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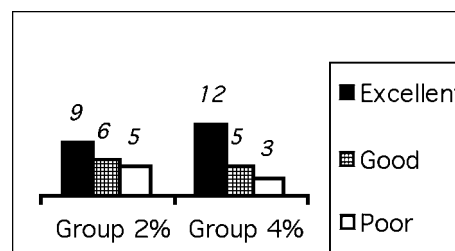
Tracheal intubation without the use of muscle relaxant : propofol, remifentanyl, and sevoflurane at two different end-tidal concentrations (2% and 4%). S. BAYAT MOKHTARI*, J. P. LECOQ*, J. C. CRES*, O. HEYMANS**, D. JACQUEMIN**, Y. GILON**, M. LAMY*, *Dep. Anesthesia and Intensive Care, CHU, Liège ; **Dep. Maxillo-Facial Surgery, CHU, Liège.

Introduction

Combinations of remifentanyl (Remi) (4 mg/kg) and propofol (PPF) (2,5 mg/kg) (1) or sevoflurane (end-tidal concentration "ET-Sevo" 8%) and Remi (2 mg/kg) (2) has been reported to allow acceptable tracheal intubation without the use of neuromuscular agents. These two studies were associated with decreased mean arterial pressure (MAP) and heart rate (HR), during induction time, but not afterwards. In this study, we evaluated, the intubating conditions, the haemodynamics and the BIS values obtained with this regimen : PPF, Remi, O₂ / N₂O(50/50) and ET-Sevo at different concentrations (2% and 4%).

Materials and methods

After Institutional Ethics committee approval and informed consent, 40 patients, ASA 1 or 2, scheduled for maxillo-facial surgery, requiring tracheal intubation, were enrolled in the study. Exclusion criteria were allergy to PPF or Remi, history of malignant hyperthermia, or susceptibility to gastric aspiration and asthma. After administration of alprazolam (0,5 mg po) as premedication, IV Remi (0,25 mg/kg/min), PPF (1 mg/kg) were given ; lungs were manually ventilated with an open system (fresh gas flow of 10 liter/min) in a O₂/N₂O mixture (50/50) and different ET-Sevo concentration according to the groups : Group 2% (ET-Sevo = 2%) and Group 4% (ET-Sevo = 4%). MAP, HR, BIS were recorded before and after PPF injection, after 2,5 min, 5 min of manual ventilation, and after intubation. Intubation was performed 5 min after starting manual ventilation. The intubating conditions were assessed and scored for three variables (1) : jaw relaxation (jaw mobile = 1, partly mobile = 2, or immobile = 3), position of the vocal cords (open = 1, half closed = 2, or tightly closed = 3), and patient response to intubation and cuff inflation (no coughing = 1, 1 or 2 coughs = 2, permanent coughing or movements = 3). Using the above criteria, intubation conditions were assessed as excellent (all criteria scored as 1), good (one criteria scored as 2) or poor (one criteria scored as 3). Patients in whom one criteria was scored as poor were given rocuronium and intubation was considered as a failure. Statistical test as data (mean \pm SD), analysis of variance (ANOVA) for repeated measures, Student's t test, Chi-square and Fischer's exact



test were used when appropriate. p values smaller than 0,05 were considered as significant.

Results

We observed a 25% failure in the group 2% and a 15% failure in the group 4% ($p = 0,75$) (fig 1). Haemodynamics were similar in both groups. A significant decrease in MAP and HR was observed in both groups after 2,5 min of sevoflurane ventilation. Ratio between MAP at 5 min of sevoflurane ventilation and MAP at starting was similar in group 2% and 4% ($63\% \pm 9\%$ vs $64\% \pm 10\%$). A significant MAP increase was observed in both groups after intubation ($12\% \pm 11\%$ vs $15\% \pm 15\%$). In case of intubating failure, HR and MAP evolution were similar. BIS values decreased after propofol injection in both groups and was significantly smaller after 5 min ventilation in group 4% (34 ± 7 vs 42 ± 12). In both group, Bis values was not significantly affected by intubation. In case of failure, higher BIS values were observed 5 min after starting ventilation ($49,6 \pm 16,7$ vs. $39,4 \pm 11,5$, $p = 0,048$).

Discussion

In other protocols (1, 2), Remi (4 μ g/kg (1), 2 μ g/kg (2)) was associated to a higher dose of PPF or sevoflurane. In our study Remi (1,25 μ g/kg) in 5 min, was injected with smaller dose of PPF combined with N₂O and lower ET-sevo concentration. MAC for endotracheal intubation (MAC_{ei}) using sevoflurane alone is 4,52% (3). The combination of sevoflurane at ET-Sevo 2%, N₂O 50/50, PPF and Remi in this study seems to be sufficient to reduce the MAC_{ei} to 2% in 75% of case (and *a fortiori* to 4%). In contrast, the haemodynamic depres-

sion associated with combination of PPF and Remi is greater in our protocol (-36,5% of PAM) than in protocol using sevoflurane 8% (2) (-29% of PAM) or PPF (1) (-30% of PAM) alone as induction agents.

Conclusions

Good or excellent intubating conditions were assessed by using sevoflurane 4% or 2% during 5 minu-

tes, PPF 1 mg/kg and Remi 0,25 mgr/kg/min. Bis value lower than 40 before intubation in this protocol was associated with more success.

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Does preoperative consultation influence patient preoperative anxiety, satisfaction and recovery ?

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Introduction

Traditionally the role of the anesthesiologist in the reduction of preoperative anxiety has been considered to be crucial. The aim of this study was to evaluate the impact of the pre-anesthetic consultation on preoperative anxiety and to determine whether the level of anxiety influences patient satisfaction and immediate recuperation in a one-day clinic setting.

Methods

All patients attending the pre-anesthetic consultation during a period of 2 months were asked to quantify their anxiety before and after the consultation through a French translation of the State and Trait Anxiety Inventory (STAI) (1) and a Visual Analogue Scale (VAS). They were also asked to fill in a postoperative question form and to quantify the quality of their recovery through another VAS (2). We used a paired Student t-test to compare continuous variables and a chi-square test to compare categorical data. Results are expressed as mean values \pm SD. Exclusion criteria were refusal to participate and poor French language skills.

