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Dose response relationship of spinal bupivacaine, levobupivacaine and ropivacaine, combined with sufentanil, during anaesthesia for Caesarean section : effects on maternal haemodynamics.

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Introduction

Spinal induced hypotension following intrathecal anesthesia for Cesarean section is a common problem (1). Previous studies have indicated that spinal induced hypotension is a dose-dependent phenomenon (2). We performed recently a dose-response study comparing ropivacaine (R), levobupivacaine (L) and bupivacaine (B). A secondary analysis of the results was performed to evaluate the effects of dose and drug on maternal haemodynamics.

Methodology

Following ethics committee approval and written informed consent, 450 term patients with singleton pregnancies undergoing elective Caesarean section were included in a blinded, randomised trial. Combined spinal epidural anaesthesia was performed using intrathecal B, L or R in a dose of 5.0, 6.25, 7.5, 8.75, 10 or 11.25 mg, always combined with 2.5 µg sufentanil. Patient demographics, obstetrical data, haemodynamics, maternal and foetal side effects and pain scores were noted. Hypotension was defined as a decrease in systolic

blood pressure of more than 10% from baseline. Severe hypotension was defined as a decrease in systolic blood pressure of more than 20% from baseline. A logistic regression model was used to relate hypotension, severe hypotension, foetal acidosis and Apgar scores with dose and drug. Analyses were performed using the statistical package SAS (version 9.1).

Results

Bupivacaine was significantly more potent than ropivacaine and levobupivacaine, who were of similar potency. Local anaesthetic dose significantly affected the incidence of hypotension ($p < 0.0001$) and severe hypotension ($p = 0.0003$). The higher the dose, the higher the probability of hypotension and severe hypotension. Dose also affects Apgar scores with more low Apgar scores if the dose is increased. Umbilical artery pH is unaffected by the dose received. There is also a significant difference in probability of hypotension between the three drugs administered, irrespective of the dose used : B causes more hypotension than L, which in turn causes more hypotension than R (B : 81%, L : 76%, R : 60%).

| | 5 mg | 6.25 mg | 7.5 mg | 8.75 mg | 10 mg | 11.25 mg |
|--------------------|------|---------|--------|---------|-------|----------|
| Hypotension | 55% | 67% | 71% | 74% | 85% | 82% |
| Severe hypotension | 25% | 42% | 37% | 46% | 57% | 50% |
| Apgar scores < 7 | 1% | 0% | 6% | 6% | 3% | 9% |

Discussion

The current secondary analysis reveals that hypotension and neonatal outcome are affected by the dose of local anaesthetic administered intrathecally during anaesthesia for Cesarean section. These results confirm previous findings and underline the importance of aggressively treating maternal hypotension.

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Large Volume N₂O Uptake Alone Does Not Explain the Second Gas Effect of N₂O on Sevoflurane during Constant Inspired Ventilation. R. CARETTE¹, J. F. A. HENDRICKX², T. DELOOF², H. J. M. LEMMENS³, E. VANDERMEERSCH¹, A. M. DE WOLF. Depts. Anesthesiology¹, KUL, Leuven, Belgium ; OLV Hospital², Aalst, Belgium ; Stanford³, CA, USA ; NWU⁴, Chicago, IL, USA.

Introduction

The second gas effect (SGE) is considered to be significant only during periods of large N₂O uptake (VN₂O) (1, 2) ; however, the SGE of small VN₂O has not been studied well. We hypothesized that the SGE of N₂O on sevoflurane would become less pronounced when sevoflurane administration is started 60 min after the start of N₂O administration when VN₂O has decreased to approximately 125 mL.min⁻¹, and that the kinetics of sevoflurane under these circumstances would become indistinguishable from those when sevoflurane is administered in O₂.

