

# Abstracts of the Research Meeting of the SARB

Summer 2002

*Which oxygen/air mixtures can be used safely in a circle system ?*. J. VAN ALPHEN\*, J. F. A. HENDRICKX\*, D. VANDEPUT\*, T. DELOOF\*, J. CODDENS\*, A. M. DE WOLF\*\*. Departments of Anesthesiology of the \*OLV Ziekenhuis, Aalst, Belgium ; \*\*Northwestern University Medical School, Chicago, IL 60611.

## Introduction

Inspired hypoxic mixtures can form with apparently "safe" (non-hypoxic) mixtures being delivered at the common gas outlet with the use of air or certain O<sub>2</sub>/air mixtures in a circle system, especially with low fresh gas flow (FGF). Under these conditions N<sub>2</sub> can accumulate, leading to hypoxic gas mixtures due to O<sub>2</sub> uptake by the patient and rebreathing of O<sub>2</sub> depleted exhaled gases. Because previously published mixing charts for O<sub>2</sub>/air were intended for use with non-rebreathing systems (such as commonly used in the intensive care unit) (1), we examined which O<sub>2</sub>/air mixtures could be used safely in a circle system in awake volunteers.

## Methods

After obtaining IRB approval and informed consent, 8 volunteers were enrolled in this study. While applying a tightly fitting clear plastic face mask and sitting upright, the volunteers were asked to breath regularly from a circle system (Anesthesia Delivery Unit, Datex-Ohmeda, Helsinki, Finland). We determined which O<sub>2</sub>/air mixtures ensured an inspiratory O<sub>2</sub> concen-

tration (F<sub>I</sub>O<sub>2</sub>) of 30% with each of the following total FGFs : 8, 4, 2, 1, 0.8 and finally 0.5 L/min. The volunteers were monitored using an ear lobe pulse oximeter and inspiratory gases were analysed using a multigas analyser (M-CAiOV compact module, Datex-Ohmeda, Helsinki, Finland). Gases sampled by the multigas analyser (approximately 200 ml/min) were scavenged. F<sub>I</sub>O<sub>2</sub> and SpO<sub>2</sub> values were downloaded and stored in a spreadsheet every 10 s. The ratio of the O<sub>2</sub> FGF to the total FGF to maintain F<sub>I</sub>O<sub>2</sub> at 30% was calculated and expressed as percentage. Results are expressed as mean ± standard deviation (SD).

## Results

The volunteers' age, height, and weight were 31 ± 4 years, 176 ± 6 cm, and 71 ± 9 kg, respectively. Five males and 3 females were enrolled. The composition of the O<sub>2</sub>/air mixture to maintain F<sub>I</sub>O<sub>2</sub> at 30% in all volunteers depended on the total FGF. The relative proportion of O<sub>2</sub> flow to a total FGF of 8, 4, 2, 1, 0.8 and 0.5 L/min had to be 15 (± 1) ; 18 (± 2) ; 25 (± 3) ; 43(± 5) ; 48 (± 6) ; and 71 (± 6) % respectively (Fig. 1).

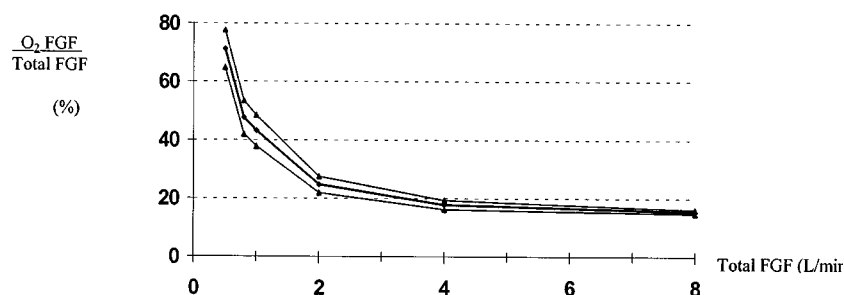


Fig. 1

## Discussion

We experimentally defined the mixtures of O<sub>2</sub> and air that would maintain F<sub>I</sub>O<sub>2</sub> > 30% in a circle system in awake adults. The relative proportion of O<sub>2</sub> to blended with air increases as the total FGF decreases. No extrapolations should be made from existing O<sub>2</sub>/air mixing charts to blend O<sub>2</sub> with air for use with low flow anesthesia techniques. Our observations are now being

used to facilitate the safe practice of MFA during CABG surgery in which O<sub>2</sub>/air mixtures are commonly used. Careful monitoring of the F<sub>I</sub>O<sub>2</sub> is essential.

## References

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*Haemodynamic comparison of remifentanyl and sufentanyl in carotid endarterectomy.* N. ARACI, M.D.\*\*, B. BELLENS, M.D.\*\*, P. EWALENKO, Ph.D.\*, J. MASSAUT, M.D.\*. \*Anaesthesiology department and \*\*Vascular Surgery Department, Brugmann University Hospital, Brussels, Belgium.

### Background

We compared the haemodynamic stability during anaesthesia with sevoflurane/oxygen in nitrous oxide, remifentanyl or sufentanyl as adjuncts in a balanced anaesthesia for carotid endarterectomy (1).