Results

Among a total of 127 recruited patients (pts), 118 completed the study (27% male ; 73% female). Mean age was 36.4 (ranges : 13-78) years. Most of the pts were Belgian, French speaking and had at least a "secondary" level of school education. Sixty percent of the pts declared to have professional, financial or family problems, 37% to have needle phobia, 39% were insomniac and 21% took tranquilizer on a regular basis. Twenty-eight percent of the pts had no previous anesthesia experience, whereas 12% quoted a previous bad experience. Fear of death (not waking up after the operation) and for postoperative pain was present in 39 and 37% of the pts respectively. The preoperative consultation took place 7 days (range : 1-29) before the scheduled operation date. The majority (85%) of the operations took place under general anesthesia. Scheduled interventions included gynecological, stomatologic, hand surgery, and arthroscopies, nose or esthetic surgery.

STAI and VAS evaluating anxiety, decreased significantly after the consultation (table I). A satisfactory correlation was obtained between STAI and VAS scales ($r = 0.59$; $p < 0.01$).

Table I

Summary of results of STAI and VAS tests pre and post-consultation

	Pre consultation (mean \pm SD)	Post consultation (mean \pm SD)	Paired t-test
STAI (all pts)	38.5 \pm 14.3	35.9 \pm 12.8	$p < 0.001$
VAS (all pts)	2.6 \pm 3.3	1.9 \pm 2.3	$p < 0.05$
STAI (male/female)	32.3 \pm 10.9 / 40.8 \pm 14.8	29.1 \pm 8.7 / 38.5 \pm 13.3	$p = 0.05$ / $p < 0.01$

Women showed significant higher level of basal STAI than men ($p < 0.01$).

Pts most often complained about pain (20%), cold (12%), thirst (9%) and soar throat (3%). Only one pt had nausea. 45% of the pts started to feel better 30 minutes after emergence of anesthesia. In 10% of the patients a delay of adequate recovery was observed. At discharge, quality of recovery was quoted maximal (VAS 9-10) in 53% of the pts. Preoperative STAI evaluation was neither related with recovery time nor quality of recovery or number of physical complaints.

Discussion

Patient satisfaction was not a discriminative variable and recovery wasn't influenced by the preoperative

degree of anxiety. However we could reproduce a higher preoperative anxiety in women. The reduced effect of the consultation can be explained by the predominance of women in our sample.

Conclusion

Pre-anesthetic consultation was associated with a small but significant reduction in preoperative anxiety. VAS allows effective measurement of preoperative anxiety.

References

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Pulmonary function after sternotomy: comparison between S(+)-ketamine and remifentanyl.

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Background and Goal of Study

Cardiac surgery is associated with a significant pulmonary function impairment persisting several months after surgery (1). It is well studied that cardiopulmonary bypass is a strong activator of the systemic inflammatory response (2), which may result in postoperative reduction of pulmonary compliance and atelectasis. As S(+)-ketamine has a known anti-inflammatory effect (3), we investigated whether the S(+)-ketamine administration lessened this pulmonary function impairment when compared to our usual anesthetic regimen.

Materials and Methods

Following ethical committee approval and informed consent from each patient, 23 adult patients, scheduled for elective, primary valvular surgery were

randomized to 2 groups. The first group (11 patients) was induced with 2.5 mg.kg⁻¹ S(+)-ketamine, followed by a continuous infusion of 125 mcg.kg⁻¹.min⁻¹ until the end of the procedure. In the other group (12 patients) a target controlled infusion (TCI) of remifentanyl was infused to maintain a plasma level of 6-14 ng/ml. In both groups a TCI of propofol between 1 and 4 mcg.ml⁻¹ was administered. Pethidine was used for postoperative analgesia in all patients. The forced vital capacity (FVC), the forced expiratory volume in 1 second (FEV₁) and the forced expiratory flow between 25% and 75% of forced vital capacity (FEF₂₅₋₇₅) were determined preoperatively (pre) and postoperatively at week 1 (w1) and 10 (w10). For each patient we subtracted the preoperative from each postoperative value. The Mann-Witney U test was used for statistical analysis. P-value of less than 0.05 was considered statistically significant.

Results

	S(+)-ketamine (n = 11)	remifentanyl (n = 12)	p value
FVC(w1-pre)	-1.260(0.463)	-1.280(1.135)	0.90
FVC(w10-pre)	-0.175(0.735)	-0.550(0.555)	0.02
FEV ₁ (w1-pre)	-0.850(0.655)	-1.060(0.695)	0.83
FEV ₁ (w10-pre)	-0.110(0.448)	-0.125(0.335)	0.50
FEF ₂₅₋₇₅ (w1-pre)	-0.750(1.345)	-0.735(0.515)	0.98
FEF ₂₅₋₇₅ (w10-pre)	-0.030(0.518)	0.110(1.030)	0.98

Data are presented as median (interquartile range). Changes in FVC (L), FEV₁ (L) and FEF₂₅₋₇₅ (L/sec) at week 1 and week 10 after surgery versus before surgery were similar in both groups, except for the FVC(w10-pre).

Conclusion(s)

S(+)-ketamine during cardiac surgery seems, in our clinical setting, not to be associated with better postoperative pulmonary function tests compared to remifentanyl, although the decline in FVC is less severe 10 weeks after surgery.

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Acute respiratory effects of the upright position in ards patients. A. DE WOLF M.D., E. HOSTE M.D., J. DE WAELE M.D., K. COLPAERT M.D., S. OEYEN M.D., J. DECRUYENAERE M.D., J. POELAERT M.D. PH.D., C. ROOSENS M.D., Ghent University Hospital, De Pintelaan 185, B-9000 Gent, Belgium.

Introduction

Patients with the Acute Respiratory Distress Syndrome (ARDS) suffer from severe hypoxemia often necessitating mechanical ventilation with high inspiratory pressures and PEEP levels. Prone ventilation has been shown to improve oxygenation (1). Recently, ventilation with the patient in upright position (UP) has been proposed as an alternative to influence gas exchange (2). During UP, the position of the bed is turned 45-60 degrees vertically. In this investigation, the acute effects of the upright position on the mechanics of the respiratory system, lung and chest wall are described.