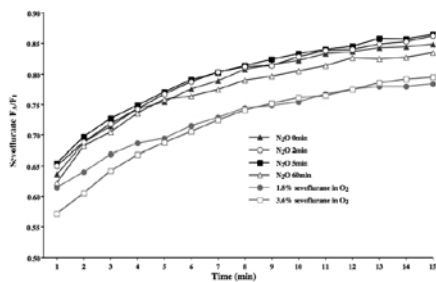


Fig. 1. — Sevoflurane F_A/F_I in the 6 groups

Discussion

We confirmed the existence of a SGE of N₂O. Surprisingly, when using an F_A of 65% N₂O, the magnitude of the SGE was the same with large or small VN₂O. The classical model and the graphical representation of the SGE alone should not be used to explain the magnitude of the SGE. We speculate that changes in ventilation/perfusion inhomogeneity in the lungs during general anaesthesia result in a SGE at levels of VN₂O

Materials and Methods

After IRB approval and informed consent 72 ASA PS I-II patients were randomly assigned to 1 of 6 groups (n = 12 each). In the first 4 groups, sevoflurane (1.8% vaporizer setting) administration was started 0, 2, 5, and 60 min after starting 2 L.min⁻¹ O₂ and 4 L.min⁻¹ N₂O, respectively. In the last 2 groups, sevoflurane (1.8 or 3.6% vaporizer setting) was administered in 6 L.min⁻¹ O₂. The ratios of the alveolar fraction of sevoflurane (F_A) over the inspired fraction (F_I), or F_A/F_I , were compared between the groups.

Results

Sevoflurane F_A/F_I was larger in the N₂O groups than in the O₂ groups, and it was identical in all 4 N₂O groups.

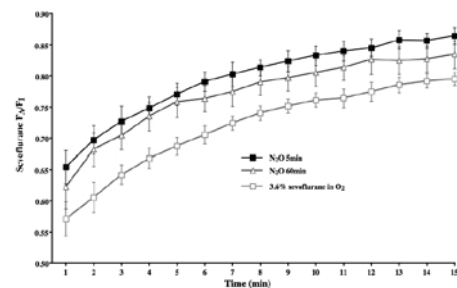


Fig. 2. — Sevoflurane F_A/F_I in the N₂O 5min. Mean values are presented at 1 min intervals. N₂O 60min, and 3.6% sevoflurane in O₂ groups. Mean values and 95% confidence interval.

previously considered by most to be too small to exert a SGE (3).

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A Vaporizer-O₂/N₂O Fresh Gas Flow Sequence Can Lower ADU® Desflurane Use Below That With The Zeus®. S. DE COOMAN¹, J. F. A. HENDRICKX², P. EWALENKO¹, RIK CARETTE³, E. VANDERMEERSCH³, T. DELOOF², A. M. DE WOLF⁴. Depts. Anesthesiology Institut Jules Bordet¹, ULB, Bruxelles ; OLV Hospital², Aalst, Belgium ; KUL³, Leuven, Belgium ; NWU⁴, Chicago, IL, USA.

Introduction

Low flow techniques are often perceived as cumbersome because (1) frequent vaporizer (F_D) or fresh gas flow (FGF) adjustments may be needed, especially at the beginning when initial wash-in and high uptake by the patient rapidly alter the concentrations of anesthetic gases ; (2) a discrepancy develops between the delivered and the inspired concentrations of gases, which has been considered as “lack of control” ; and (3) the older literature has focused on the use of rather complex uptake models to administer these agents with closed-circuit anesthesia (CCA) techniques. The Zeus® (Dräger, Lübeck, Germany) black-boxes these issues for the clinician by administering inhaled agents by automated closed-loop end-expired feedback administration (1). However, the Zeus® also *has* to use a high FGF initially to wash-in the circuit and lungs, and intermittently flushes the circuit to remove unwanted N₂, increasing desflurane consumption above true CCA conditions. We hypothesized that desflurane consumption with a conventional anesthesia machine might be lower than with the Zeus® if used with a previously derived desflurane-O₂/N₂O F_D -FGF schedule that allows for a very early FGF reduction (2).