### Methods

Thirty one patients were assigned at random to receive either sufentanyl (group 1, 15 patients) or remifentanyl (group 2, 16 patients). For induction of anaesthesia, etomidate (0,1-0,2 mcg/kg) and sufentanyl (0,1-0,2 mcg/kg) or remifentanyl (0,15-0,3 mcg/kg/min) were given, followed by boluses of sufentanyl (0,1-0,2 mcg/kg) or infusion of remifentanyl (0,1-0,3 mcg/kg/min). Anaesthesia was maintained with

sevoflurane (Et 0,9%) and a 50% mixture of N2O/O2. The statistical analysis of the haemodynamic variables were performed by a multivariate test (ANOVA). Mean blood pressure (MBP) and heart rate (HR) were analysed along the first hour of anaesthesia and at following moments : induction, intubation and incision time (2).

### Results and Discussion

When comparing group 1 to group 2, there is no difference in the haemodynamic changes when we use remifentanyl or sufentanyl. A significant decrease of MBP and HR was revealed during and at different time of anaesthesia for both groups. Remifentanyl provided a rapid awakening and an early opportunity for neurologic examination.

Comparison of blood pressure and heart rate along anaesthesia

	Into the group	Between the groups
MBP	remifentanyl $p \leq 0.05$ sufentanyl $p \leq 0.001$	$p = 0.07$
HR	remifentanyl $p \leq 0.05$ sufentanyl $p \leq 0.05$	$p = 0.3$

Comparison of mean blood pressure and heart rate at induction, intubation and incision time

	Into the group	Between the groups
MBP	remifentanyl $p \leq 0.001$ sufentanyl $p \leq 0.001$	$p = 0.38$
HR	remifentanyl $p \leq 0.001$ sufentanyl $p \leq 0.001$	$p = 0.38$

### Conclusions

Haemodynamic stability was similar with remifentanyl or sufentanyl in patient undergoing carotid endarterectomy . We conclude that remifentanyl is a reliable alternative to sufentanyl in that surgery.

### References

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2. ANESTH. ANALG., **93** (6), 1402-9, 2001 dec.

*PiCCO and laparoscopic esophagectomy : is there any interest ?* M. DOIGNIES\*, I. PASTIJN\*, G. B.CADIÈRE\*\*, M. SOSNOWSKI\*. \*Service d'Anesthésiologie, CHU Saint-Pierre, 1000 Bruxelles ; \*\*Service de Chirurgie digestive, CHU Saint-Pierre, 1000 Bruxelles.

### Goal

To study the impact of laparoscopic esophagectomy on several physiologic data and to identify the most common complications.

### Methodology

From March 2002 to June 2002, every patient admitted for an elective laparoscopic esophagectomy was included in this prospective study. The patients characteristics were as followed : 7 patients (7 men, 0 woman), mean age 57 years (range : 27-77 years), ASA 1 to 3. Indication for surgery was : neoplastic lesion on a Barrett's esophagus (85%) or caustic ingestion (15%). Every patient had either exclusive laparoscopic esophagectomy (28%) or followed by cervicotomy (72%). No thoracotomy was needed.

Induction of anesthesia was as followed : propofol (1.5-2.5 mg/kg), sufentanil (0.1-0.2 µg/kg) and cisatracurium (0.15 mg/kg), single lumen endotracheal tube was then positioned. Anesthesia was maintained with sevoflurane, continuous sufentanil and cis-atracurium (monitoring of neuromuscular blockade). At the end of the procedure, patients were transferred to the ICU and maintained anesthetized until acceptable physiological values (T°, pH, EtCO<sub>2</sub>, ...) were recorded.

Monitoring : ECG, NIBP, SaO<sub>2</sub>, EtCO<sub>2</sub>, invasive arterial pressure (femoral artery)  
Central venous pressure  
Continuous cardiac output measure (PiCCO, Pulsion Medical Systems)

### Results

Mortality 0%

Two major complications were observed :

Pneumothorax was present in every case (70% bilateral)

Cardiac compression (during dissection of the mediastinum).

PiCCO showed a time dissociation between the drop in arterial pressure and the drop of cardiac output.

### Conclusions

The intra-operative rapid management of the patient relies on cardiac output knowledge. Consequently, the use of a continuous cardiac output device such as the PiCCO is of interest, since PiCCO is a less invasive method of measurement than a Swan Ganz catheter.

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5. S. G. Sakka, K. Reinhart, K. Wegscheider, A. Meier-Hellmann, *Is the placement of a pulmonary artery catheter still justified solely for the measurement of cardiac output ?*, J. CARDIOTHORAC. VASC. ANESTH., **14** (2), 119-24, 2000 Apr.

*Long-term follow-up of patients of the University Hospitals of the K.U.L. that participated in the European Mivazerol Trial for prevention of cardiac morbidity/mortality.* T. SYKORA, J. VAN HEMELRIJCK, E. VANDERMEERSCH, J. P. MULIER. Universitaire Ziekenhuizen, Katholieke Universiteit Leuven.

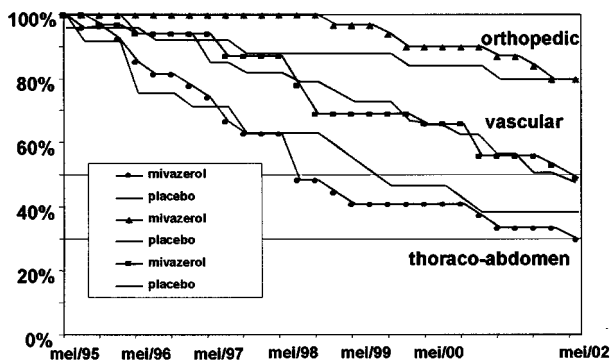
Mivazerol is an alpha<sub>2</sub> adrenergic agonist submitted to clinical trials as a means to prevent adverse cardiac outcome in perioperative patients with coronary artery disease (CAD). The European Mivazerol Trial investigated the effect of mivazerol on the incidence of perioperative cardiac complications during non-cardiac surgery in patients with or at risk for CAD during a period of 30 days postoperatively (1). Mivazerol did not reduce the incidence of myocardial infarction and cardiac death significantly. Subgroup analysis, however, revealed that the incidence of cardiac events and cardiac death was lower in vascular surgery patients receiving mivazerol compared to placebo, although there was no significant reduction in the incidence of myocardial infarction. It has been demonstrated that the risk of long-term adverse cardiac outcome increases in patients with postoperative cardiac ischemia (2). We performed "a long-term follow-up" telephone interview of the 224 patients who participated in the mivazerol-study at our center.