Methods

8 patients with ARDS of different etiologies (mean APACHE II score 26) were studied. All patients were ventilated with a lung protective strategy with high PEEP (> 10 cm H₂O) and tidal volume (V_T) 6 mL/kg. Respiratory mechanics were determined with the technique of rapid airway occlusion during constant flow inflation; esophageal pressure was obtained with an

esophageal balloon catheter. Static elastance of respiratory system and chest wall (E_{STAT,RS} and E_{STAT,CW}) were obtained by dividing the difference between end-inspiratory and end-expiratory pressure of airway pressure and esophageal pressure respectively by V_T. Lungelastance (E_{STAIL}) was calculated as E_{STAT,RS} - E_{STAT,CW}. Total resistance of respiratory system and chest wall (R_{MAX,RS} and R_{MAX,CW}) was determined as the difference between peak inspiratory and end-inspiratory pressure divided by inspiratory flow. R_{MAX,L} was calculated as R_{MAX,RS} - R_{MAX,CW}. The mechanical work done by the ventilator (WOB_V) was calculated by integrating the area of P_{AW} over V_T and expressed in Joules/L. The alveolo-arterial oxygen gradient (A-a gradient) was calculated using standard formula. Intra-abdominal pressure (IAP) was measured with the urinary bladder catheter technique. Measurements were performed with the patient supine (control), after 30 and 120 minutes UP (UP30 and UP120) and again supine after 30 and 120 minutes (SUP30 and SUP120). Statistical significance was set at p < .05. Overall analysis was performed with ANOVA for repeated measures and for further analysis a Wilcoxon matched pair signed ranks test was used.

Results

Are presented in the table.

	Control	UP30	UP120	SUP30	SUP120
IAP (mm Hg)	12.3 ± 3.7	18.4 ± 5.5*	18.7 ± 5.8*	9.9 ± 4.3**	10 ± 3.6 °
PaO ₂ /FiO ₂ (mmHg)	162 ± 37	163 ± 39	161 ± 44	151 ± 45	151 ± 51
WOB _V (Joules/L)	2.2 ± 0.38	2.3 ± 0.5	2.3 ± 0.5	2.3 ± 0.6	2.2 ± 0.5
E _{STAT,RS} (cmH2O/L)	27.9 ± 9.3	30.3 ± 11.6	27.5 ± 8	27.7 ± 9	29.3 ± 11.7
E _{STAT,CW} (cm H2O/L)	9.3 ± 5.4	13 ± 5.8*	11.4 ± 5.3•	9.7 ± 5.7	9.3 ± 5.4
E _{STAIL} (cm H2O/L)	18.6 ± 6.8	17.2 ± 7*	16 ± 4.5•	17.9 ± 6.3	20 ± 8.5
R _{MAX,RS} (cmH2O/L/sec)	9.03 ± 1.5	8.5 ± 1.4	8.3 ± 2.7	9.2 ± 2.6	8.5 ± 3.2
R _{MAX,CW} (cm H2O/L/sec)	2.1 ± 1.4	2.3 ± 1.6	2.3 ± 1.6	2.1 ± 0.9	2 ± 0.7
R _{MAX,L} (cm H2O/L/sec)	6.9 ± 1.7	6.2 ± 2.2	6 ± 2.7	7 ± 2.6	6.5 ± 3.4
A-a gradient (mm Hg)	285 ± 119	300 ± 116	297 ± 124	303 ± 129	306 ± 144

* p < .05 vs Control ; • p < .05 vs SUP 30 ; ** p < .01 vs UR 120 ; ° p < .05 vs UR 120.

Conclusions

In this small and heterogeneous group of patients with severe impairment of respiratory mechanics, UP results in a stiffening of the chest wall and increased lung compliance but without significant influence on oxygenation parameters. The benefit of UP in selected ARDS patients or in patients that are less recruited, needs to be elucidated.

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A Double blind, Prospective, Randomized Comparison between Tramadol and Piritramide for treatment of late postoperative pain in cardiac surgery. S. EVERS, C. HUYGENS, E. VANDERMEERSCH, P. WOUTERS, Department of Anesthesia, University Hospitals Katholieke Universiteit, Herestraat, B-3000 Leuven, Belgium.

Introduction

Tramadol hydrochloride (T) is a synthetic analgesic with dual mode of action (1) Its efficacy has been demonstrated in the early postoperative period after various types of surgery (2, 3). Few clinical data are available in cardiac surgical patients. We compared intermittent IM Piritramide (P) injection with continuous T infusion in terms of analgesic efficacy, patient safety, and patient and nurse satisfaction in patients recovering from CABG-surgery.

Methods

The study was approved by the ethical committee and patient informed consent was obtained. 52 subjects were randomized to T or P treatment after CABG surgery when discharged from the ICU. Exclusion criteria were age above 80 y, renal or hepatic disease, major coagulation abnormalities and sedation verbal rating scores exceeding 2. Upon arrival on the routine wards (To) baseline evaluations of pain intensity and sedation (verbal rating score (VRS)), nausea/vomiting, pulmonary function tests (PFT) (VC, FVC, FEV1, PEFr), and hemodynamics were made before the loading dose of T or P was administered. Rescue medication consisted of Propacetamol 2 gr iv.

Patients allocated to the T group received a loading dose of 3 mg/kg iv (50 ml mini bag) over 20 minutes and a placebo saline IM injection (0.03 ml/kg), followed by a continuous IV T infusion (10 mg/kg/24h) with a volumetric pump over 24 hours and placebo IM boluses on demand (0.03 ml/kg max every 4 hours). The P group received a loading dose of 0.03mg/kg IM (= 0.03 ml/kg) and a 50 ml saline placebo infusion over 20 minutes, followed by 0.03 mg/kg IM P boluses on demand (max every 4 hours) and a continuous infusion of saline using a volumetric pump over the following 24 hours. Drugs were labeled at the hospitals pharmacy to guarantee double blinding. Measurements were repeated 4, 8, 20 and 24 hours after the beginning of treatment. PFT's were repeated at 4 and 24 hours after baseline. All adverse effects were recorded and patient and nurse satisfaction were assessed at the end of the study.

Student t (parametric data) and Mann-Whitney tests (non-parametric data) were used to compare results between groups with α set at 0.05.

