cervical dilatation, use of oxytocin, mode of delivery and fetal outcomes, including cord pH, 1 and 5 minute Apgar scores and NACS score at 2 and 24 hours. Patient groups were analysed by intention to treat.
RESULTS - Fifty-three patients were enrolled, 50 proved suitable for data analysis (1 technical failure and 2 equipment failures). There were 28 subjects in the PCEA group and 22 in the PCA group. Eleven women crossed over from PCA to PCEA ,but none from PCEA to PCA. Patient demographics were comparable. We made the following observations:

	n=	1st vas	2nd vas	vag del	c/s del	pH < 7.15	5 min Apgar<7
PCEA	28	11	10	25	3*	1	2
PCA	22	47	54	20	2*	2	2

* one in each group for fetal distress

DISCUSSION The above protocol proved capable of evaluating the effects of labor analgesia on the progress and outcome of labor in primiparous women. A larger prospective randomized study using this method should be undertaken to answer the important question'Does analgesia and its mode of administration affect the outcome of labor?', since it may eliminate many of the methodological problems encountered in earlier studies.
REFERENCES 1. Obstet Gynecol, 1994;83:1045-52

B

ANALGESIA / ANAESTHESIA FOR REMOVAL OF RETAINED PLACENTAS

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INTRODUCTION

Analgesia and uterine muscle relaxation are often needed to facilitate the removal of retained placentas. Different techniques, ranging from no medication at all to intravenous nitroglycerin to general anaesthesia have been suggested[1]. We have performed a retrospective review of the analgesia/anaesthesia techniques used to facilitate the removal of retained placentas at our hospital.

METHODS

We reviewed the records of all deliveries from April 1991 to June 1995, associated with retained placentas. We excluded births with gestations less than 36 weeks. The analgesia/anaesthetic techniques were determined by the attending anaesthetists. The prenatal and the lowest postnatal haemoglobin levels were recorded. Results are expressed as frequencies, means and ranges. Chi square test was used to compare the frequencies. $P<0.05$ was considered significant.

RESULTS

One hundred and twenty-seven patients had retained placentas. Thirty-two patients (25%) had epidural analgesia. Of these 32 patients, 2 received supplemental intravenous sedatives and 6 (19%) needed general anaesthesia for manual removal of the retained placentas. Ninety-five patients did not have epidural analgesia. Of these 95 patients, 9 did not require any medication, 15 received intravenous analgesics with or without additional sedatives, 3 had intravenous nitroglycerin and nitrous oxide by inhalation, 5 had amyl nitrate and nitrous oxide by inhalation, and 7 received intravenous nitroglycerin, intravenous analgesics, nitrous oxide by inhalation and then general anaesthesia. Fifty-six of the 95 patients had general anaesthesia only. Overall, patients who had epidural analgesia were less likely to require general anaesthesia (19% vs. 66% relative risk = 3.54 (95% confidence limits 1.70 - 7.38) ($P<0.001$)). Patients had an average reduction of 20% in their haemoglobin levels after delivery and removal of retained placentas. Four percent (5/127) of the patients had greater than 40% decrease in haemoglobin levels. There was no difference in frequency of large haemoglobin reductions between patients who had a general anaesthetic and those who did not.

DISCUSSION

Ninety-three percent (118/127) of the patients required analgesia for removal of retained placentas. Epidural analgesia was adequate for 24 (75%) of patients with epidural catheters in place. Among patients who received intravenous nitroglycerin, 70% (7/10) still required general anaesthesia. A prospective study to evaluate the efficacy of intravenous nitroglycerin in removal of retained placentas is needed.

REFERENCES

1. Anesthesiology 1990;73:787.

DOES THE NURSE PRACTITIONER HAVE A ROLE IN THE PRE-ADMISSION UNIT?

