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# Abstracts of the Research Meeting of the SARB

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*Prolonged recovery after rocuronium infusion, compared with atracurium, cisatracurium and mivacurium.* Basset P., Dubois P., Jamart J., Eucher P., Joucken K.L. Catholic University of Louvain 1 Mont-Godinne UCL Hospital, 5530 Yvoir, Belgium.

## Background and Goal of Study

The recovery of some neuromuscular blocking agents (NMBA) can be affected by the duration of their infusion (1). The goal of this study was to compare the extent of the recovery variability of four NMBAs after infusion.

## Materials and Methods

After Ethical Committee approval and informed consent, 4x20 ASA3 patients undergoing coronary artery bypass grafting with normothermic cardiopulmonary bypass were randomized to receive either atracurium, cisatracurium, mivacurium or rocuronium, monitored by acceleromyography. During propofol and sufentanil anesthesia, the effect of an initial equipotent NMBA bolus (2xED95) recovered first up to a train-of-four ratio (TOFr) of 0.75. Then, a potency-adjusted infusion of the NMBA maintained the first twitch at  $15 \pm 5\%$  of control until chest closure and again a spontaneous recovery was awaited. We compared the TOFr recovery index (the time from TOFr 0.25 to 0.75) of the two recovery using paired samples t test. Results are expressed as mean  $\pm$  SD, and time in minutes.

## Results and Discussion

Groups were similar concerning age ( $65 \pm 10$  y.o.), weight ( $74 \pm 13$  kg), renal and hepatic function. The infusion lasted  $3 \pm 1$  hours.

TOFr ratio Recovery index	after bolus	after infusion	Delay after infusion	p
Atracurium	13.4 $\pm$ 3.6	19.7 $\pm$ 6.4	6.2 $\pm$ 5.3	<0.001
Cisatracurium	15.9 $\pm$ 3.4	21.6 $\pm$ 3.5	5.7 $\pm$ 2.8	<0.001
Mivacurium	8.2 $\pm$ 4.0	13.4 $\pm$ 4.8	5.2 $\pm$ 2.6	<0.001
Rocuronium	15.9 $\pm$ 8.7	38.0 $\pm$ 20.5	22.1 $\pm$ 19.8	0.001

The four NMBA showed a significantly prolonged recovery after the infusion. The rocuronium group was the most affected (unpaired t test,  $p < 0.001$ ). The interindividual variability of recovery was increased in the rocuronium group, and this was especially clinically relevant after the infusion (Levene test,  $p \leq 0.001$ ).

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*Combined spinal epidural (CSE) versus epidural anesthesia for Caesarean section in preeclamptic (PET) women: a retrospective analysis.* N. BERENDS, M. VAN DE VELDE, A. TEUNKENS, E. VANDERMEERSCH. Department of Anesthesiology, UZ Gasthuisberg, Leuven.

### Introduction

Spinal and CSE anesthesia for PET patients requiring caesarean section (Csection) is controversial (1,2) It is believed that hypotension is more likely than following epidural anesthesia. However spinal anesthesia has the benefit of producing rapid and reliable anesthesia. Since we commonly use CSE anesthesia for C-section in PET parturients, a retrospective chart analysis comparing CSE versus epidural anesthesia was performed.

### Methodology

Following institutional approval, the charts of all women, diagnosed with PET and caesarean section between Jan 1998 and Dec 2001, were retrospectively analyzed. Data (demographics, iv fluids, pressor agents, blood loss, maternal blood pressure, severity of PET, neonatal and maternal outcome) were compared according to the anesthetic technique used: epidural (EPI-group) vs CSE anesthesia, (CSE-group). Data were analyzed with repeated measures ANOVA, Students t-test, the Fisher exact test and Chi-square analysis where appropriate. Data are presented as mean  $\pm$  SD. P-values  $<$  0.05 were considered significant.

### Results

77 PET patients, who underwent C-section under regional anesthesia, were identified, 62 in the EPI-group, 15 in the CSE-group. In the CSE-group 47% had severe PET diagnosed, and only 31% in the EPI-group (p-value NS). Maternal blood pressure and neonatal and maternal outcome did not differ between both groups, except for a higher umbilical artery pH in the CSE-

Table 1

Mean blood pressure recordings at specific time-points. No statistically significant differences between the groups were observed

	CSE-group	EPI-group
Baseline MAP	93 $\pm$ 6	92 $\pm$ 6
Highest gestational MAP	118 $\pm$ 8	113 $\pm$ 11
Highest preoperative MAP	109 $\pm$ 18	106 $\pm$ 12
Lowest intraoperative MAP	98 $\pm$ 17	93 $\pm$ 13
Lowest after delivery MAP	91 $\pm$ 15	86 $\pm$ 13

group (7.26  $\pm$  0.01 vs 7.29  $\pm$  0.02; p  $<$  0.05). More ephedrine was administered in the CSE-group (14.6  $\pm$  4.4 vs 3.6  $\pm$  4.6 mg; p  $<$  0.05). However more i.v. fluids were administered in the EPI-group (855  $\pm$  408 vs 1128  $\pm$  409 ml in the CSE vs EPI-groups respectively; p  $<$  0.05). Similar results were obtained when only the seriously PET parturients were included in the analysis.