Results

From the 52 included patients 1 refused to continue and 3 others were excluded for incomplete data (Pain VRS missing). Both groups were comparable for demographics and baseline data. No differences were noted in safety variables, haemodynamics, pain VRS and PFT between T and P throughout the study, except for the use of alizapride ($\alpha < 0.001$) (Table 1).

Table 1

total use of Alizapride ; painVRS and FEV1 at time 24h as representative examples of these parameters throughout the study

	Piritramide	Tramadol	
total use of Alizapride	9%	70%	$\alpha < 0.001$
painVRS (median) at 24h	0.0	0.0	N.S.
FEV1 (L) at 24h	1.03 ± 0.4	0.98 ± 0.38	N.S.

Discussion

Our study shows that in terms of analgesic efficacy, safety and overall patient and nurses satisfaction tramadol IV bolus followed by continuous infusion is comparable to intermittent piritramide IM injection. While the former technique is less labour intensive on the surgical ward, it clearly causes more nausea/vomiting (use of Alizapride as parameter of nausea and vomiting) and demands association with a potent anti-emetic drug.

Conclusion

The use of continuous intravenous Tramadol is a valid alternative for intermittent intramuscular Piritramide in the treatment of pain after CABG-surgery on the surgical ward, provided that preventive antiemetics are supplemented.

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Does the degree of denitrogenation affect N₂ accumulation during closed-circuit anesthesia (CCA) ?

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Introduction

Modern technology seeks to lower fresh gas flow (FGF) during automated administration of inhaled agents down to truly CCA conditions. The amount of inhaled agent wasted by flushing the anesthesia circuit to reduce N₂ concentrations during CCA may increase agent consumption to such an extent, that the same amount of agent is used as when using a FGF of 1 L/min. To absolutely minimize agent consumption, adequate denitrogenation therefore is likely to be important. With modern agent analyzers, the most important source of N₂ accumulation during CCA is not the patient, but rather the paramagnetic O₂ analyzer (1) Using 100% O₂ instead of air as the reference gas attenuates N₂ accumulation during CCA (1). We examined to what extent the degree of denitrogenation (deN₂) would attenuate N₂ accumulation under these conditions.

Methods

After IRB approval and informed consent, 30 ASA PS I or II patients presenting for general surgery were enrolled. Total intravenous anesthesia (propofol, remifentanyl, rocuronium) and mechanical ventilation was used (ADU, Datex-Ohmeda, Helsinki, Finland). Sampled gases (Compact Airway Module M-CAiOV, Datex-Ohmeda) were redirected to the circle system, and 100% O₂ was used as the reference gas (1). While breathing O₂ (8 L/min) via the circle system, anesthesia was induced, and the lungs were ventilated (5 L/min). The time interval between the start of preoxygenation and endotracheal intubation was 4 min, after which mechanical ventilation was started and the circuit was closed. The O₂ FGF was titrated to prevent the top of the bellows housing from touching the top of the bellows housing, thus ensuring CCA conditions. End-expired N₂ (EtN₂) was calculated as "balance gas": (100 - %O₂ - %CO₂) and recorded every 10 seconds. When ventilating a 2 L test balloon under the same conditions for 60 min, N₂ did not increase. The EtN₂ recorded just before intu-

bation (EtN₂ [end deN₂]), immediately after intubation (EtN₂ [ETT]) as well as 1 min thereafter (EtN₂ [ETT +1 min]) was correlated with (1) EtN₂ at 55 min, and with (2) N₂ increase between 15 and 55 min (Δ EtN₂ [15-55]) using linear regression analysis. EtN₂ [end deN₂] and Δ EtN₂ [15-55] were correlated with age, height, and weight.

Results

N₂ increased from 8.4 (\pm 3.8) just before intubation to 17.9 (\pm 3.8)% after 55 min. Correlation coefficients (r²) between deN₂ parameters and EtN₂ course are presented in the table. There were no linear correlations with patient demographic parameters.

	EtN ₂ 55min	Δ EtN ₂ [15-55]
EtN ₂ [end deN ₂]	0.88	0.47
EtN ₂ [ETT]	0.82	0.34
EtN ₂ [ETT +1 min]	0.63	0.32

[end deN₂] : EtN₂ just before intubation ; EtN₂ [ETT] : EtN₂ immediately after intubation ; EtN₂ [ETT +1 min] : EtN₂ 1 min after intubation.

Discussion

During CCA, the amount of N₂ present at 55 min depended more on the N₂ concentration present immediately after closing the circuit than on the ensuing rise of N₂. This could be explained by the fact that the lungs contain most of the N₂ reserves present in the body (responsible for the initial N₂ concentration), far more than that contained in other body tissues (responsible for the N₂ increase after closing the circuit).

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Recovery after desflurane or sevoflurane anaesthesia combined with remifentanyl in morbidly obese patients. S. R. B. JACOBS, L. E. C. DE BAERDEMAEKER, M. M. R. F. STRUYS, N. M. M. DEN BLAUWEN, E. P. MORTIER, Ghent University Hospital, De Pintelaan 185, 9000 Gent, Belgium.

Background

In morbidly obese patients rapid recovery is desirable in order to decrease the rate of postoperative respiratory complications (1). This randomised study compared the recovery profiles in morbidly obese patients who received BIS-guided desflurane or sevoflurane for maintenance of anaesthesia in combination with target controlled infusion of remifentanyl.

Methods

After receiving Institutional Ethics Committee approval, written informed consent was obtained from fifty morbidly obese patients (BMI > 35 kg.m⁻²) scheduled for laparoscopic gastroplasty. Following induction with remifentanyl, propofol (2mg.kg⁻¹ IBW) and rocuronium, (0.9mg.kg⁻¹ IBW) patients were randomised to receive BIS-guided desflurane or sevoflurane (targeted to maintain a BIS-value between 45 and 55) combined with TCI remifentanyl (2) initiated at 4 ng/ml and guided 25% up or 25% down by hemodynamic responses, maintaining mean arterial pressure and heart rate within 20% of baseline. All patients received 4g propacetamol iv and 150 mg iv diclofenac (non-opioid analgesia (3)). Groups were compared for recovery and doses of remifentanyl, ondansetron and piritramide. Immediate recovery (= in the OR) was recorded as time from drug discontinuation until spontaneous breathing, opening

eyes, extubation, free airway and orientation (saying name, date and location on request). Intermediate recovery (= at the PACU) was investigated by recording Aldrete and Kroulik score, OAA/S score, NRS score, SpO₂, PONV incidence, at PACU admission and 30, 60 and 120 minutes afterwards. Statistical analysis was performed by using independent samples T-test and Pearson Chi-square test where applicable.