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INTRODUCTION: Ambulatory surgery and same day admission for elective surgery are the norm in hospitals today. This has created a need to improve efficiency of patient (pt) assessment, suitability for anesthesia and coordination of their periop care. The contribution of the nurse practitioner (NP) in the preop assessment is to enhance quality and efficiency through coordination and provision of quality care, delivered efficiently and cost-effectively. This prospective study aims to define the role of NP in 1) reducing no. of unnecessary laboratory (lab) tests 2) identifying pts requiring consultations 3) co-ordination of services before OR within hospital and community to decrease postop stay.

METHODS: Institutional approval was obtained. During 6 m period, consecutive pts admitted to Preadmission, Same Day Admission/Discharge Unit were assessed. Preop lab tests ordered by surgeons were evaluated by NP according to anaesthesia (anae) preop guidelines. Tests that were not required by guidelines were cancelled by NP. The NP also identified pts that required anae consultation or other consultations. e.g. cardiology. To decrease postop stay, NP coordinated different services before OR within hospital and community for pts with complex care. The types of services and the frequency of referrals were documented.

RESULTS: During 6 m period, 1,503 pts were evaluated at the Preadmission, Same Day Admit/Discharge Unit. The NP had an impact on the management of 28.9% (434/1,503) pts, M 136 : F 290. The lab tests that were cancelled by NP are shown in table 1. 45 pts were identified by NP to require anae consultation. 11 pts required other consultations. Coordination of the services is shown in table 2.

Test	No. ordered by surgeon	No. Not Required	$Cost$ for Test	$Cost$ Savings
CBC	427	1	3.18	3.18
Electrolytes	246	87	13.20	1,148.40
Urea	24	9	3.18	28.62
Creatinine	199	71	3.18	225.78
Blood sugar	131	54	3.18	171.72
ECG	260	29	15.50	449.50
X-ray	209	69	40.71	2,808.99
Ultrasound	10	0	0.00	0.00
Others	100	18	30.00	540.00
Total	1,606	338		5,376.19

Pre-op	No.	%	Post-op	No.	%
Teaching	373	85.9	Home care	34	7.8
Physiotherapy	3	0.7	Meals on Wheels	1	0.2
Home care	12	2.8	Wheel Trans	0	0.0
Occ. Therapy	0	0.0	Follow up GP	262	60.4
Dietitian	30	6.9			
Social Worker	52	12.0			
Pharmacist	22	5.1			
Psychologist	22	5.1			

CONCLUSION: NP played a definite role in the Preadmission, Same Day Admission/Discharge unit. Unnecessary lab tests were cancelled, consultations were sought and different services were coordinated to improve the periop care of pts.

SEND FOR THE NEXT PATIENT, PLEASE

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INTRODUCTION: In these cost conscious times it is important to find ways to increase OR efficiency. As a first step toward this goal we tried to identify potentially correctable factors leading to undue delays between cases. In this study we measured turnover times of seven surgeons working in an academic hospital when "following themselves" and when operating after a different surgeon.
METHODS: Operative records referring to the first ten months of 1995 were reviewed. Turnover time defined as time from first "patient out" to second "patient in" was determined from Nursing records. Services involved were General surgery, Plastic surgery, and Gynecology. The following cases were specifically excluded: emergency cases, major surgeries, cases done under local anaesthesia only, patients presenting from the ICU, as well as any cases where turnover times were $\geq$ 60 min. Data were analyzed using a two tailed t-test assuming unequal SD.
RESULTS: A total of 256 cases were analyzed. Each of the seven surgeons studied had shorter turnover times when "following himself", than when following a different surgeon. In the case of five of seven surgeons this difference was statistically significant. (See below)
DISCUSSION: Operating Room turnover times would be decreased, and thus efficiency improved, by scheduling surgeons, whenever possible, to work within time blocks where they "follow themselves".