### Discussion

In line with previous studies, hemodynamic changes were independent of the chosen anesthetic technique (2,3) Neonatal and maternal outcome were good in both the CSE and EPI-group. We conclude that either technique can safely be used in (severe) PET patients undergoing caesarean section.

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3. Lombaers *et al.*, Acta Anaesthesiologica Belgica, **53** (1), 73, 2002.

*O<sub>2</sub>/N<sub>2</sub>O Fresh Gas Flow Sequences with the ADU Anesthesia Machine.* S. CARDINAE, JAN F. A. HENDRICKX, E. VANDERMEERSCH, T. DELOOF, A. M. DE WOLF. Department Anesthesiology, OLV Hospital, 164 Moorselbaan, 9300 Aalst, Belgium.

### Introduction

The ideal O<sub>2</sub>/N<sub>2</sub>O fresh gas flow (FGF) sequence seeks to combine a short duration of high FGF followed by the clinically lowest attainable FGF using contemporary anesthesia equipment, based on known quantitative data on O<sub>2</sub> and N<sub>2</sub>O uptake. Goals include a) denitrogenation; b) final O<sub>2</sub> and N<sub>2</sub>O flow should be = patient uptake + gas sampling rate + leaks; and c) simplicity. By combining the use of an anesthesia machine (ADU anesthesia machine, Datex-Ohmeda, Helsinki, Finland) with a short wash-in time constant (1 mm with a FGF of 6 L/min), a gas analyzer with a sampling rate of 200 mL/min, and by applying Severinghaus' N<sub>2</sub>O uptake pattern (1000/√t mL/min at 65% end-expired concentration (1), we hypothesized that a duration of high FGF less than 5 wash-in time constants might suffice to attain and maintain clinically acceptable O<sub>2</sub> and N<sub>2</sub>O concentrations when being immediately followed by the clinically lowest possible FGF that can be used routinely in clinical practice at this time (0.7 L/min O<sub>2</sub> and N<sub>2</sub>O combined). We studied the effects of different time periods (1 to 5 wash-in time constants) of high FGF (6 L/min) before reducing FGF to 0.7 L/min.

### Methods

After IRB approval and informed consent, 32 patients receiving general anesthesia for a variety of gynecological or urological procedures were randomly assigned to 1 of 4 groups (n=8 each), depending on duration of high O<sub>2</sub>/N<sub>2</sub>O FGF (2 and 4 L/min O<sub>2</sub> and N<sub>2</sub>O, respectively) prior to lowering total FGF to 0.7

L/min (0.3 and 0.4 L/min O<sub>2</sub> and N<sub>2</sub>O, respectively). After preoxygenation for 3 min and tracheal intubation, the high FGF period was 1, 2, 3, or 5 min, respectively (groups 1 min, 2 min, 3 min, and 5 min). The course of the end-expired (Et) N<sub>2</sub>O concentration is described in the 4 groups.

### Results

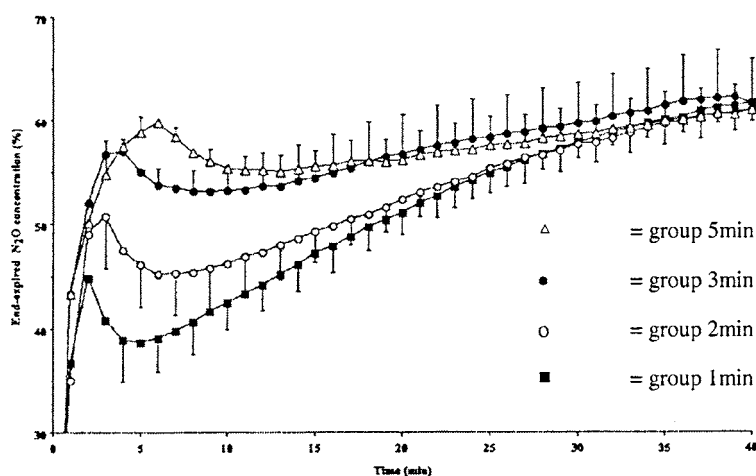
EtN<sub>2</sub>O decreased significantly after reducing FGF in groups 1 min and 2 min, but remained > 50% in groups 3 min and 5 min (Figure 1). Except for 4 patients in group 5 min, the bellows failed to reach the top of the bellows housing after lowering the FGF. This volume effect did not interfere with the delivery of the preset tidal volume, except in 1 patient in group 2 min.