Results

Immediate recovery, with the exception of spontaneous breathing, was significantly quicker in the desflurane group (table 1). Intermediate recovery data showed only statistically significant differences in Aldrete/Kroulik score and PONV incidence 120 min after admission (Fig. 1 and 2). Both groups received similar amounts of remifentanyl, piritramide and ondansetron. Without supplementary oxygen, no patients showed SpO₂ levels below 90% nor were there incidents of hypoxia. NRS scores after non-opioid analgesia showed no statistical difference.

Conclusion

Desflurane benefits the early recovery period, allowing a two minutes quicker recovery than sevoflurane. However as few differences appear in the intermediate period, this advantage seems short lasting.

Table 1
Immediate recovery

	Sevoflurane	Desflurane
Recovery time until spont. Resp (s) mean ± SD	311 ± 163	224 ± 145
Recovery time until opening eyes (s) mean ± SD	419 ± 168 *	285 ± 146 *
Recovery time until extubation (s) mean ± SD	474 ± 187 *	352 ± 148 *
Recovery time until orientation (s) mean ± SD	541 ± 188 *	397 ± 137 *
Recovery time until free airway (s) mean ± SD	488 ± 187 *	359 ± 151 *

* = p < 0.05 independent samples T-test.

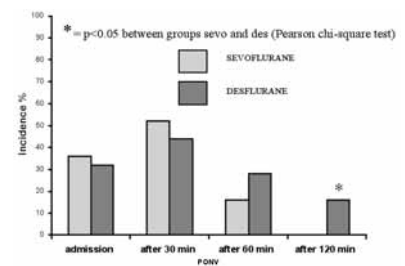


Fig. 2. — PONV incidence

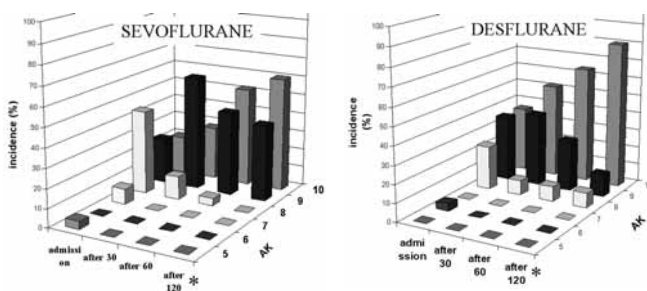


Fig. 1. — Aldrete/Kroulik score
* = p < 0.05 between groups (Pearsons chi-square test).

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Reductions in intervention times using a helicopter-based emergency medical service in a rural region of Belgium. D. MOENS*, J. MICHEELS*, G. HARTSTEIN*, Ph. MIERMANS**, P. CAMELBEECK**, M. LAMY*, *Département d'Anesthésie Réanimation de l'University Hospital – Liège ; ** HEMS – Centre de Secours Médicalisé de Bra-Sur-Lienne.

Introduction

The helicopter-based Medical Rescue Centre at Bra-sur-Lienne is now considered to be an experimental satellite Medical Emergency Service attached to the University Hospital Centre of Liège, under an agreement with the Belgian Federal Public Health Ministry.

We carried out a prospective study involving patients benefitting from primary, helicopter emergency medical service (HEMS) interventions for potentially life-threatening problems. We compared, using a validated simulator of ground-based EMS (GBEMS) access times, the effect on free medical interval (FMI) and delay to hospital admission of use of the helicopter.

Methods

This prospective study was carried out from June 1, 2002 to August 31, 2003, and involved 160 patients benefitting from primary HEMS interventions. Patients were eligible if they were suffering from possible acutely life-threatening pathologies. These patients represented 41% of primary HEMS missions during the study period. Patient status was evaluated using three established scores: the Glasgow Coma Scale (GCS), the Revised Trauma Score (RTS), and the National Advisory Committee on Aeronautics (NACA) score. Inclusion required a NACA score of 4 or higher. The simulation of ground-based access times was carried out using a digital cartographic program, similar to that used by official Belgian EMS services.

Results

72.5% of patients were male, and average age was 52.2 years. The mean age of patients who died (11% of the 160 patients) was 63.8 years. Cardiopulmonary resuscitation (CPR) was attempted in 82% of patients who died, and was not attempted in the remainder. 45% of the 160 patients were intubated; the mean age of these patients was the same as that of the entire group.

MEAN SCORES

The mean GCS was 10.3 ; the mean RTS was 5.3, and the mean NACA was 5.5.

PATHOLOGIES

Cardiac arrest : 18.8% ; multiple trauma without head injury : 13.8% ; isolated head trauma : 13.8% ; acute myocardial infarction (AMI) : 13.1% ; multiple trauma with head injury : 12.5% ; acute respiratory distress : 8.1% ; coma : 6.9%. The number of patients intubated in each pathological group : cardiac arrest : 100% ; multiple trauma with head injury : 82% ; coma : 45% ; isolated head injury : 36% ; acute respiratory dis-

stress : 31% ; multiple trauma without head injury : 14% ; AMI : 10%.

Times in min. :

	median	mean	σ	n	difference mean	σ	p
fmi HEMS	7,0	7,9	4,2				
fmi sim GB	20,0	19,5	5,2	160	-11,6	8,0	0,00
fmi sim GB bra	15,0	17,0	9,8				
tth helico	10,0	10,5	3,8				
tth road	33,0	32,9	10,1	145	-22,4	7,8	0,00

fmi HEMS = free medical interval Helicopter ; fmi sim GB = simulated fmi ground-based from others MICUs

fmi GB bra = simulated fmi ground-based from bra ; tth = time to hospital.

Conclusions

A large proportion of the patient groups cared for by the HEMS were severely ill patients, both by the subjective impression of the HEMS medical teams, as well as using the classical international scoring systems. Attesting to this is the fact that 45% of these patients required orotracheal intubation. Overall, 25% of patients cared for by the HEMS require intubation, while the Belgian national average for GBEMS units is 10%. This again reflects the selection, in this population, for more acute pathologies.