Materials and Methods

After IRB approval, 34 ASA PS I or II patients undergoing plastic, urologic, or gynecologic surgery received desflurane in O₂/N₂O. In the ADU group (n = 24), an ADU® anesthesia machine (Anesthesia Delivery Unit, GE, Helsinki, Finland) was used. An initial 3 min high FGF of O₂ and N₂O (2 and 4 L.min⁻¹, respectively) was followed by 0.3 L.min⁻¹ O₂ + 0.4 L.min⁻¹ N₂O. Desflurane F_D was 6.5% for the first 15 min, and 5.5% during the next 42 min. In the Zeus group (n = 10), the automated CCA mode was selected with a desflurane F_A target of 4.6% (the target can only be increased with 0.2% increments) and O₂/N₂O as the carrier gas with an $F_{I}O_2$ target of 30%. Patient demographics, desflurane use (retrieved directly from the machines), and desflurane F_A

were compared (t- test or RM one-way ANOVA). Results are presented as mean (standard deviation).

Results

Age and weight did not differ ($p > 0.05$), but height was larger in the Zeus group ($p = 0.04$). Desflurane F_A is presented in figure 1. Desflurane consumption after 5, 15, and 45 min was 6.0 (0), 11.0 (0), and 12.8 (0) mL liquid in the ADU group and 11.7 (4), 15.9 (4.5), and 17.2 (4.8) mL in the Zeus group respectively, and was always higher in the Zeus group ($p < 0.05$).

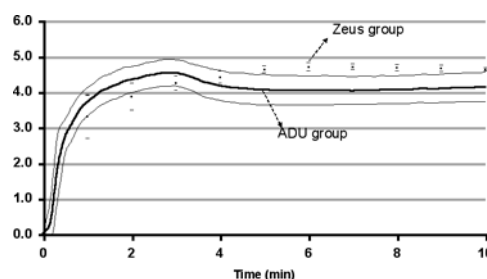


Fig. 1. — Course of desflurane F_A

Discussion

The use of a specific desflurane-O₂/N₂O F_D -FGF sequence with a conventional anesthesia machine reduces desflurane consumption below that with automated CCA. With a conventional machine, the acceptance of a temporary bellows deficit allows for early FGF reduction (after 3 min), and the small amount of FGF in excess of patient uptake during maintenance slowly washes out N₂ yet contributes little to overall desflurane consumption. Optimizing the algorithms for initial FGF management and flushing procedures might further reduce agent consumption by the Zeus®.

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Comparison of sufentanil and clonidine in the prevention of agitation in children after sevoflurane anesthesia. R. DE KORT, A. VANDEVELDE, M. LAUWERS, F. CAMU. Department of Anesthesiology, UZ Brussels, Belgium.

Introduction

Sevoflurane is frequently used for anesthesia in children undergoing day-surgery procedures. Besides its advantages, it has been associated with emergence agitation (EA) (1). Pain is regarded as a major contributing factor, however the phenomenon is present with adequate pain relief (2). Opioids are known to decrease the incidence of EA (2), and so is clonidine (3). We compared the effect of clonidine and/or sufentanil on EA in 80 children.

Methods

After local ethics committee approval, written informed consent was obtained from the parents. We enrolled 80 ASA I or II children age 2 to 8 scheduled to undergo circumcision, orchidopexia or hernia inguinalis repair. Upon successful induction of general anaesthesia with sevoflurane, and the performance of a caudal or penile block with ropivacaine 2 mg/kg, all patients received a blinded solution of sufentanil and/or clonidine. Patients were allocated randomly and in a double blind fashion into 4 groups: NaCl 0,9% (1), sufentanil 0,1 mg/kg (2), clonidine 2 mg/kg (3) and sufentanil 0,1 mg/kg + clonidine 2 mg/kg (4). Patients were excluded from the study when insufficient block was suspected by hemodynamic variables. A blinded observer at the PACU recorded the level of EA at any time, using table 1. Patients were discharged from the recovery room when they had an EAS-score 3 (awake and cooperative) without pain. Continuous variables were compared with the Kruskal-Wallis test, and frequencies and EAS-scores with Chi-squared tests. *P-values* < 0.05 were considered statistically significant.

Results

One patient had an inadequate penile block and was discontinued from the study. Demographic and intra-operative data were similar in all groups, as was time to emergence and recovery stay. None of the children experienced a clinically significant change in hemodynamics.