### Conclusion

When using O<sub>2</sub>/N<sub>2</sub>O as the carrier gas in an ADU anesthesia machine, a 3 min high FGF (O<sub>2</sub> and N<sub>2</sub>O FGF 2 and 4 L/min) period suffices to attain and maintain clinically acceptable N<sub>2</sub>O concentrations during the subsequent low FGF period (O<sub>2</sub> and N<sub>2</sub>O FGF 0.3 and 0.4 L/min). A temporary decrease in bellows volume is then limited and does not interfere with the preset tidal volume. This FGF pattern will have to be combined with a vaporizer setting schedule for potent inhaled anesthetics to facilitate the practice of low flow anesthesia.

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## ***The effect of tranexamic acid on the perioperative blood loss in radical prostatectomies.***

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### *Introduction*

More than 30 years ago tranexamic acid (TA) proved to be effective in reducing postoperative blood loss associated with urologic surgery (1, 2). Radical prostatectomy is now a routine procedure and anaesthetic and surgical techniques have profoundly changed. In this study we examined whether intravenous TA reduces blood loss and transfusion requirements during and after radical prostatectomys.

### *Methodology*

Following ethical committee approval and written informed consent from each patient, 53 patients, ASA 1-2, 45 to 76 years of age, scheduled for radical prostatectomy, were randomized to receive a bolus of 15 mg/kg TA, followed by a continuous infusion of 1,5 mg/kg/h for 24 hours (group 1) or saline (group 2) in a similar strategy. Patients with thrombo-embolic antecedents or coagulation disturbances were excluded. Both treatments were administered on a double-blind basis. The anaesthetic technique was standardized to all patients. Blood loss and substitution during surgery and during the first 48 hours postoperatively (day 0 and 1) were recorded. We gave transfusion using the principles of isovolemic component dilution therapy described by Mortelmans et al (5). Since the data were not normally distributed, comparisons were made using the Wilcoxon two-sample test. P-values < 0.05 were considered as significant.

### *Results*

Blood losses were similar in both groups during surgery. (1161±652 ml versus 1315± 617 ml; NS). During the first 48 postoperative hours however, more blood loss was observed in group 2 patients. (266 ± 229 ml versus 364 ± 174 ml ; p < 0.01). This difference how-

ever was not associated with increased administration of red blood cells in group 2 patients (median : 0 units in both groups; maximum : 4 units versus 3 units).

	TA group	Placebo group
Perop blood loss (ml)	1161 +/-652	1315+/-617
Postop blood loss (ml)	266+/-229	364+/-174
Transfusion (n units PC) mean	0,74	0,68
median	0	0
maximum	4	3

### **Discussion**

An intravenous bolus of 15 mg/kg tranexamic acid followed by a continuous infusion of 1,5 mg/kg/hour for 24 hours did not result in reduced blood loss during surgery. During the first 48 postoperative hours however, blood loss differences were significant (p > 0,01). The clinical benefit, however, was modest since the difference in blood loss did not result in a significant reduction in transfusion. Our results are in line with previous studies with tranexamic acid in transurethral resection of the prostate (1) and open prostatectomys (2, 3), and are explained by the anti-fibrinolytic effect of tranexamic acid (4). We conclude that intravenous tranexamic acid may be useful during the perioperative period in radical prostatectomys to reduce blood loss, but the exact timing of treatment remains to be defined.

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*The cost of neuromuscular block.* MORRONE S., DUBOIS P. E., JAMART J., EUCHER P., JOUCKEN K. L.  
Department of Anaesthesia Mont-Godinne University Hospital UCL, B-5530 Yvoir Belgium.

*Background and Goal of Study*

Neuromuscular blocking agent (NMBA) administration during anesthesia may be an important feature to global anesthetic cost (1). So we aimed to compare the price of four NMBA administered as equipotent boluses or infusions.

*Materials and Methods*

After Ethics Committee approval and written informed consent, 80 ASA3 patients, aged < 75 yrs, with a BMI 15-40, with normal hepatic and renal function scheduled to undergo coronary bypass grafting with normothermic cardiopulmonary bypass were enrolled in the study. Patients with known hypersensitivity to any of the study agents, history of neuromuscular disease, receiving other drugs that could influence the neuromuscular block or with deficient plasma cholinesterase were excluded from the study. Patients were randomly assigned to receive either atracurium (Atr, 50 mg / 5ml, 5.55 ), cisatracurium (Cis, 20 mg / 10 ml, 9.34 ), mivacurium (Miv, 20mg / 10 ml, 4.85 ) or rocuronium (Roc, 50mg / 5ml, 6.79 ) (n = 20 per group). The neuromuscular block was monitored by acceleromyography. During propofol and sufentanil induction of anaesthesia, an equipotent NMBA bolus (2xED95) was administered. This was followed by a potency-adjusted infusion maintaining the first twitch at 15+1-5% of control until chest closure. Paired samples Student's t test was used to compare the bolus and infusion prices taking into account the number of entire vials used. Results are expressed as mean +/-SD.