The reductions in FMI and time to hospital in the 160 patients studies were real.

The literature concerning the efficacy of HEMS in general is contradictory. However, a majority of authors agree that the subgroup of patients with life-threatening pathologies do, indeed, benefit from reductions in FMI and reduced time-to-hospital. Our results agree with this literature (1, 2, 3).

The determination of the true cost-benefit ratio of helicopter-based EMS will require more studies.

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Transfusion Requirements for CABG with vs. without Bypass. M. MOMENT¹, A. MATTA², M. T. RENNOTTE¹, M. VANDYCK¹, C. WATREMEZ¹, H. WATERLOOS¹, L. JAQUET², P. NOIRHOMME³, P. Baele¹. Dept of ¹Anesthesia, ²Intensive Care and ³Cardiac Surgery, StLuc University Hospital (UCL), avenue Hippocrate, B-1200 Brussels.

Background

Several studies have documented reduced blood losses and possible blood savings associated with off-bypass Coronary Artery Bypass Graft (CABG) surgery (1-10). One of the most recent papers by Scott allows for a more detailed analysis of the possible reasons underlying lower transfusion requirements when CABG is performed without bypass. This paper compares Scott's results with data from our own systematic quality surveys.

Methods

Data are collected every year in our institution about blood usage for cardiac surgery. Data always concern series of consecutive elective patients, regardless of sur-

geon, anesthesiologist, medicines, and patients' history : only patients with known coagulation abnormalities are excluded. For this study, we retrieved the records of blood transfusion requirements during the entire hospital stay of two series of consecutive patients operated in 2002 in our center : 100 for elective CABG with bypass and 60 patients operated without bypass. No approval from the ethical committee, nor formal patient consent, are required for retrospective analysis of anonymous Quality Improvement System data. 'Blood transfusions' are expressed as the total number of units of red cell, plasma, and platelets given, with the exception of autologous blood retrieved from the operation field during surgery ; no difference could be found ($p = 0.826$, t test). Hemoglobin levels at hospital discharge were also similar : 108 vs. 109 g/L ($p = 0.596$, t test).

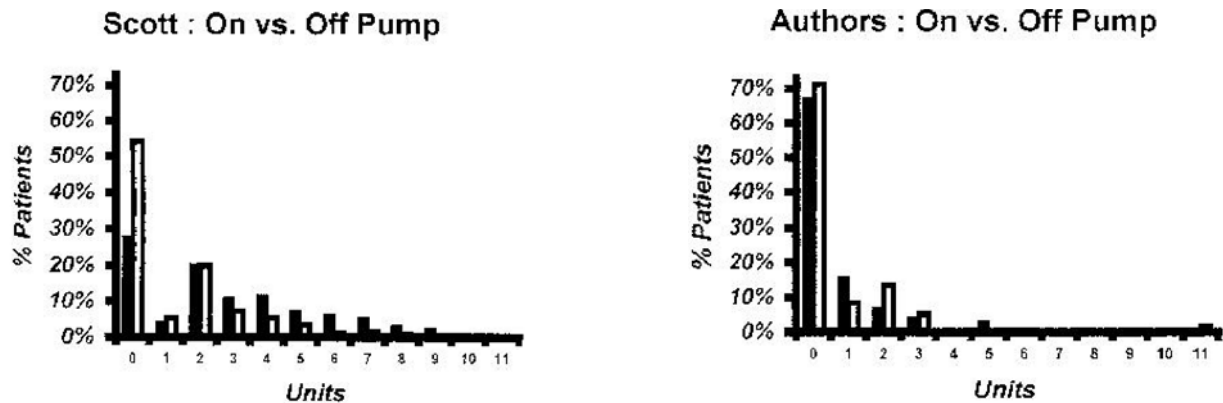


Fig. 1. — Comparison of blood requirements for CABG patients operated with bypass (black bars) vs. without bypass (open bars) as reported by Scott (ref. 1) [left histogram] or recorded in our team [on the right].

Discussion

When comparing the results published by Scott with ours, expressed as percentages of patients, two major differences in patterns emerge (see graphs). Firstly, a larger proportion of patients get no transfusion at all in our center for both techniques, moving the two histograms towards the left. Secondly, transfusion frequencies decrease harmoniously in a continuous fashion from the lowest requirements to the highest. In contrast very few patients get transfused with only one unit in Scott's series. This suggests that one-unit transfusions are discouraged in this team, whereas they are considered respectable medical decisions in our practice because one unit may be all it takes to improve a patient's condition. Shifting Scott's histogram one unit to the left would yield results close to ours. As far as

other studies are concerned, the global transfusion rates are generally higher than Scott's and ours, especially for on-pump cases, and many authors compare early off pump experiences with well established on pump practice : in those conditions such non-optimal baseline results suggest still uncompleted blood saving policies.

Conclusions

Our results show that differences in transfusion requirements between on and off-pump CABG can totally fade away as a comprehensive blood saving policy is applied to all patients. A measure as simple as abandoning the traditional 'transfuse-two-or-nothing' attitude, could lead to important reductions in blood usage ; however such policy requires a new medical decision to be made before each unit is transfused.

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A multi-centre, randomized, double-blind study to compare the absence of side effects and the effectiveness of parecoxib/valdecoxib in comparison to placebo treatment of post-surgery pain after bypass-operation via median sternotomy. N. RUYSSCHAERT, E. OTT, Klinik für Anaesthesiologie, Ludwig Maximilians-Universität, München/KUL, Marchioninstr. 15, 81377 München.

Objective

In this study, the efficacy and safety of the COX 2 inhibitors parecoxib and valdecoxib in patients undergoing CABG surgery through a median sternotomy was evaluated in a randomized clinical trial. Aim of the study was to investigate whether COX 2 inhibitors can avoid the known side-effects of non selective NSAIDs (eg. gastro-intestinal ulceration, renal dysfunction and platelet inhibition) and reduce the opioid consumption (side-effects : sedation, respiratory depression) (1, 2).