Table -turnover time in minutes ± SD

Surgeon	Turnover Time	Sample Size
A-A	14.8 ± 6.9*	34
Other-A	21.0 ± 11.3	32
B-B	16.3 ± 10.0*	26
Other-B	24.4 ± 14.0	21
C-C	13.8 ± 6.3*	16
Other-C	22.7 ±14.3	21
D-D	12.6 ± 4.3*	17
Other-D	20.7 ± 6.6	10
E-E	11.7 ± 3.9*	37
Other-E	20.7 ± 11.3	21
F-F	9.3 ± 4.0	9
Other-F	24.2 ± 18.6	6
G-G	13.8 ± 3.8	10
Other-G	22.0 ± 11.9	6

*p<0.05 compared to surgeon following another surgeon

A

UNANTICIPATED ADMISSION – AN AREA FOR IMPROVEMENT

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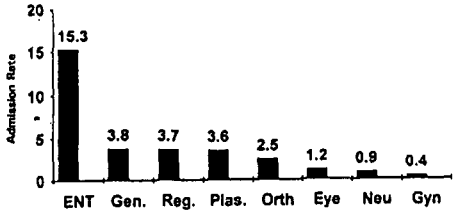
INTRODUCTION: Increasing proportions of surgery are being done on an ambulatory basis. Unanticipated admission (adm) is one of the quality indicators in ambulatory surgery (amb surg). Current data range from 0.09% to 7.9%.[1,2] This study determined: 1) incidence and demographics of unanticipated adm in an amb surg unit within a tertiary care hospital; 2) the causes for unanticipated adm; 3) the association with different types of surg.
METHODS: After institutional approval, over a 32 m period, consecutive amb surg patients (pts) were prospectively studied. Data on demographics, medical, anaes, surg were collected preop, intraop and postop. Data were entered into a Dbase III+ computer program. Reasons for unanticipated adm were categorized as surgical, anaes, medical or social reasons with subgroups in each. The demographic data between unanticipated adm pts and same day discharge pts were compared by t-test. The incidence of unanticipated adm with different types of surg were also compared. P<0.05 was considered statistically significant.
RESULTS: 1.53% (216/14,154) pts were admitted after amb surg. Pts with unanticipated adm were significantly older. Sex, age, ASA, duration of anaes & PACU were significantly longer (table I). Reasons for unanticipated adm are shown in table II. ENT had the highest adm rate 15.3%, then gen surg 3.8%, and regional diagnostic/therapeutic blocks 3.7% (Fig.).

Table I

*P<0.05	Same Day Surgery/Discharge	Unanticipated Adm.
n	13,938	216
M:F	4,415:9,523	93:123*
Age (yr)	46 ± 21	51 ± 20*
ASA	I:7,765 II:5,484 III:689	I:92 II:101 III:23*
Anae duration (m)	50 ± 47	79 ± 78*
PACU duration (m)	36 ± 30	83 ± 72*

Table II

Reason	%	*Reason*	%	*Reason*	%	*Reason*	%
Surgical	38	Anaesthesia	24	Medical	18.1	Social	19.9
intractable pain	13.9	nausea/ vomiting	13.8	pre-existing disease	10.2	pt request	6.95
misadventure	6.5	somnolence	2.3	periop Cx	6.5	surgeon request	6.0
more exten. surgery	3.7	other	7.9	other	1.4	no escort	6.95
other	13.9						



CONCLUSIONS: 1.5% rate of unanticipated adm is comparable to other institutions. Unanticipated adm in ENT is 39 fold of gynaecology surgery. Intractable pain, nausea/vomiting, and somnolence are aspects of periop care that need improvement and further attention. Better education of surgeons and patients may also reduce the social reasons.

REFERENCES:
1. Anaesth Int Care 20:541-52, 1992.
2. Opht Surg 21:540-43, 1990.

B

PAIN AFTER AMBULATORY SURGERY: WHAT REALLY MATTERS?