*Methods*

The study was approved by our hospital's Ethics Committee and all participants gave written informed consent before the telephone interview, taken from the patient, or a family member, or his general practitioner. Data regarding a period starting 30 days postoperatively (May 1995) till June 2002 were acquired. Questions were directed primarily to detect possible adverse cardiac outcomes. Cause of death was recorded, as were non-cardiac diagnoses. Kaplan-Meier survival curves were constructed and cardiac mortality/morbidity data compared between patients receiving mivazerol or placebo for all patients, and in each surgical group separately (Fisher's exact test).

*Results*

Data of 78% of all patients were obtained



*Conclusions*

Orthopedic patients had the best survival (79.3%) ( $p < 0.001$ ). Mortality was highest in the thoracic and abdominal surgery patients (69%) but mainly due to non-cardiac problems. Mortality in vascular patients was 54.5%, and due to cardiac problems in 36% of the cases. Cardiac events were frequent in all survivors. Mivazerol had no influence on long-term outcome.

	orthopedic		thorax/abd		vascular	
	miva n = 28	placeb n = 25	miva n = 30	placeb n = 25	miva n = 34	placeb n = 32
Total mort.	6	5	22	16	19	17
Cardiac mort.	3	2	2	2	7	6
Cerebrovasc.	1	0	0	0	1	1
Survivors with min cardiac event	17/22	19/20	6/8	3/9	11/15	11/15

*References*

1. ANESTHESIOLOGY, **91**, 951-61, 1999.
2. JAMA, **268**, 233-9, 1992.

*TCI for sufentanil improves hemodynamics and decreases sufentanil requirements during infrarenal aortic surgery.* David JOB, Gilles GODET, Pierre CORIAT. Department of Anesthesiology, Pitié-Salpêtrière Hospital, Paris, France.

### Background

Sufentanil (S) is a potent opioid with rapid emergence after administration, but sufentanil may induce detrimental hemodynamic effects when overdosed. Target controlled infusion (TCI) of sufentanil with infusion adapted to pharmacokinetic models, might improve hemodynamics. For this reason we evaluated intra- (IO) and postoperative (PO) hemodynamics, S requirement during anesthesia, and PO morphine requirement, in patients scheduled for infrarenal aortic surgery, and receiving either continuous iv weight-adjusted infusion (Siva) or TO for S (TCIS).

### Methods

Forty- six patients were enrolled in this randomized prospective study and gave informed consent after approval of the study by the ethic committee of our institution. In all patients, premedication consisted of po midazolam 5 mg. Monitoring included invasive arterial pressure and bispectral index (BIS). Patients received a standardized anesthetic technique consisting of TCI for propofol (Diprifusor, AstraZeneca) and atracurium 0.5 mg/kg. Initial central nervous target was set at 2.5 mcg/ml then progressively decreased according to BIS values which were kept between 40 and 60 during surgery. Added to this regimen the patients received either Siva or TCIS.

- Twenty three patients received Siva (bolus of 0.25 mcg/kg then 0.25 mcg/kg/h for induction and

intubation, with the infusion rate decreased near to 0.1 mcg/kg/h after intubation, adapted by step of 0.05 mcg/kg/h according to hemodynamic parameters during surgery).

- Twenty three patients received TCIS (Hudson model, Rugloop), effect-site concentration at 0.1 ng/ml during induction than adapted by step of 0.05 ng/ml up to 0.4 ng/ml according to hemodynamic parameters.

All patients received a 50% mixture of N2O/O2. Administration of S was stopped 30 min before end of surgery, while propofol and N2O were maintained until skin closure. PO analgesia included propacetamol (2 g) and morphine (0.15 mg/kg), 1 hour after end of surgery. All patients received a PCA Morphine for at least 24 h.

Hypotension, hypertension, bradycardia and tachycardia were defined as 30% change versus baseline pre-operative values. Data were analyzed using unpaired-t test.

### Results

TCIS lead to a significantly lower requirement of S without difference in propofol requirement. Siva was significantly associated with more frequent episodes of 10 hypotension, in comparison with TCIS. Need for vasoactive agents was not significantly different between both groups. Need for morphine titration is unsignificantly lower in TCIS group.

	Siva	TCIS	P
Sufentanil requirement (mcg/ min of anesthesia)	0.7 ± 0.2	0.55 ± 0.2	0.01
Propofol requirement (mg/min of anesthesia)	5.9 ± 2.0	5.5 ± 21.8	ns
IO hypotension (n)	15	8	0.04
IO hypertension (n)	6	4	ns
IO bradycardia (n)	7	5	ns
IO tachycardia (n)	3	1	ns
Ephedrine (mg)	14 ± 14	10 ± 9	ns
Phenylephrine (mcg)	121 ± 161	92 ± 145	ns
PO need for β-blockers (n)	7	8	ns
PO need for nicardipine (n)	0	2	ns
Morphine (mg) during titration	9 ± 6	7 ± 6	ns
Morphine (mg) until POD1	42 ± 23	34 ± 10	ns

### Conclusion

TCIS allows an improved hemodynamic stability when compared to Siva, this effect is probably related to lower administered dose of sufentanil.