*Results*

Groups were of a similar age ( $65 \pm 10$ year), weight ( $74 \pm 13$ kg), renal and hepatic function. Using an initial bolus of 2XED95 the maximum weight per one vial for atracurium, cis-atracurium, mivacurium and rocuronium was 100, 111, 125 and 83 kg respectively. Thus, for the initial bolus, mivacurium is the cheapest NMBA for patients weighing up to 125kg.

For infusions lasting up to 1.72 hours, mivacurium is the cheapest NMBA. Afterwards, best prices are shared by atracurium (from 1.72 to 2.39h, and from 4.12 to 7.17h) and cisatracurium (from 2.39 to 4.12h, 7.17 to 8.24h). Discussion Interestingly, atracurium and cis-atracurium alternate in terms of best price depending on duration of infusion. Rocuronium remained the most expensive despite its lower price per vial compared to cisatracurium. Despite its Hoffman elimination, cis-atracurium was proven to cumulate (2). This phenomenon may explain our finding that although cis-atracurium was the most expensive vial, due to the need for decreasing its infusion rate turned out to be cheap for infusions of certain duration. Conclusion Without taking into account the safety profile of NMBA, our findings suggest using mivacurium, atracurium and cis-atracurium as potential means for cost minimization.

*References*

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Infusion	Atr	Cis	Miv	Roc
µg/kg/min	2.37 ± 0.65	1.25±1-0.42	3.35 ± 1.41	2.82 ± 0.89
Hours/vial	2.39 ± 0.56	4.12 ± 1.94	1.72 ± 0.81	12.18 ± 1.94

*Frontal and Parietal Median Electroencephalogram (EEG) Frequency (MEF) during total intravenous anesthesia.* MVONDO L. C., PANDIN P., VANDESTEENE A. Department of Anesthesiology, Erasmus Hospital, Free University of Brussels, Brussels, Belgium.

### Introduction

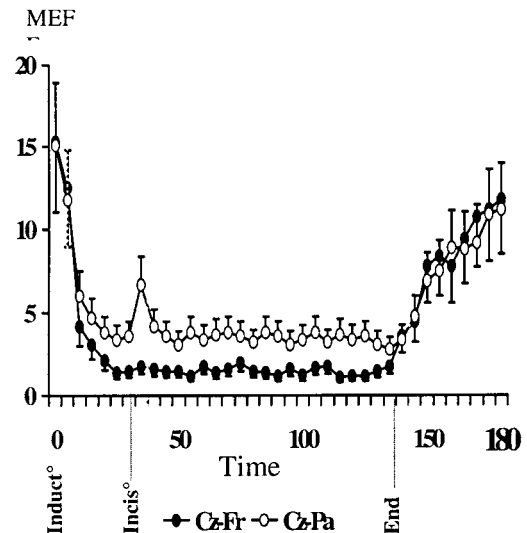
The variable reactivity to the effects of the anesthetic drugs of the different cerebral cortex areas is now well known and well described (1, 2). Derived from the spectral analysis of the EEG, the MEF is recognized and can be used as an hypnotic indicator of the anesthesia (3, 4). This study compares the respective values and variations of the MEF recorded in frontal or parietal channels during an usual intravenous anesthesia.

### Method

After IRB agreement, 20 ASA I and II informed and unpremedicated patients (21 to 46 years), scheduled for orthopaedic (n = 13) or ENT (n = 7) surgery, without neurologic deficit were included. Surgery type was chosen about homogeneous duration. Total intravenous anesthesia used target controlled infusion (TCI) of propofol (p) (Diprifusoir<sup>m</sup>) with sufentanil (5) induction bolus (0.2 µg/kg) and top-ups (0.1 µg/kg) and air/oxygen mixture (fiO<sub>2</sub> = 40%). The EEG was continuously recorded (cEEG of Eegpod<sup>TM</sup> included in 9000XL Apollo<sup>TM</sup> Siemens<sup>TM</sup> monitoring) using centro-frontal (Cz-Fr) and centro-parietal (Cz-Pa) channels. Based on the international ten-twenty system, left and right frontal (F3 and F4) and parietal (P3 and P4) electrodes of a classical electrode cap (adult size) were referenced to the central point (Cz) while the ground electrode was dispensed in the pre-frontal area. Electrode impedance were kept below 10kΩ. Notch filter (50/60Hz) was active. Spectral analysis was performed between 0.1Hz and 30Hz on EEG epochs taken every 30 seconds. Data were compared using analysis of variance and the least significant difference test (p < 0.05 as significant).

### Results

Figure depicts mean MEF values in frontal and parietal channels from induction until the end of anesthesia. The range of applied P target concentrations was 3 to 5.5 µg/ml and the mean compiled S amount 0.54 µg/kg (0.3 to 0.7). Before induction, Cz-Fr and Cz-



Pa mean MEF values were not different: 16.2 (12.8 to 18.9) and 15.8 (12.9 to 17.9), respectively. After induction and during anesthesia the Cz-Fr and Cz-Pa mean MEF values are always statistically different (p minimum of 0.017 at incision time around 35min-Fig).