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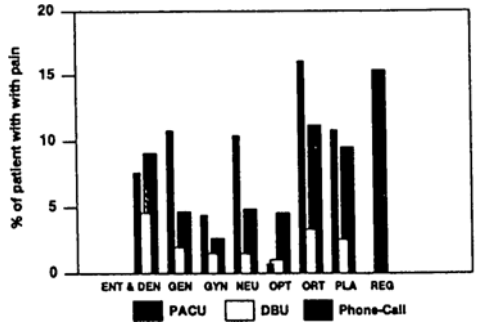
INTRODUCTION Pain is one of the commonest reasons for delayed discharge after ambulatory surgical procedures. The purpose of this study was to determine: 1) the incidence of pain in Post-Anaesthesia Care Unit (PACU), ambulatory surgery unit (ASU), and 24h in different types of ambulatory surgery; 2) the patient (pt), surgical, anaesthetic, and analgesic factors which alter the incidence of pain.

METHODS After institutional approval, over a 23-month period consecutive ambulatory surgical patients were prospectively studied. Data on demographics, medical, anaesthesia, surgery were collected. Data on pain was collected in PACU, ASU and 24h phone interview. In PACU, pts with excessive pain were defined as: moaning or writhing in pain, initial nursing care dominated by pain control or requiring more analgesics than ordered (≥ 8 mg of morphine IV). In ASU, pts with pain were defined as: pain delaying discharge or additional analgesic required. At 24h interview, pts were asked about pain level: none, mild, moderate, severe. % of pts with pain in PACU, ASU and 24h postop for each type of surgery was determined. Patient, surgical, anaesthetic factors were included in a multiple logistic regression model to identify which factors altered the incidence of pain. The odds ratio <0.9 or ≥ 1.1 was considered significant.

RESULTS For 10,068 patients, 5.2% had excessive pain in PACU, 1.7% ASU, 5.3% 24h. The incidence of pain in different types of surgery at PACU, ASU, 24h is shown in Fig. Excessive pain in PACU was seen more with lower body mass index, male, general anaesthesia (compared to neuroleptic, local, regional anaesthesia), longer duration of surgery, and higher dose of fentanyl (table).



Variable	Pr> Chi Square	Odds Ratio (95% C1)
Body mass index	0.0001	0.64 (0.68-0.22)
Sex	0.0004	0.64 (0.70-0.20)
Gen. Anaes.	0.0001	21.1 (2.26-3.84)
Duration of surgery	0.0001	4.53 (1.26-1.76)
Fentanyl dose	0.0177	1.31 (0.05-0.49)

CONCLUSIONS Orthopaedic outpatients (ort) had the highest incidence of pain. Excessive pain in PACU was related to lower body mass index, male, general anaesthesia, longer duration of surgery, and higher dose of fentanyl.

A

COMBINATION OF DROPERIDOL AND METOCLOPRAMIDE FOR ANTIEMETIC PROPHYLAXIS

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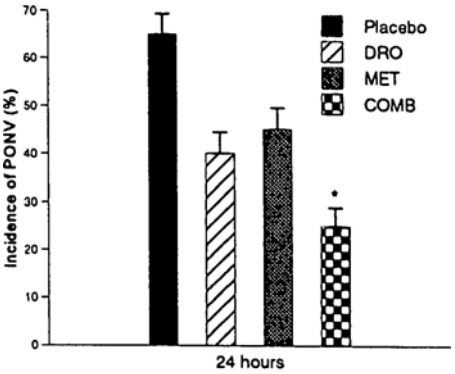
INTRODUCTION: Oncology patients routinely receive combination drug therapy for chemo-induced emesis. It was hypothesized that this approach would also be beneficial for postoperative nausea and vomiting (PONV). We chose to investigate droperidol and metoclopramide since these are commonly used antiemetic agents. We hypothesized that the combination of these two drugs would be more efficacious than either drug alone.