### References

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*Bispectral Index changes during sevoflurane anesthesia : a comparative study between adults and children.* B. JUBERTIE, A. E. BENNOUN, P. TROUILLER, I. MURAT, I. CONSTANT. Department of Anesthesia, Trousseau Hospital, Paris, France.

*Background*

The Bispectral index (BIS) assesses anesthesia depth in adults (1). The relationship between BIS and sevoflurane concentration in children has been demonstrated to be similar to that seen in adult patients (2). The aim of this study was to compare BIS changes during sevoflurane induction in children versus adults.

*Methods*

After written informed consent and approval of the ethic committee, 15 children ( $9 \pm 2$  years, mean  $\pm$  sd) (group C) and 15 adults ( $19 \pm 6$  years) (group A) scheduled for middle-ear surgery were included. All subjects were premedicated with hydroxyzine (1mg/kg). Rapid induction was performed with 8% sevoflurane in 50% N<sub>2</sub>O-50% O<sub>2</sub>. After tracheal intubation at central pupils (CP), patients were mechanically ventilated, and then, three 10 min-epochs with a stable expired concentrations of sevoflurane (4%, 2% and 1% in 50% N<sub>2</sub>O-50%

O<sub>2</sub>) were studied prior to surgery. Time to obtain loss of eyelash reflex (LER) and CP were noted. BIS was continuously recorded during induction until the end of the study. BIS values were noted at baseline, at LER, at CP and at the end of the three 10 min-epochs of stable sevoflurane concentration. In addition the nadir of BIS and the corresponding time were noted. Data between the 2 groups were compared using ANOV A for repeated measure, while  $p < 0.05$  was considered as significant.

*Results*

(table) : Time to obtain LER and CP was similar in the 2 groups. All subjects were successfully intubated. At baseline and at CP, the BIS was similar in the 2 groups, whereas the BIS at LER was lower in children. Moreover the nadir of the BIS was lower and occurred earlier in children compared to adults. However, at the three stable expired concentrations of sevoflurane (4-2-1%) the BIS was higher in children.

	baseline		LER		Nadir		CP	Sevo 4%	Sevo 2%	Sevo 1%
	BIS	BIS	Time (s)	BIS	Time (s)	BIS	Time (s)	BIS	BIS	BIS
Group A	93 $\pm$ 5	81 $\pm$ 16	58 $\pm$ 21	14 $\pm$ 6	150 $\pm$ 38	31 $\pm$ 9	271 $\pm$ 49	26 $\pm$ 15	34 $\pm$ 8	52 $\pm$ 11
Group C	91 $\pm$ 5	57 $\pm$ 28 **	59 $\pm$ 22	9 $\pm$ 3 *	115 $\pm$ 37 *	36 $\pm$ 12	265 $\pm$ 51	34 $\pm$ 7 *	41 $\pm$ 6 **	64 $\pm$ 2 ***

*Conclusion*

Noticeable differences of BIS were evidenced between adults and children during sevoflurane anesthesia. These differences may be due to pediatric pharmacodynamic and/or pharmacokinetic specificities, or to specific pediatric features of EEG under anesthesia.

*References*

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## Comparison of effect-site propofol concentrations at loss of consciousness and recovery.

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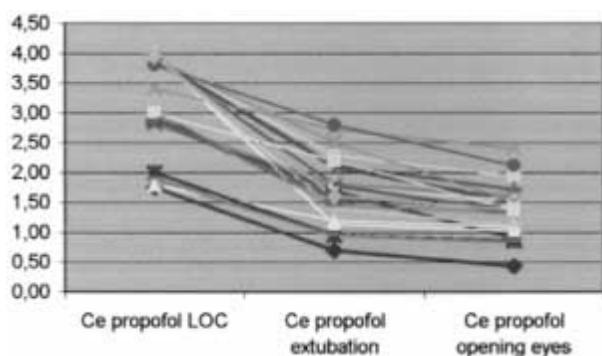
### Background

Following the concentration of propofol at the effect site ( $C_e$ ) during target controlled infusion (TCI), is more sensitive than following the plasma concentration ( $C_p$ ) of propofol (1). However, results obtained are markedly dependent on the accepted  $k_0$  included in the chosen pharmacokinetic set (2). Our purpose was to study if there was a relationship between propofol  $C_e$  at loss of consciousness (LOC) and at recovery when a population pharmacokinetic-pharmacodynamic set of propofol was used (3). During both periods, remifentanyl  $C_e$  was targeted at the same level using the pharmacokinetic set of Minto et al (4) which has been associated with an acceptable predictive accuracy.