### Discussion

This study demonstrates the higher level of parietal cortical function than the frontal one and confirms literature (1,2). This could correspond to the somatosensory afference integrated into the parietal areas during surgery which can not be investigated by the frontal channels. Based on this, clinicians could consider EEG not only as an assessment of the cerebral depression but also as an indicator of the control of the stimulation level during surgery.

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*Antithrombotics and interventional neuroradiology.* L. PIRE\*, C. FRANSEN\*, P. FLANDROY\*\*, M. LAMY\*. \*Department of Anaesthesia and Intensive Care Medicine, CHU-Sart Tilman  
\*\* Department of Neuroradiology, CHU-Sart Tilman, B-4000 Liège.

### Introduction

Treatment of intracranial aneurysms or stenosis of intracranial vessels (carotid or vertebral artery) with interventional neuroradiology is accompanied by a high rate of thromboembolic complications (1). However new drugs (aspirin, clopidogrel and GPIIb/IIIaR antagonists) associated with low molecular weight heparin such as used in interventional cardiology may decrease the incidence of ischemic events. (2, 3). We describe our antithrombotic strategy and evaluate whether the association of clopidogrel, aspirin and iv enoxaparin is safe and effective in patients undergoing aneurysm embolisation (without subarachnoid hemorrhage) or artery stenting.

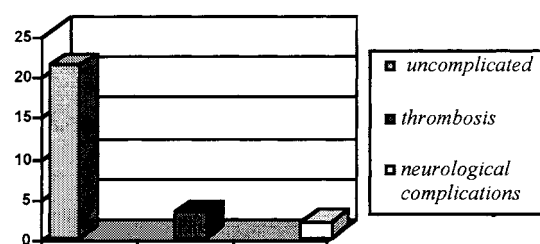
### Patients and methods

In a prospective study, from January 2003 to November 2003, we evaluated the new antithrombotic strategy in 23 patients (25 procedures : 18 aneurysm embolisations, 7 arterial stents). Patients received clopidogrel 300mg and aspirin 200mg, orally, 2 hours before the procedure. One dose (0.5mg/kg) iv enoxaparin was injected after departure of the procedure. All the procedures were performed under general anesthesia. Early awakening was authorized at the end of the intervention. Clopidogrel (75mg) together with aspirin (100mg) was given for at least one month after the procedure. Patients were monitored during 6 hours in PACU and for the next 48 hours in the neurosurgical unit. The cumulative rate stroke, stent thrombosis, intracranial hemorrhage and total bleeding complications at 6 months have assessed the efficacy and security of this strategy.

### Results

21 procedures were free from complications. In 3 patients (12%), thrombotic phenomena were noted dur-

ing the procedure but resolved after intravenous abciximab perfusion. Two of these patients presented post-operatively transient neurologic damage. There was no major hemorrhage and one minor bleeding (piles).



### Conclusion

The present study is the first report of dual antiplatelet therapy (clopidogrel, aspirin) associated with iv enoxaparin to prevent thrombotic complications in patients undergoing neurointerventional procedures. This antithrombotic strategy seems to be safe, effective and comfortable. Further clinical trials are required.

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*Evaluation of the analgesic efficiency of “Vioxx Dolor”® (Rofecoxib) as a function of delay between oral administration and surgery”. SCHWALL C., DEPAUW P., TALIBI H., VENNEMAN I., LAMY M. Department of Anesthesiology and Intensive Care Medicine, University Hospital, Liège, Belgium.*

### Background

The analgesia at the One-Day clinic requires the use of molecules with low side effects, including pain, nausea, vomiting and bleeding. Cyclooxygenase-2 (COX-2) inhibitors may bring a significant advantage over the classical anti-inflammatory agents, as these agents are associated with reduced gastrointestinal toxicity and platelet dysfunction (1). In addition, the use of Vioxx Dolor® once a day is effective in term of total drug cost (2). However, the kinetics of COX-2 inhibitors and other agents require pre-operative administration for short-duration surgery.

### Materials and Methods

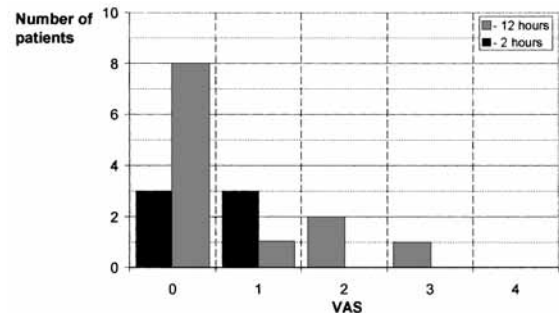
After approval of the Ethical Committee and informed consent, 19 patients scheduled for carpal tunnel surgery (CC) and 15 patients with dental surgery (DS) were randomly assigned to two groups. DS was performed under general anesthesia and CC under intravenous regional anesthesia (Bier block). A tablet of Vioxx dolor® (Rofecoxib 50 mg) was administered either 12 hours (-12) or 2 hours before surgery: CC-12 (n = 10), CC-2 (n = 9) and DS-12 (n = 7), DS2 (n = 8), respectively. The Visual Analogical Score (VAS) and the consumption of analgesic drugs were recorded for 24 hours. The data were analysed using the t-test corrected for small sample data sets (PEPITo®) with a statistical significance threshold set at 0.05.