Methods

After institutional ethic committee approval and written patient informed consent was obtained, a total of 462 patients with NYHA classes I to III, who were less than 77 years of age, and were from 58 institutions in the United States, Canada, Germany, and the United Kingdom, participated in this multicenter, phase III, placebo-controlled, double-blind, randomized, parallel-group trial. Patients were allocated at a 2 :1 ratio, with 311 patients in the parecoxib/valdecoxib group and 151 patients in the placebo or control group. Intravenous study drug (40 mg) was administered within 30 minutes after extubation and every 12 hours for a minimum of 3 days. Subsequently, oral treatment at a dose of 40 mg every 12 hours was initiated and administered for a combined total of 14 days. Patient-controlled analgesia (PCA) with morphine and codein (30mg) combined with acetaminophen (300 or 500mg) were available as required. Assessment of the analgesic efficacy of the study drug was primarily based on morphine and morphine equivalent consumption. Consumption data were compared on the basis of time intervals by using an

analysis of variance (ANOVA). Additional efficacy evaluations included a daily pain intensity score (ANOVA), patient and physician global evaluation of study medication (Cochran-Mantel-Haenszel test), and the effect of pain on the quality of life (modified Brief Pain Inventory questionnaire). Clinical adverse events (AEs) were assessed by the principal investigator at each site from the time of the first dose through the 30-day postdosing period (Fisher exact test). In addition to AE assessment, safety was evaluated by physical examination, laboratory blood sample analysis and ECG (ANOVA).

Results

Patients in the parecoxib/valdecoxib group received significantly less morphine or morphine equivalents than patients in the control group during the 0- to 24-hour ($P = .009$), 24- to 48-hour ($P = .017$), 72- to 96-hour ($P = .002$), 96- to 120-hour ($P = .004$), and 120- to 144-hour ($P = .037$) periods (Table 1). Both patients ($P < .001$) and physicians ($P < .001$) evaluated the study medication as significantly better than control therapy. The modified Brief Pain Inventory questionnaire used in the oral dosing period detected significant improvements in the parecoxib/valdecoxib treatment group (eg. current pain, worst pain, and mood). There were no significant differences between the groups in overall adverse events : 89.1% (277/311 patients) in the P/V group versus 89.4% (135/151 patients) in the control group ($P > 0.95$). The incidences of individual serious adverse events, including cerebrovascular complications ($P = 0.177$), myocardial infarction ($P = 0.669$), and renal dysfunction ($P = 0.184$), were proportionally greater but not significantly different between the groups (Table 2).

Table 1

Time interval (h)	Standard care, n = 151 (mg)			Parecoxib/valdecoxib 40 mg IV/PO Q12H, n = 311 (mg)			P value
	n	Mean	SD	n	Mean	SD	
0-24	123	25.4	24.3	251	19.7	18.7	.009
24-48	135	31.8	28.0	264	25.1	23.8	.017
48-72	98	16.5	17.4	177	14.0	18.2	.260
72-96	78	12.3	15.4	124	7.5	6.4	.002
96-120	62	7.7	6.2	101	5.5	3.4	.004
120-144	59	6.2	5.1	93	5.1	3.5	.037
144-168	53	6.7	4.0	79	5.6	4.0	.098

Table 2

	Standard care, n = 151 (%)	Current study parecoxib/valdecoxib, n = 311 (%)	P value
Cerebrovascular disorder	1 (0.7)	9 (2.9)	.177
Myocardial infarction	1 (0.7)	5 (1.6)	.669
Cardiac failure	2 (1.3)	3 (1.0)	.664
Abnormal renal function	0	6 (1.9)	.184
Gastrointestinal hemorrhage	0	3 (1.0)	.554
Thrombophlebitis	0	3 (1.0)	.554

Conclusions

In patients undergoing CABG surgery, the COX 2 inhibitors parecoxib and valdecoxib were effective for postoperative analgesia by reducing the opioid consumption and improving the pain-related quality of life. At the same time, there was no statistically significant increase in overall adverse events. Due to the positive effects of this test medication, benefits for future patient generations are to be expected.

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Amniotic Fluid Embolism : diagnostic and therapeutic considerations based on a retrospective review of 7 cases. B. VAN DESSEL, P. VAN HOUWE, J. VAN LEEMPUT, L. HEYTENS. AZ Sint-Augustinus, Department of Anaesthesiology, Antwerp, Belgium.

Purpose of review

Amniotic Fluid Embolism - AFE, is a rare but often catastrophic complication of pregnancy. A myriad of clinical expressions make its diagnosis difficult and therefore treatment is often delayed. By reviewing a small series of patients with presumed AFE, this report aims to present a general diagnostic and therapeutic guideline, developed in our centre, in order to gain control over this life-threatening complication.

Materials and Methods

We traced 7 patients with presumed AFE, out of 12.269 deliveries between October 1997 and October 2003. We carried out a retrospective review of the medical records and we analysed the relevant demographic, clinical and laboratory data as well as the therapeutic interventions that were initiated.

Results

Demographics	I	II	III	IV	V	VI	VII
Delivery	vaginal	caesarian	vaginal	vaginal	vaginal	vaginal	caesarian
Complications	ARDS	ARDS, MOF	ANI	+	-	-	-
ICU stay	7 days	24 days	5 days	2 hrs	3 days	4 days	2 days
Final outcome	nl	death	nl	death	nl	nl	nl
Symtoms							
Respiratory	desaturation	dyspnea		nl		dyspnea	dyspnea
Haemodynamic	hypotension	hypotension	hypotension	hypotension	hypotension	hypotension	hypotension
Hemorrhage	++	+++	+++	+++	+	++	++
Lab data : First Results							
Hb - g/dl	5,3	7,4	10,1	6,3	9,0	9,6	11,1
Platelets - 1000	75	157	86	121	214	121	335
aPTT - sec			66	> 180		61,4	
PT - %			49,4	< 7		46	
fibrinogeen - mg/dl			220	< 65		106	
D-dimeren - ng/dl				> 80.000			
Lab data : Worst Results							
Hb - g/dl	5,3	5,6	6,1	6,3	7,5	8,4	3,6
Platelets - 1000	75	60 (< 25)	52	57	47	77	19
aPTT - sec	> 165	> 180	> 180		189	89,3	> 180
PT - %	16,2	0,0E + 01	< 7		< 7	34	8,3
fibrinogeen - mg/dl	< 50	< 50	< 50		56	74	< 65
D-dimeren - ng/dl	> 8.000	(> 8.000)	16.000		> 20.000		
Therapeutic Interventions							
Packed cells (U)	8	19	16	+	4	6	14
FFP (U)	4	10	6	+	3	5	8
PPSB		+	+	+	+		+
Fibrinogen		+			+	+	
Platelet (U)	+	2	4		1		1
Revision	+	+	+	+	+	+	+ (packing)
Hysterectomy	+	+	+ (packing)	-	+	-	-
Embolization	-	-	-	-	-	-	+