### Materials and methods

After local ethical committee approval and informed consent, 20 adult ASA 1- 11 patients scheduled for

elective minor surgery were studied. All patients were premedicated with alprazolam 0.5 mg orally. After having targeted a remifentanyl  $C_e$  at 1 ng/ml, propofol  $C_e$  was progressively increased by steps of 1  $\mu\text{g/ml}$  until LOC was obtained. Patients were asked to respond to a simple verbal order (eye opening) every 15 seconds. During surgery, propofol was maintained at the level of  $C_e$  recorded at LOC and remifentanyl  $C_e$  was adjusted according to the intensity of the surgical stimulation. At the end of surgery, remifentanyl was decreased and targeted at 1 ng/ml again. Thereafter, propofol infusion was stopped. During the awakening period, patients were tested every 15 seconds and propofol  $C_e$  were recorded at tracheal extubation and eyes opening. BIS-monitoring was recorded during the whole study. The t-paired test was used to compare propofol  $C_e$  at LOC and during the recovery period. Probability values less than 0.05 were considered as statistically significant. Results are expressed as mean  $\pm$  SD.



Age (years)	50,6 $\pm$ 14,7
Weight (kg)	70,5 $\pm$ 11,9
Length (cm)	168,9 $\pm$ 9,9
Infusion duration (min)	149,3 $\pm$ 61,6
Propofol $C_e$ at LOC ( $\mu\text{g/ml}$ )	3,2 $\pm$ 0,8
Propofol $C_e$ at eye opening ( $\mu\text{g/ml}$ )	1,4 $\pm$ 0,5
BIS at LOC	59,7 $\pm$ 10,3
BIS at eye opening	78,9 $\pm$ 8,8

### Results

The evolution of propofol  $C_e$  at LOC, extubation and eyes opening is depicted for each patient in the figure and demographics is shown in the table. Using the set of Schnider *et al.* (3), propofol  $C_e$  at LOC is significantly higher than during the recovery for all patients with a mean value of  $3.2 \pm 0.8 \mu\text{g/ml}$  at LOC and  $1.4 \pm 0.5 \mu\text{g/ml}$  at eyes opening ( $p < 0.01$ ).

### Discussion and conclusion

Using the population set of Schnider *et al.* (3), the calculated propofol  $C_e$  values required during the recovery period are smaller than the propofol  $C_e$  values observed at LOC in young adult patients undergoing

minor surgery. This difference could partially be explained by either a positive bias of the pharmacokinetic set in our study conditions or by a slower return of propofol from the effect-site to the plasma after long term infusion. During total intravenous anesthesia using effect-site propofol and remifentanyl TCI, the targeted propofol  $C_e$  associated with awakening could be extrapolated by halving the propofol  $C_e$  values observed at LOC if remifentanyl  $C_e$  are at the same level.

### References

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*The evaluation of a risk score to reduce the incidence of regurgitation and pulmonary aspiration during routine colonoscopy.* I. RAETSCHELDERS, M.D., W. STOCKMAN, M.D., F. GALLANT, M.D., M. VERMAUT, M.D., S. VERVAEKE, M.D., E. VANDERMEERSCH, M.D., Ph.D., P. DOBBELS, M.D., D. DE KEGEL, M.D., J. WILLAERT, M.D. (†). Heilig Hart Ziekenhuis, Wilgenstraat 2, 8800 Roeselare.

### Introduction

Total colonoscopy is often performed under light sedation, administered by the endoscopist (1). We perform it under general anesthesia without routine intubation, because of the high success ratio and the safety issues of light sedation administered by a non-anesthetist. We previously reported an incidence of moderate to severe regurgitation of 2 on 1368 patients (0.15%) (2). In this study, we evaluated whether a Colonoscopy Regurgitation Score (CORES) can reduce the incidence of regurgitation and pulmonary aspiration.

### Methods

All patients presenting for total colonoscopy from June first 2001 until May 31<sup>st</sup> 2002 were included. Approval of the ethical committee to use patient data was obtained. Bowel cleansing took place in the morning by drinking Klean-prep®, and was to be finished before 11 A.M. Colonoscopy was performed between 1 and 4 P.M. Anesthesia consisted of intravenous propo-

fol-alfentanil or propofol-remifentanil. Patients were not intubated (mask airway), except as guided by the colonoscopy regurgitation score (CORES) (see table 1 and 2) developed by one of the authors. The score was developed by analyzing the regurgitation incidents in our previous study and reviewing literature and knowledge on the subject. The score is calculated by assigning one point to each item present.

Signs of regurgitation were monitored and classified as minor, moderate or severe. *Minor*: all incidents of hiccupping, desaturation, coughing, laryngospasm, oro-pharyngeal regurgitation of fluid during the procedure but without the need for oxygen therapy or intubation, and without fever or prolonged hospital stay. *Moderate*: need for post-procedural oxygen therapy, administration of antibiotics, presence of fever, prolonged hospital stay or infiltration on chest X-ray, but no need for mechanical ventilation. *Severe*: need for post-procedural mechanical ventilation and ICU-admission. Data are presented as mean  $\pm$  standard deviation.

Table 1  
CORES (colonoscopy regurgitation score)

1. Admitted patient
2. Patient on CCU/ICU
3. Emergency procedure
4. ASA III or higher
5. History of regurgitation during anesthesia
6. Insuline dependent diabetes
7. Nausea/Vomiting during bowel cleansing
8. NPO for less than 2 hours
9. Obesity (BMI > 30)
10. Large hiatus hernia (endoscopic diagnosis)
11. Suspicion or signs of active GI bleeding
12. Suspicion or signs of (sub)obstruction

### Results

Table 3  
patient characteristics

Number of Patients	1064
Males / Females	529/535
Age (years)	59.2 $\pm$ 15.6
ASA-Classification	
I	53%
II	37%
III	9.6%
IV	0
Weight (kg)	72.5 $\pm$ 12.6
Males	77.0 $\pm$ 11.6
Females	68.1 $\pm$ 11.6