### Results and Discussion

The four groups were similar in terms of demographics, ASA status and amount of analgesic drugs given during the surgical procedure. In patients after carpal tunnel Vioxx administration two hours before surgery seems to reached a better pain relief than twelve hours before surgery immediately after discharge from

the recovery room (mean VAS  $3.44 \pm 3.09$  cm vs  $1.44 \pm 1.58$  cm, NS) and on the first postoperative morning (mean VAS  $0.11 \pm 0.33$  cm vs  $0.90 \pm 1.20$  cm, NS) (fig.).

Figure : VAS morning after of Carpal tunnel



This contrast, with dental surgery patients, where a similar level of pain resulted in the group DS-2 and in the group DS-12 immediately after discharge from the recovery room (mean VAS  $5.38 \pm 2.77$  cm vs  $4.71 \pm 3.40$  cm) and on the first postoperative morning ( $0.11 \pm 0.33$  cm vs  $0.90 \pm 1.20$  cm). Total analgesic drug consumption was similar between groups.

### Conclusion

Although no significant difference could be observed in this small-size study, there is a trend towards a better pain relief morning after surgery in the CC-2 as compared with the CC-12. These data suggest preoperative administration of cox-2 inhibitors immediately before carpal tunnel surgery. No trend is observed in the dental surgery groups

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*Complications following obstetric anesthesia in an obstetric referral center : a prospective evaluation in 6976 patients over a 4 year period.* C. Vandewaeter, A, TEUNKENS, E. VANDERMEERSCH, M. VAN DE VELDE. Department of Anesthesiology, UZ Gasthuisberg, Leuven.

### Introduction

Both obstetric general (GA) and regional (RA) anesthesia have been associated with morbidity and mortality. Respiratory complications, following GA, and post dural puncture headache (PDPH) and central nervous system complications, following RA, are the most important reasons for serious morbidity (1, 2, 3). As part of routine quality control, we prospectively evaluated all obstetric anesthesia procedures for 4 years.

### Methodology

We report on all patients who underwent obstetric anesthesia between Jan 1998 and Dec 2001. Prospectively gathered evaluation forms and patient charts were systematically reviewed. Demographic data were recorded and the relevant medical and obstetric history was noted. The type of anesthesia performed as well as the complications that occurred were noted. If complications occurred, there follow up was reviewed.

### Results

In the 4 year period of analysis, 6976 patients underwent obstetric anesthesia. From 601 parturients, incomplete evaluation forms or incomplete patient charts were identified and excluded from final analysis.

Thus the data from 6375 patients were used in the final analysis. Serious complications occurred in 1/87 patients undergoing GA and in 1/172 parturients undergoing RA. In all women, with complications, complete recovery occurred. In table 1 and 2 the most important results are presented.

Neurologic complications: 2 patients with cerebrovascular incident; 4 patients with isolated nerve injury of the lower extremities.

### Discussion

The serious complication rate of our obstetric anesthesia service was 0.60 %. This is comparable to literature data reported. The incidence of serious problems was higher in the GA group. Both problems in the GA patients were potentially life threatening. Fortunately all patients, both in the GA and RA groups, recovered fully. The incidence of neurologic problems and PDPH is similar to that reported in the literature.

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Table 1  
Serious complications.

Complications general anaesthesia		Complications regional anaesthesia	
Difficult intubation	1(1/174)	PDPH	28(1/222)
Mendelson syndrome	1(1/174)	Neurologic complications	6(1/1034)
		Total spinal anaesthesia	2(1/3101)
		Infections	0

*Intravenous glycopyrrolate in sevoflurane-remifentanyl based anesthesia for cardiac catheterization for children with congenital heart disease.* R. VAN EYNDE, K. REYNTJENS, \*L. FOUBERT, A. MOERMAN, D. DE WOLF, E. MORTIER. Departments of Anesthesia and Pediatric Cardiology, University Hospital Ghent, \*Department of Anesthesia, OLV, ZH Aalst.

### Introduction

Diagnostic and interventional cardiac catheterization in children is increasingly performed under general anesthesia. The short acting mu opioid receptor agonist remifentanyl has apparently an excellent pharmacological profile in this setting. However, vasodilation and bradycardia may constitute a problem in children with congenital heart disease (CHD). Therefore we investigated whether intravenous (IV) glycopyrrolate could prevent bradycardia in this setting.