METHODS: Following institutional ethics approval and informed written consent, 80 female patients scheduled for outpatient laparoscopy were randomly assigned in a double-blind fashion to one of four treatment groups: i) placebo, ii) droperidol (DRO) 1.25 mg, iii) metoclopramide (MET) 10 mg, iv) DRO 1.25 mg and MET 10 mg in combination (COMB), all administered intravenously on induction. A standard general anaesthetic technique using fentanyl, propofol induction, succinylcholine, forane, N_2O, vecuronium, neostigmine and atropine was used. Patients were interviewed at 0.5, 1.5, 2.5, 3.5 and 24 hours postoperatively to assess incidence of PONV. Data on side effects and need for a rescue antiemetic was also recorded. Data was analyzed by ANOVA or x^2 (chi-square) and $P<0.05$ was considered statistically significant.

RESULTS: There were no demographic differences between the treatment groups with respect to age, weight or day of menstrual cycle. The cumulative incidence of PONV for the first 3.5 hrs postoperatively was 40% in the placebo group, 15% with DRO, 25% with MET and 15% with COMB. The cumulative 24 hr incidence was 65% in the placebo group, 40% with DRO, 45% with MET and 25% with COMB. COMB at 24 hrs was significantly different from placebo.



*p<.05 with respect to placebo

DISCUSSION: In this study, only the combination of droperidol and metoclopramide significantly reduced the 24 hr incidence of PONV. This would suggest that the combination is more efficacious than either drug alone, however, a study with a larger number of patients would be required to verify this.

B

PREOPERATIVE AIRWAY ASSESSMENT: DO WE MEASURE UP?

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Introduction: It has been shown that the preoperative airway assessment tests used by anaesthetists have a low capability of identifying patients who are difficult to intubate.[1] Recent evidence suggests that the reliability of these tests is poor unless they are done in a precise manner.[2] Do anaesthetists perform these tests in a precise manner? To answer this question, we compared the reproducibility of four tests when done precisely and accurately by a single rater and when done by the anaesthesia department of a tertiary care teaching hospital.

Method: Following institutional approval, 447 patients were randomly selected, and their airway was assessed preoperatively by a single specially trained certified anaesthetist. To increase the number of abnormal cases, 40 patients, 20 of whom were difficult to intubate (plus 20 controls to avoid bias) were seen by the rater postoperatively. Altogether, 487 patients were included.

Anaesthetists at the hospital were not aware of this study and continued to document their airway assessments on the anaesthetic record in the usual manner. The record is in a tic-box format where three airway tests (mouth opening, thyromental distance, and neck extension) are checked as normal or abnormal; and the oropharyngeal view is graded according to Samsoon and Young's classification.[3] The single rater determined the same four tests in a precise manner by using a ruler to measure mouth opening (normal: >3.5 cm) and thyromental distance (in complete extension with mouth closed, normal: >5 cm from thyroid notch to inside of mentum), a goniometer to assess atlanto-occipital extension (normal: >27 degrees), and a flash light to assess the best obtainable oropharyngeal view (normal: grades I and II).

The rates of agreement between the single rater and 'all anaesthetists' were determined using the Kappa (K) statistic (Kappa less than 0.4 means poor reproducibility).

Results:

	Agree		Disagree		
Single Rater =>	Nor.	Abnor	Abnor	Nor.	
All Anaesth. =>	Nor.	Abnor	Nor.	Abnor	K (95% C.I.)
Thyromental Dist.	360	8	53	25	.08 (.00,.17)
Mouth Opening	421	6	21	4	.30 (.22,.38)
Neck Extension	393	13	19	22	.34 (.25,.43)
Oropharynx View	325	26	42	23	.36 (.26,.45)

Note: n < 487 due to missing assessments by 'all anaesthetists'.

Conclusion: Since the rates of agreement are poor, we can conclude that the current techniques of assessing the airway are not precise. More precise methods will improve the reliability of the tests. Interestingly, the single rater detected more abnormalities in three of the four tests. The effect of this variation on the validity of tests needs further investigation.

References: 1. Can J Anaesth 1994,41:372-83 2. Anesthesiology 1994;81:69-75 3. Anaesthesia 1987;42:487-90

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