Table 2  
CORES score

= 0	Low risk	no intubation advised
= 1	Slightly increased risk	intubation to be considered
= 2	Increased risk	intubation strongly to be considered
$\geq$ 3	High risk	intubation strongly advised

Table 4  
procedure data

Amount of preparation fluid (liters)	4.5 l
NPO time (minutes)	259
Number of patients NPO < 2 hours	7 (0.66%)
Number of patients NPO between 2 and 3 hours	107 (10%)
Number of patients NPO between 3 and 4 hours	278 (26%)
Number of patients NPO > 4 hours	576 (54%)
Unknown	96 (9.0%)
Colonoscopy complete : colon fully examined	1032 (96,9%)
Colonoscopy incomplete : colon not fully examined	32 (3,1%)
Colon perforations	0
Mean dose of alfentanil (mg) (n = 848)	1.1 mg
Mean dose of propofol (mg)	283.8 mg
Mean duration of colonoscopy (minutes)	19.1 min.
Number of patients not intubated	994 (93.4%)
Number of patients intubated	70 (6.6%)
Number of patients intubated in previous series (2)	26/1368 (1.9%)
Mean CORES for unintubated patients	0.54 $\pm$ 0.72
Mean CORES for intubated patients	2.54 $\pm$ 1.19
Reasons for intubation	
Intubation for gastroscopy/colonoscopy procedure	2
Intubation based on CORES criteria	62
Intubation for other reasons, not CORES	1
Intubation during procedure	5

Table 5  
results

	Number of patients
No regurgitation	1032 (97%)
Minor regurgitation	30 (2.82%)
Moderate regurgitation	2 (0,19%) (cores 0 and 2)
Severe regurgitation	0

### Conclusions

Performing all total colonoscopies, under general anesthesia results in a very high colonoscopy success

ratio (96.9%). However, the use of our CORES risk score did not reduce the incidence of moderate to severe regurgitation, although it increased the number of patients being intubated for the procedure from 1.9% to 6.6% ( $p < 0.05$ ).

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*Is hyperlactatemia associated with poor outcome after cardiopulmonary bypass surgery.* P. SAKR, S. DE HERT, P. VAN DER LINDEN, A. DAPER, A. TREUCHAUT, M. LEVEULET. CHU Charleroi, UZA Antwerpen, CUB Erasme-Brussels.

#### *Background and goal of study*

Prognostic significance of the occurrence of hyperlactatemia after cardiac surgery remains controversial (1). The present study assessed retrospectively whether the presence of hyperlactatemia after cardiopulmonary bypass (CPB) surgery was related to increased postoperative mortality and morbidity.

#### *Materials and methods*

After institutional approval, medical charts of 1032 consecutive patients who underwent non-emergent cardiac surgery with CPB from January 1998 to June 2001 were reviewed. The anesthetic and CPB procedures were performed according to standard institutional protocols. Blood lactate level was measured at arrival in the ICU. Linear regression analysis was used to relate lactate values to pre- and perioperative risk factors. This analysis was followed by a backward stepwise multiple regression analysis. Postoperative morbidity was evaluated as the development of one or more organ failure. This included the presence of a low cardiac output status (inotropic support > 24 h), a prolonged intubation (> 48 h), a postoperative infection, the need for hemodialysis, and the development of liver dysfunction (SGOT increase > 2.5 the normal value). Linear regression analysis was used to relate lactate values to postoperative mortality and morbidity. Hyperlactatemia was defined as a lactate value > 25 mg/dl.

#### *Results and discussion*

Data : mean $\pm$ SD	Normal Lactate (N = 636)	Hyperlactatemia (N = 396)
Age (years)	66 $\pm$ 11	62 $\pm$ 11**
Diabetes (%)	18	25**
Surgery time (min)	227 $\pm$ 51	245 $\pm$ 51**
Mortality (%)	2.5	5.8**

(\*\* p < 0.01 vs hyperlactatemia)

Regression analysis identified age (p < 0.001), diabetes (p = 0.0048), surgery, CPB and aortic clamping times (all p < 0.0001) and difficult weaning from CPB (p < 0.0001) as independent variables to predict increased postoperative lactate values. Postoperative lactate significantly correlate with in hospital mortality (R = 0.184, p = 0.0003) and the development of organ failure (r = 0.184, p = 0.0003).

#### *Conclusion(s)*

In the conditions of our study, hyperlactatemia after CPB surgery was associated with an increased postoperative mortality and morbidity.

#### *Reference*

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## Ilio-inguinal block with levobupivacaine for unilateral inguinal herniorrhaphy in adults.

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### Background

Postoperative pain management remains a significant problem following inguinal hernia surgery. Adequate analgesia is essential and may be provided through the use of an ilio-inguinal nerve block (INB). This technique has been associated with a safe and rapid recovery profile after ilio-inguinal herniorrhaphy (1, 2, 3, 4).

### Objective

This study investigated the effectiveness and patient satisfaction after an INB with levobupivacaine 0,25% in adults undergoing unilateral herniorrhaphy.