### Methods

After Ethics Committee approval and written parental informed consent, 45 children (aged 1d-3 year, ASA 2 or more) were enrolled in a randomised double blind study. Standard monitoring included five leads ECG, non invasive blood pressure, capnography, pulse oximetry and gas analysis (Datex AS 5). Mask induction with sevoflurane 8-6-42% in oxygen-air was followed by IV remifentanyl (0.15 µg/kg/min), cisatracurium (0.2 µg/kg) and glycopyrrolate (0.6 or 12 µg/kg, respectively group 0, 6 and 12). After nasal intubation, sevoflurane was reduced to 0.6 MAC in oxygen/air and paracetamol (20mg/kg) was administered rectally.

### Results

The groups were comparable for demographic data. Statistical analysis was performed using repeated mea-

asures analysis of variance and a Dunnett multiple comparisons test with  $p < 0.05$  considered significant. In group 0, heart rate decreased significantly from 12.5 min. on ( $p < 0.01$  vs baseline) whereas in group 6 and 12 no decrease in HR was seen for at least 45 min. In the 12 group significant tachycardia was seen between 5 and 9 minutes after induction. HR is shown in fig 1

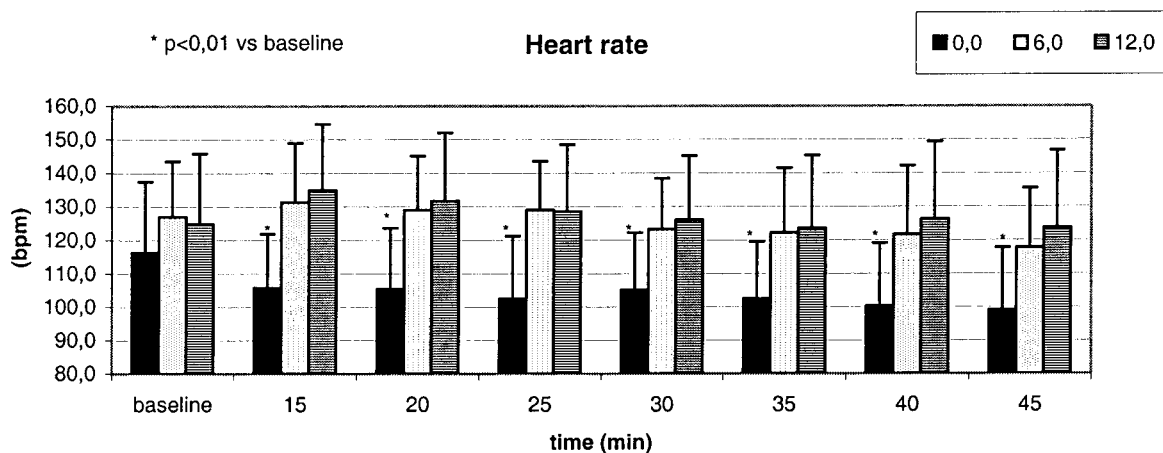
Systolic blood pressure decreased from 20 min on in all 3 groups, diastolic blood pressure in the 6 and 12 group only ( $p < 0.05$ , both vs baseline).

### Conclusions

Intravenous glycopyrrolate effectively prevents bradycardia during remifentanyl-sevoflurane anaesthesia for cardiac catheterisation in children with congenital heart disease. The use of 12 µg/kg glycopyrrolate gives no additional benefit compared to 6 µg/kg.

### References

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*Maternal haemodynamic effects following combined spinal epidural anesthesia for Cesarean section: dose response effects of hyperbaric bupivacaine.* I. WILLEKENS, D. VAN SCHOUBROECK, J. JANI, E. VANDERMEERSCH, M. VAN DE VELDE. Department of Anesthesiology and Obstetrics and Gynecology, UZ Gasthuisberg, Leuven.

### Introduction

Combined spinal epidural (CSE) anesthesia for cesarean delivery is growing in popularity as the anesthetic technique of choice. One of the theoretical advantages is the reduction in incidence and severity of hypotension if lower initial spinal doses are used. The scientific data to support these theoretical considerations is limited (1, 2). Thus we initiated a randomized, blinded trial to evaluate the haemodynamic effects of incremental doses of hyperbaric spinal bupivacaine as part of a CSE anesthesia technique.

### Methodology

Following ethical committee approval and written patient informed consent, 45 ASA I and II women carrying term pregnancies scheduled for elective C-section, were randomized to three study groups. All patients underwent CSE anesthesia, at the L3-L4 interspace whilst seated. The intrathecal mixture consisted of 2.5 µg sufentanil combined with either 6.5 (L-group), 8 (M-group) or 9.5 (H-group) mg hyperbaric bupivacaine. Demographic data, obstetric data, visual analogue scale (VAS) score for pain, number of anesthetist interventions for pain, haemodynamic data and neonatal outcome were recorded. Data were analyzed using analysis of variance and appropriate parametric and non-parametric tests.