The incidence of level 4 EA was significantly higher in the placebo group ($P < 0,05$), but was comparable in

group 2, 3 and 4. There was no significant difference in the incidence of level 5 agitation ($P > 0,05$). Compared to group 2, 3 and 4, statistically less patients in group 1 did not experience agitation regardless of the definition used (level < 4) ($P < 0,05$).

Table 1

Emergence Agitation Scale (EAS)
(* = significant)

| Level | Description |
|-------|---|
| 1 | Obtunded with no response to stimulation |
| 2 | Asleep but responsive to movement / stimulation |
| 3 | Awake and responsive |
| 4 | Crying |
| 5 | Trashing behaviour that requires restraint |

Table 2

Incidence of agitation and pain

| Score | 1 (n = 19) | 2 (n = 20) | 3 (n = 20) | 4 (n = 20) | <i>P-value</i> |
|-------------|---------------|---------------|---------------|---------------|----------------|
| EAS 4 (%) | 57,9* | 30 | 30 | 20 | 0,04 |
| EAS 5 (%) | 10,5 | 10 | 20 | 0 | 0,22 |
| EAS < 4 (%) | 31,5* | 60 | 60 | 80 | 0,02 |

Discussion and conclusion

Results of this study demonstrate that both clonidine and sufentanil significantly reduce the incidence of EA. Their use was not associated with increased time to awakening and duration of PACU stay. Both substances had comparable effect on EA. Combination of the two seems to be more effective, but this is not significant.

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Five years of experience with spontaneous versus induced labour in a tertiary care obstetric hospital : effect on need for analgesia and labour outcome. Veerle DIRCKX, Frederik DE BUCK, Bernard SPITZ*, Eugène VANDERMEERSCH, Marc VAN DE VELDE. Departments of Anaesthesiology and Obstetrics and Gynaecology*, UZ Leuven, Belgium.

Introduction

Spontaneous labour is most likely associated with a better obstetric and neonatal outcome (1, 2, 3). Many authors suggest that spontaneous labour is also associated with a reduced need for epidural analgesia. We retrospectively evaluated the effects of spontaneous versus induced labour on labour outcome, neonatal outcome and the need for anaesthetic intervention.

Methods

Following institutional approval, the obstetric and anaesthesia database of a tertiary care teaching hospital was searched to identify all patients with term, singleton, vertex presenting pregnancies between Jan 1st 2000 and Dec 31st 2004. Since 1997 all patients having received obstetric anaesthesia are visited on the second postpartum day and data is prospectively gathered on all patients. Type of labour, mode of delivery, demographic data, type of labour analgesia and neonatal outcome was recorded. Data were analysed using Chi-square analysis.

Results

During the study period, 4726 patients with complete datasets were identified. Planned Caesarean section was performed in 655 patients. In 1782 patients labour was induced (induction rate : 37.7%). Spontaneous labour occurred in 2944 mothers (62.3%). Demographic data were similar between induced and

spontaneous labours, except for maternal weight which was higher in the induced patient population (80 ± 14 versus 76 ± 12). Patients with spontaneous labours had a higher chance to delivery vaginally (95.4 versus 91.5%) and less risk for Caesarean section (4.6 versus 8.5%). Patients undergoing induced labour were more likely to need epidural analgesia (88.8 versus 72.2%). Neonatal outcome was better in patients delivering following a spontaneous labour. Umbilical artery pH was higher (7.272 ± 0.074 versus 7.266 ± 0.075), the incidence of Apgar scores less than 7 was lower (5.0 versus 6.7%) and the need for admittance of the neonate to the neonatal intensive care was lower (4.2 versus 6.4%) in the spontaneous delivery group.

Discussion and conclusion

In term, vertex presenting singleton pregnancies the maternal and neonatal risks associated with delivery are higher in induced as compared to spontaneous labours. Induced labour is also more painful. The results of this retrospective study must be interpreted with caution since induced labours are performed for a reason, a reason which may also be associated with significant risks.