### Patients and methods

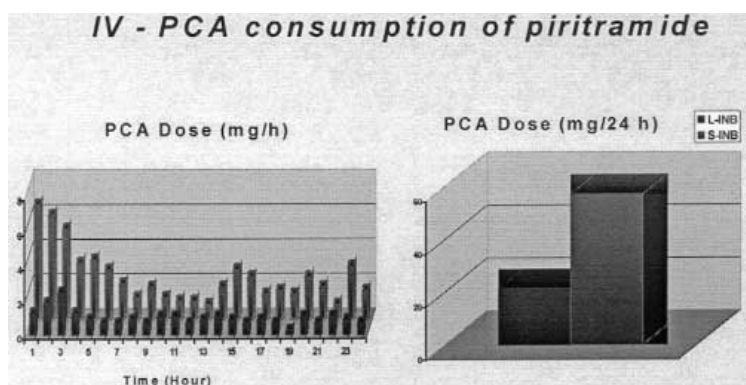
Following ethics committee approval and informed consent, twenty ASA physical status I-II patients, aged between 18 and 75 years, participated to this randomised single blinded clinical trial. They received either an INB with levobupivacaine 0,25% in a dose of 1 mg/kg (L-INB, n = 10) or placebo (S-INB) at the end of surgery. Their general anaesthesia regimen was standardized and consisted of TCI propofol, remifentanyl infusion and

cisatracurium for muscle relaxation. After arrival in the PACU all patients received a PCA system with a standardized piritramide regimen IV during 24 hours. Visual analogue pain scores (VAS) at rest and on movement were recorded. We also evaluated patients hemodynamics (BP, HR), oxygen saturation (SaO<sub>2</sub>), respiratory rate (RR), sedation and side-effects during 24 hours follow-up and their satisfaction score (0-10) at the end of the study period.

Results are expressed as mean values ± standard deviation. All parameters were compared between both groups by using the unpaired t-test after verification that the variances of the groups were not significantly different (F-test). A p-value < 0.05 was considered statistically significant.

### Results

Demographics, hemodynamics, SaO<sub>2</sub>, RR, sedation and side-effects did not reveal any statistical difference. However, piritramide requests scores during 24 hours postoperatively were lower in the L-INB group than in the S-INB group (L-INB : 21.4 ± 17.05 mg/24 hr - S-INB : 57.2 ± 30.1 mg/24 hr ; p < 0.01).



VAS scores at rest and on movement were also significantly lower in the L-INB group during the first two hours at rest and during six hours on movement (p < 0.05). Also the patients' satisfaction score (0- 10) during 24 hours postoperatively was higher in the L-INB group (L-INB : 9.2 ± 1.5 ; S-INB : 6.9 ± 1.7) (p < 0,05).

### Conclusion

Levobupivacaine 0,25% in a dose of 1 mg/kg appeared to be very effective and safe for pain relief after hernia repair in ilio-inguinal blocks after general anaesthesia.

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*Colonization and infection risk after continuous '3 in 1 block'. G. J. VAN GEFFEN, M.D., F. CAMU, M.D. Academic Hospital Flemish Free University Brussels, Laarbeeklaan 101, 1090 Brussels.*

### Introduction

Postoperative pain is a major concern after orthopedic limb surgery. After total hip arthroplasty, continuous femoral nerve block is effective for providing good pain relief with minimal side effects (1). Femoral venous catheterization has a high rate of bacterial colonization. Therefore the femoral sheath catheter, placed in the same region, might be of concern to the surgical team with regard to infectious complications (2). The purpose of the present study was to determine prospectively the incidence of femoral catheter bacterial colonization and or infection in post-operative adult patients having femoral nerve catheters inserted for post-operative analgesia.

### Methods

Patients scheduled for hip, femoral or knee surgery were prospectively included in the study. The procedure for catheter insertion was standardized. All patients received cefamandol 2-g i.v. pre-operatively. Continuous femoral nerve catheters were placed in the post anesthesia care unit according to the technique described by Winnie (3) with a nerve stimulator. The skin was disinfected with a chlorhexidin alcohol solution and draped with a sterile operative drape. After negative aspiration, 0,3 ml/kg ropivacaine 0,75% was slowly injected. The needle was removed through the plastic cannula and a 20-gauge catheter was treaded 6-10 cm into the femoral nerve sheath and after negative aspiration 0,1 ml/kg ropivacaine 0,75% extra was given. The catheter was secured with a transparent adhesive dressing. A bacterial filter was connected between syringe and catheter and the continuous infusion of ropivacaine 0,375%, 4 to 6 ml/h was started. Other postoperative pain relief was standardized, propacetamol 2 g/6 h and diclofenac 1 mg/kg/12 h. Rescue analgesia consisted of piritramid 0,15 mg/kg i.m. / 6 h. On the day of surgery the patient

was checked twice daily. On day one to three post-operatively the patient was visited once daily and a record was made of pain scores in rest and during motion. The insertion site was inspected looking for erythema, indurations or discharge at the site. After 72 hours the dressing of the catheter was removed and the skin around the insertion site was cleaned with chlorhexidin alcohol solution. The distal 3 to 4 cm of the catheter was cut with sterile scissors and sent to the laboratory. If the catheter was accidentally removed with the dressing as it was lifted from the insertion site, the tip of the catheter was still cultured but it was noted on the record. Reports were considered to be positive if bacterial colonies developed on agar cultures. 8 weeks after surgery, the surgical and catheter insertion site was inspected by the surgeon.

### Results

From December 2001 to 30 April 2002, 53 patients were included. 7 (13,2%) patients were excluded because of accidentally removing the catheter. 4 (7,5%) patients were excluded because the catheter was not cultured. Thus 42 (79,2%) catheters were studied. Pain-scores are listed in Table 1. Supplemental analgesia was infrequent. The median piritramid consumption was 0 mg for 0 - 24 hours, 0 for 24 to 48 and 0 for 48 to 72 hours. Bacterial analysis was performed for 42 catheters. Positive cultures were found in 9 (21,4%) patients. (Table 2) No patients showed clinical signs of infection or bacteriemia.