### Results

No differences in demographic and obstetric data were observed. Neonatal outcome was good in all groups. Hypotension was more pronounced in the H-group as compared to the L-group (see table). Severe hypotension (MAP > 20% decrease) occurred in more patients in the H-group as compared to the L-group. Anesthesia was good in all groups. Duration of effective anesthesia (block to cold sensation > T2) was prolonged in the H-group as compared to the L-group (96 ± 27 vs 69 ± 19 respectively, p < 0.05 vs H-group)

### Discussion

From these preliminary results we conclude that reducing the spinal dose of hyperbaric bupivacaine as part of a CSE technique of anesthesia, confers significant advantages in terms of maternal haemodynamic stability. Hypotension is less severe, requires less treatment and is much shorter in duration. However, duration of anesthesia is limited.

### References

1. Crowhurst J. A., Birnbach D. J., ANESTH. ANALG., **90**, 241-242, 2000.
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Table

Haemodynamic data in the three study groups.

	H-group	M-group	L-group
% decrease MAP	33 ± 14	33 ± 18	22 ± 12 *
% decrease SAP	31 ± 13	29 ± 16	18 ± 13 *
% decrease DAP	40 ± 15	44 ± 15	32 ± 11
Lowest Syst BP	92 ± 16	93 ± 20	99 ± 15
Ephedrine (n)	15	15	15
Ephedrine (mg)	10(10-10)	10(10-10)	7(5-10)
Phenylephrine (n)	11	10	5 *
Phenylephrine (mcg)	238(0-400)	215 (100-300)	35 (0-100) *
Hypotension (n)	15	12	14
Severe hypotension (n)	13	9	4 *
Duration hypo (mm)	15 ± 10	15 ± 8	5 ± 4 *

\* p < 0.05 versus H-group; # p < 0.05 versus H- and M-group ; Data are presented as mean ± SD or as number of group total or as median and interquartile (25-75) range.

### Validation of arterial thermodilution and pulse contour analysis with a brachial artery catheter.

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#### Introduction

Pulse contour analysis is gaining clinical acceptance as a less invasive and continuous method to measure cardiac output (CO). Validation studies have consistently used a femoral artery catheter but in the setting of cardiac surgery this may interfere with surgical access to the groin (1). The brachial arterial approach may therefore be a more acceptable alternative for this purpose, however, its accuracy has not yet been reported in that setting. Since both the pressure waveform and the trajectory of the thermal tracer differ from the femoral artery system, the aim of this study was to validate the pulse contour (PC) and arterial (A) CO system using a 4 French brachial artery thermistor-tipped catheter (PiCCO Plus, Pulsion, Munich, Germany) with an updated software algorithm (version 5.5).

#### Materials and Methods

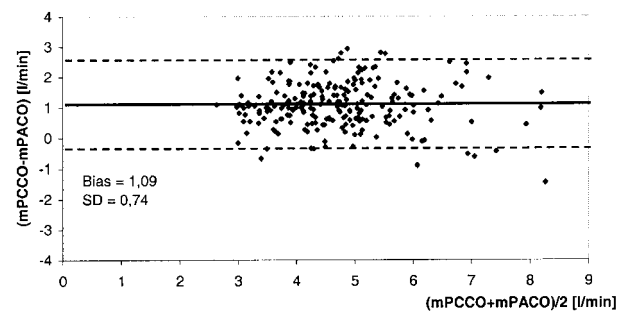
After approval by the Institution's Ethical Committee and patient's informed consent, twenty-three adult patients undergoing OPCAB surgery were studied. Exclusion criteria were moderate to severe aortic valve disease, tricuspid regurgitation and atrial fibrillation. 846 measurements (in 248 sets) of coupled PCCO, ACO and reference pulmonary artery (PA) CO were performed during an average of ten time points per patient including a dobutamine challenge of 3-10 mcg.kg<sup>-1</sup>.min<sup>-1</sup>. ACO and PACO were simultaneously assessed by at least three bolus injections of ice-cold saline. The PC system was calibrated only once in each patient at the beginning of the study. Regression and Bland-Altman analyses were performed to assess accuracy and precision (2).

#### Results

Catheter insertion was successful in all patients and no adverse effects occurred. Absolute values of PACO

ranged from 2,01 to 8,99 L/min. With ACO, bias was 0,91 L/min and limits of agreement (LOA = 2 SD of the bias) were  $\pm 0,98$  L/min. PCCO showed a bias of 1,09 L/min and LOA of  $\pm 1,49$  L/min (fig 1). The coefficient of variation (for consecutive measurements during a single set) for ACO was 6.4% as compared to 4.1% for PACO, but a fast injection of at least 15 ml ice-cold saline (injectate temperature below 8°C) was mandatory to achieve reproducible measurements.

Fig 1 : PACO versus PCCO



#### Conclusions

The results of the present study show that both ACO and PCCO, determined with the brachial artery catheter, have a close agreement with standard PACO but tend to consistently overestimate CO by 1 L/min. Further improvements of the software algorithm may be required to further optimize this clinically appealing technique, specifically for brachial arterial application.

#### References

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