Discussion

The *demographic* data show that there is no uniformity in the population of pregnant women who develop an AFE-syndrome. Neither do these data have any predictive value regarding the final outcome. The typical *clinical presentation* in this series is a combination of sudden respiratory distress with hypoxia, haemo-

dynamic instability and inappropriate bleeding shortly after delivery. It was most often the latter that triggered the idea that something serious was wrong. In the fulminant cases, this coincided quickly with a cardiovascular collapse. The *laboratory results* show serious perturbations (Hb, PT, aPTT, fibrinogen) in all cases but no direct link between these and the final outcome could be shown. In view of the current knowledge that AFE is

clearly associated with diffuse intravascular coagulation – it is clear however that in 4 out of these 7 cases the appropriate tests were not taken at the time of onset of clinical symptoms.

The *therapeutic interventions* included transfusion of blood products (PC, Platelets, FFP, PPSB, Fibrinogen), 4 women needed a hysterectomy, one underwent an arterial embolization, five women received vasopressive and/or inotropic agents.

Conclusion

In view of the variable clinical presentation, laboratory results and outcome, a standardised approach regarding both diagnosis and treatment is therefore recommended. A guideline developed in our centre includes the following :

1. Combination of respiratory distress, shock and abnormal blood loss in a peripartal setting is a potentially life threatening event and should be managed as such
2. Respiratory support : Administration of oxygen, secure airway when needed
3. Haemodynamic stabilization : Administration of fluids and vasopressors/inotropes
4. Urgent and repeated laboratory testing : Hb, Platelets, aptt, PT, fibrinogen, D-dimers, AT- III and possibly tryptase

5. Immediate ordering of blood products (packed cells, fresh frozen plasma)
6. Inspection of birth canal to exclude other causes of postpartum hemorrhage
7. If negative : exclusion of other causes of postpartum hemorrhage (coagulopathy, HELLP, ...)
8. When lab results confirm diffuse intravascular coagulation (DIC-score of > 5) and depending on the specific results : administration of platelets, ATIII, fibrinogen, Fresh Frozen Plasma
9. If life-threatening character persists, consider hysterectomy/abdominal packing/arterial embolization
10. After initial stabilization, institute invasive monitoring and treatment as deemed necessary.

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Accuracy of a new pulse contour algorithm (PulseCo™) in cardiac surgery. T. VAN SEVEREN, P. SERGEANT, E. VANDERMEERSCH, P. F. WOUTERS, Departments of Anesthesiology and Cardiac Surgery, University Hospitals Katholieke Universiteit Leuven, Herestraat 49, B-3000 Leuven, Belgium.

Introduction

Pulse contour analysis is gaining clinical acceptance as a less invasive and continuous method to measure cardiac output (CO). Complex mathematical models such as the four compartment Windkessel model have been developed to predict stroke volume from pulse pressure signals, but this approach requires frequent calibration (to assess arterial compliance), is subject to error from reflecting pressure waves and requires signals from within a centrally located artery (1). A new method (PulseCo™, London, GB), based on autocorrelation and power calculation of the entire pressure waveform, was recently developed. It is theoretically independent of the site of measurement and operates with a regular 20 G radial arterial catheter. We validated this technique in patients undergoing cardiac surgery using thermodilution as the reference method.

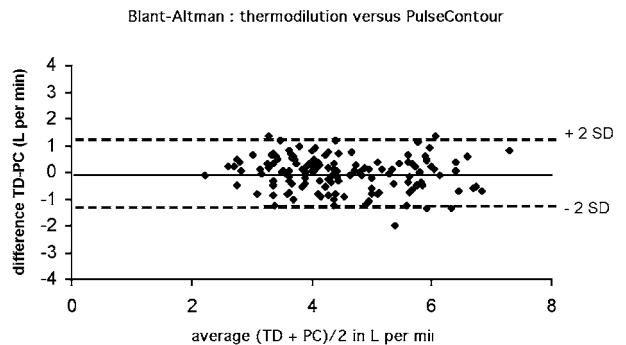
Materials and Methods

After approval by the Institution's Ethical Committee and patient's informed consent, twenty adult patients undergoing CABG surgery were studied. Patient demographics were: age 68 +/- 10 years, height 168 +/- 9 cm, weight 78 +/- 12 kg, male/female 15/5. Exclusion criteria were aortic valve disease and atrial fibrillation. Series of at least 5 coupled pulse contour (PC) and reference pulmonary artery thermodilution (TD) CO measurements were performed per patient. In six patients, a dobutamine challenge of 2.5 µg.kg⁻¹.min⁻¹ was included. TDCO was assessed by three injections of 10 ml ice-cold saline. There was one single calibration of the software system in each patient at the beginning of the study. Bland-Altman analysis was used to assess accuracy (2).

Results

A total of 145 coupled measurements were obtained. Absolute values of TDCO ranged from 2.5 to

7.7 L.min⁻¹. The bias between PCCO and TDCP was -0.02 L.min⁻¹ with limits of agreement (= 2 SD of the bias) as low as +/- 1.2 L.min⁻¹ (Fig.).



Discussion

The results of the present study show that PCCO, using the autocorrelation software algorithm on a radial arterial pressure waveform, is in close agreement with standard TDCO (variance = 27%) in patients undergoing coronary artery surgery. Further studies are required to assess its performance in larger groups of patients and in other challenging clinical conditions.

Conclusions

Pulse Contour analysis based on autocorrelation is a promising technique to measure cardiac output continuously. The minimally invasive approach and the possibility to calibrate the system with lithium dilution offers perspectives for its use in children.

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