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Postoperative pain relief after laparoscopic Cholecystectomy. A placebo-controlled randomized trial of local infiltration and intra peritoneal administration of Ropivacaine 0.25%. S. HASAN¹, M. LAUWERS¹, VAN HOEIJ², Y. VAN NIEUWENHOVE², F. CAMU¹. Department of Anaesthesiology¹; Department of Abdominal Surgery², Flemish Free University of Brussels, Laarbeeklaan 101, 1090 Brussels, Belgium.

Introduction

A large number of surgical procedures are performed laparoscopically with cholecystectomies being one of the most popular. Several studies already proved the benefit of infiltration with ropivacaine after laparoscopic cholecystectomy (1, 2, and 3). The aim of this study was to test the use of incisional local infiltration with ropivacaine 0.25% and/or intraperitoneal administration of ropivacaine (R) 0.25% at the end of surgery after laparoscopic cholecystectomy for postoperative pain relief.

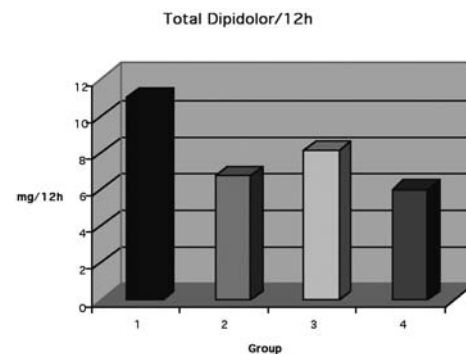
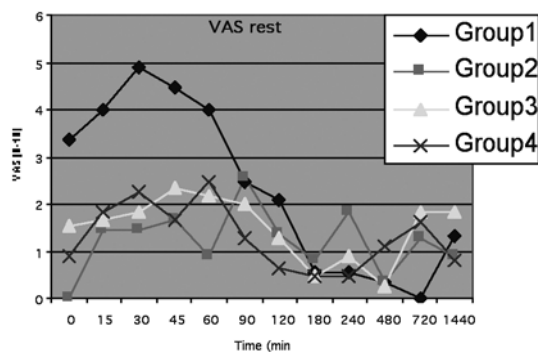
Methods

The local hospital ethics committee approved this randomised double blind study. After obtaining informed consent 36 ASA physical status I or II were assigned to four study groups: 20 ml local infiltration and 20 ml intra peritoneal administration of normal saline (NS) (Group 1), 20 ml local infiltration of R and 20 ml NS intra peritoneally (Group 2), 20 ml NS local infiltration and 20 ml R intra peritoneal instillation (Group 3) and both 20 ml R local infiltration and intra peritoneal administration (Group 4). General anesthesia was performed with propofol TCI and continuous infusion of

remifentanyl and cisatracurium. During induction patients received maximum 20 µg sufentanil, 40 mg Dynastat and at the end of surgery 1 g Perfusalgan was given. Vital signs, VAS scores, right shoulder pain and adverse effects were recorded for 24 hour postoperatively. Piritramide boluses of 2 mg were given as rescue analgesia in the recovery room. Between groups differences were analysed with 1-way ANOVA. Results are presented as mean ± STDEV. A value of $p < 0.05$ was considered statistically significant.

Results

No differences were seen in demographic parameters, duration of anaesthesia and surgery, amount of sufentanil and remifentanyl given intra operatively, hemodynamics, saturation and the use of Perfusalgan and Dynastat in the postoperative period. No severe side effects were seen. There was no difference in consumption of Piritramide/ 12 hours between the 4 groups. VAS scores in rest, at movement and during coughing were significantly better ($p < 0.05$) during the first hour between the 3 groups receiving R than the group receiving NS. But, no difference was found between Group 2, 3 and 4.



Conclusions

The use of 20 ml R 0.25% for incisional local infiltration, or at the end of surgery for intra peritoneal instillation or the combination of the 2 techniques give a better pain relief the first hour after laparoscopic cholecystectomy than the use of NS.

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Determination of the dose response relationship of spinal bupivacaine, levobupivacaine and ropivacaine, combined with sufentanil, during anaesthesia for Caesarean section. K. HUYSMANS, R. DREELINCK, J. DUBOIS, F. DE BUCK, E. VANDERMEERSCH, M. VAN DE VELDE. Department of Anaesthesiology, UZ Gasthuisberg, Leuven, Belgium.