Table 1

Visual Analog Pain Scale Scores (0 = no pain, 10 = worst pain)

	6 h	24 h	48 h	72 h
VAS (rest)	0	0	0	0
VAS (movement)	2	2	2	1.5

Values are expressed as median (5-95) n = 42

Table 2

Bacterial complications at 72 hours

No colonization	33 (78,6%)		
Bacterial colonization	9 (21,4%)		
Colonization with bacteriemia	0		
One organism/catheter	6 (66,7%)	Two or more organism/catheter	3 (33,3%)
<i>Staphylococcus epidermidis</i>	2	<i>Staphylococcus epidermidis</i>	3
<i>Staphylococcus subsp. urealyticus</i>	1	<i>Enterococcus faecalis</i>	2
<i>Staphylococcus simulans</i>	1	<i>Escherichia coli</i>	1
<i>Pseudomonas aeruginosa</i>	1	<i>Enterobacter faecalis</i>	1
<i>Bacillus species</i>	1	<i>Pseudomonas aeruginosa</i>	1
	(3 catheters removed without skin disinfection)	<i>Klebsiella oxytoca</i>	1
			(2 catheters removed without skin disinfection)

With removal of the dressing the catheter was dislodged in 7 cases and sent for analysis without skin disinfection. In 5 patients the culture became positive, in two of them with more than 2 bacteria. In one patient with a removed, with *pseudomonas aeruginosa* infected knee prosthesis, the tip and Urine culture became positive with the same species. In another patient in whom baccillus species were cultured from the tip, at the day of removal of the catheter it was found that there was no bacterial filter connected. After 8 weeks, no septic complications were noted at tile surgical procedure site or at tile catheter insertion site by the surgeon.

#### Conclusion

We conclude that continuous femoral nerve block for postoperative analgesia is effective. There is a risk of bacterial colonization but this seems to have little clinical consequences. Systematic bacterial analysis of the catheter is not advised but infection requires immediate catheter removal, culture and treatment. Until 8 weeks

after femoral nerve catheter insertion no septic complications were noted.

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*Follow-up of patients with an anaphylactic reaction to a muscle relaxant : skin testing safely guides future use of muscle relaxants.* K. VRINTS, M.D., I. GEUDENS, M.D., F. SOETENS, M.D., F. SMOLDERS, M.D., P. VAN DER AA, M.D., M. SOETENS, M.D. Department of Anaesthesiology, Sint-Elisabeth hospital, Turnhout.

### Introduction

Skin testing usually identifies the causal agent of an allergic reaction during anaesthesia and guides future choice of anaesthetics. Virtually all intravenous anaesthetic agents can be tested with skin testing. Usually within the four to six weeks after the allergic reaction. Muscle relaxant allergy has a cross-sensitivity to other muscle relaxants. An incidence up to 60% is reported (1). In this survey we analysed the anaesthetic history of the patients after an anaphylactic reaction to a muscle relaxant and looked if they safely received other muscle relaxants based on skin testing.

### Methods

The records of patients with a post induction anaphylactic reaction to a muscle relaxant were analysed. Several items were recorded after an allergic reaction : age, gender, the requested amount of epinephrine, the incidence of cardiac massage and the postponement of surgery. Skin testing was done as described in the article of M. Fisher (2). Cross-sensitivity (positive skin test to more than one agent) between muscle relaxants was determined. Furthermore, we investigated if the patient got another anaesthesia after the reaction and if so, which muscle relaxants were used.

### Results

Between 1976-2001, 41 patients showed an anaphylactic reaction to a muscle relaxant, confirmed by

skin testing. Their mean age was 38 years (SD = 10,7) and most (29) were female. In 34 patients epinephrine was used with a mean dose of 1.8 mg (SD = 2, 12). 11 patients received cardiac massage and in 19 patients surgery was postponed. There was no serious postoperative morbidity or mortality. 9 of the 41 patients tested positive for more than one muscle relaxant (table 1).

Table 1

Cross-sensitivity between muscle relaxants

Positive intradermal skin test for :	Number of patients
Succinylcholine and Gallamine	4
Succinylcholine and d-Tubocurare	1
Succinylcholine, Pancuronium and Vecuronium	4

11 of the 41 patients received no anaesthesia after the reaction. In 11 patients regional or general anaesthesia without the use of muscle relaxants was used. On 26 occasions, 19 patients received general anaesthesia with the use of a muscle relaxant, which tested negative during skin testing. Type and frequency of muscle relaxants used after the anaphylactic reaction is shown in table 2. In the latter group none of the patients did an allergic reaction.

Table 2

Type and frequency of muscle relaxants used after the anaphylactic reaction

	Gall.	Panc.	Vec.	Roc.	Atr.	Mivac.
Positive intradermal skin test for :						
Succinylcholine		1	9	4	5	1
Gallamine					1	
Succinylcholine and Gallamine			1		2	
Succinylcholine and d-Tubocurare					1	
Succinylcholine, Pancuronium and Vecuronium	1					

### Conclusion

Because of cross-sensitivity between muscle relaxants and the possible necessity of muscle relaxation for future anaesthesia and surgery, it is necessary to test not only the muscle relaxant used during the suspected allergic reaction, but all available muscle relaxants. In

our survey, skin testing proved to be an effective way to select the safest muscle relaxant.

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