Introduction

Ropivacaine (R) and levobupivacaine (L) are less toxic and produce less motor block than bupivacaine (B). The advantages of reduced toxicity, motor block sparing and differential sensory blockade must be evaluated in view of the relative potency of these drugs. Recently, the full dose response relation of R, L and B was described during intrathecal labour analgesia (1). R and L were found to be less potent than B (1). However in labour, many factors influence pain intensity and active labour remains a volatile situation which can change rapidly. The response to a surgical stimulus is more predictable and may therefore better allow investigators to describe the full dose response relation. This study determines the full dose response relationship of spinal L, R and B when used to achieve surgical anaesthesia for Caesarean section.

Methodology

Following ethics committee approval and written informed consent, 450 term patients with singleton pregnancies undergoing elective Caesarean section were included in a blinded, randomised trial. Combined spinal epidural anaesthesia was performed using intrathecal B, L or R in a dose of 5.0, 6.25, 7.5, 8.75, 10 or 11.25 mg, always combined with 2.5 µg sufentanil. Patients were considered responders to spinal anaesthesia if adequate anaesthesia was reached within 15 minutes following injection, which persisted for at least 60 minutes. Adequate anaesthesia was defined as the insensitivity to

cold up to dermatome T2 and no need for anaesthetic supplementation. Patient demographics, obstetrical data, haemodynamics, maternal and foetal side effects and pain scores were noted. Group-specific dose response curves were constructed using a probit regression model. ED50 and ED95 doses were calculated. A logistic regression model was used to check the sensitivity of the results and a likelihood-ratio test was used to compare the dose response curves of L, R and B.

Results

The ED50 of spinal B, L and R was respectively 5.417 mg (95%CI, 4.398-6.028), 7.246 mg (95%CI, 6.145-8.064) and 7.512 mg (95%CI, 6.743-8.178-6.028). The ED95 of spinal B, L and R was respectively 8.633 mg (95%CI, 7.876-10.104), 13.277 mg (95%CI, 11.584-17.102) and 12.328 mg (95%CI, 11.077-14.706). B was significantly more potent than L and R, whilst R and L were of similar potency.

Discussion

Based on the present dose response study, intrathecal R and L combined with sufentanil, are less potent than B used for anaesthesia during Caesarean section. R and L are of similar potency.

References

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A comparison of intrathecal morphine with intrathecal methadone for postoperative analgesia after cesarean section. Thomas LOPES, Etienne DEREPPER, Maurice SOSNOWSKI, Clarence KARLER, Alain ROMAN. CHU Saint Pierre (ULB), rue haute 322, 1000 Bruxelles, Belgium.

Introduction

Intrathecal morphine is used for postoperative analgesia after cesarean section, but has numerous side effects (1). Methadone has scarcely been studied for acute pain control (2, 3). We focused on the ability of methadone to relieve postoperative pain and reduce opioid side effects after cesarean section during the first postoperative 24 h.

Method

After approval of the protocol by the ethical committee and gathering of informed consent, 30 healthy parturients (ASA 1 and 2) undergoing elective cesarean section with spinal anaesthesia were randomised in a double-blind manner into three groups :

- Group 1 (n = 10) received hyperbaric bupivacaine 12.5 mg with 100 µg methadone.

- Group 2 (n = 10) received hyperbaric bupivacaine 12.5 mg with 300 µg methadone.
- Group 3 (n = 10) received hyperbaric bupivacaine 10 mg with sufentanil 2,5 µg and morphine 100 µg.

We monitored the maximum visual analogue scale (Max.VAS) pain scores, rescue analgesia and occurrence of side effects (nausea, vomiting, bladder retention and pruritus) during the first postoperative 24 hours. A satisfaction score was recorded at the end of data collection on a 0 to 10 scale at 36 hours.

Results

Statistical analysis was performed by ANOVA test (Maximum VAS score), Kruskal Wallis test (Tramadol dose, satisfaction score) and Chi Carré test (nausea, vomiting, bladder retention, pruritus). Data : Mean+/-SD and percentage.

| Groups | Methadone 100 µg (n = 10) | Methadone 300 µg (n = 10) | Morphine 100 µg Suf. 2.5 µg (n = 10) |
|---------------------------------------|---------------------------------|---------------------------------|--|
| Max. VAS pain score (p = 0, 097) | 5,6 (2,8) | 5,0 (1,5) | 3,6 (1,9) |
| Tramadol (mg) (p > 0,05) | 78 (66) | 80 (63) | 36 (50) |
| Nausea, Vomiting (%) (p < 0,001) | 0 | 0 | 20 |
| Bladder retention (%) (p < 0,05) | 10 | 0 | 40 |
| Pruritus (%) (p < 0,02) | 0 | 20 | 60 |
| Satisfaction score at 36 h (p > 0,19) | 8,6 (1,0) | 7,9 (1,6) | 8,3 (0,9) |

Conclusion

Maximum VAS pain scores, rescue tramadol doses and overall satisfaction scores were similar in the three groups. Opioid side effects were less frequent in the methadone treated patients. Methadone relieved post-operative pain with fewer side effects than morphine in the healthy parturient after cesarean section.

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Regional cerebral oxygen saturation and outcome after opcab surgery in diabetic and non-diabetic patients. E. PAUWELS, B. GENIETS, C. STOLTE, F. CAMU, C. VERBORGH. Dienst Anesthesiologie, UZ Brussel, Laarbeeklaan 101, B-1090 Brussel.

Introduction

A history of diabetes type I or II or insulin use pre-operatively are a risk factor for neurological injury following cardiac surgery (1). Although cannulation of the aorta is avoided in off-pump coronary artery bypass (OPCAB) surgery, neurocognitive functioning after surgery may still be impaired (2). Active monitoring of regional cerebral oxygen saturation measurement (SrO₂) by near infrared optical spectroscopy showed a negative correlation with length of stay (LOS) in cardiac surgery (3). We wondered whether the subgroup of diabetic patients would likewise profit from SrO₂ monitoring and whether this would be reflected in a reduced LOS after OPCAB.

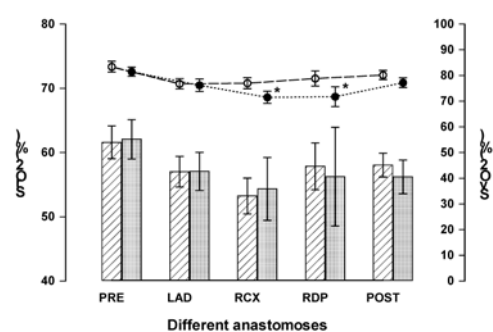
Methods

After Institutional approval, 34 informed patients scheduled for off-pump CABG agreed to take part in this open observational study. Data were analyzed retrospectively. There was no history of neurological disease, previous cardiac surgery or pulmonary disease. SrO₂ (Invos®, Somanetics Corporation) was recorded via sensors placed left and right on the frontoparietal area. Cardiac output (CO) and mixed venous oxygen saturation (SvO₂) and other hemodynamic variables were obtained with the heart in neutral position and different modified positions to allow sutures on the diseased coronaries. The hemodynamic consequences of the heart manipulations were promptly treated with vasoactive medications, alteration in table position and fluid administration to a lesser extent. Response was adequate. Glycemia was closely monitored and SrO₂ was not allowed to vary more than 10%. Mann-Whitney U-test and Wilcoxon's test was performed with Statistica®, data are expressed as means (S.E.M.).

Results

The control group (I) and diabetic group (II) (gray, dotted) patients were comparable with respect to weight, length and age. Ejection fraction as evidenced by

ventriculography was 57 (3) % in group I and 57 (4) % in group II. SrO₂ at the beginning of the procedure was 62 (3) % in group I and 61 (3) % in group II. The lowest SrO₂ encountered was 53 (3) % in group I and 54 (5) % in group II, both recorded at the left side. These variables were never different between groups. LOS at the intensive ward was 48 (3) hours in group I and 257 (97) hours in group II. Hospital LOS was 204 (10) hours and 563 (153) hours respectively. Both differences are highly significant.



Discussion

Apparently the mere presence of the diabetic disease largely determines outcome, more than the ability to monitor SrO₂. The results should be interpreted with caution, since SrO₂ is not continuously monitored on the intensive ward.

Conclusion

The use of the Invos® regional cerebral oximeter does not seem to have a large impact on hospital or intensive ward LOS in a diabetic group of patients.

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Nerve damage 2 years after continuous popliteal nerve block : a retrospective study. P. SEPOT, K. FOURNEAU, J. DE COSTER. UZ Gasthuisberg, Herestraat 49, 3000 Leuven.

Introduction

Peripheral nerve blocks have a lot of advantages. When performed adequately, there is good perioperative analgesia and a prolonged analgesia. The short term advantages are obvious : more patient satisfaction, decreased use of opioids with less PONV and faster mobilisation. Although the incidence of perioperative nerve damage is higher in general anaesthesia due to bad positioning of the patient or neuraxial anaesthesia (1), there is fear of peripheral nerve damage with peripheral nerve blocks. In this retrospective study we looked for late complications of the continuous popliteal nerve block, the efficacy of the block and the patient satisfaction.

Methods

In this retrospective study we included 63 patients scheduled for forefoot surgery at the university hospital Pellenberg in the period between February 2003 and December 2005. During this period there were no changes in surgical technique. The popliteal nerve blocks were performed by a staff member or by residents under direct supervision. A posterior approach was used. To perform the block we used a 110 mm needle (Braun, Contiplex D) and a nerve stimulator. After obtaining optimal motor response, 30 cc of mepivacain 1% was injected slowly. The catheter was introduced 12 cm and stitched. Postoperatively a PCA-pump (continuous 5 cc/h, bolus 2 cc, lockout 20 min) with ropivacain 0,2% was started. All patients received paracetamol and ketorolac. Tramadol was used as rescue analgesic. During the first 48 hours after the operation VAS, patient satisfaction and the need for supplementary analgesics were registered. After two years six questions were asked by phone :

- Do you sometimes have a feeling of needles stitching your foot ?
- Do you sometimes have pain touching your foot or wearing socks ?
- Has the sensitivity of your skin been changed or diminished after the operation ?
- Has the strength of your muscles to pull up your toes been changed ?
- Has the strength of your muscles to pull down your toes been changed ?
- Would you choose the same kind of anaesthetic technique for the same kind of surgery ?

Results

Full data was collected from 62 patients (8 male / 54 female), because one patient died one year after surgery. The mean age was 57 years (29-79 years). The mean weight was 71 kg (52-102 kg).

| first 48 hours | Nr of patients | % of patients |
|--|----------------|---------------|
| pain on injection | 0/62 | 0% |
| reconversion to GA | 1/62 | 1,60% |
| tramadol needed | 7/62 | 11% |
| stop PCA because of PONV | 2/62 | 3,20% |
| neurological complications after 2 years | 0/62 | 0% |
| patient satisfaction after 2 years | 55/62 | 89% |
| same technique next time (after 2 years) | 54/62 | 87% |

Discussion

As former studies already suggested, there were little complications after a popliteal nerve block (2-3) when safety measures were taken : no pain on injection, the use of a 45-degree bevelled needle, the use of a nerve-stimulator. In our study patients were only questioned about neurological damage, there was no objective method like EMG to measure minimal neurological damage. Also the number of patients is too low to make conclusions.

Conclusion

The use of a continuous popliteal nerve block seems to be a safe technique with a lot of advantages. More prospective studies with a larger population to make statistically significant conclusions are necessary. After 2 years patient satisfaction is high.

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Nurse training and standardised pain management improve postoperative pain relief. K. VAN DEN HAUWE*, K. SUY*, A. M. MENTEN*, H. KEYMEULEN*, T. DELOOF*, E. MORTIER**, L. FOUBERT*. Dept of Anaesthesia and Intensive Care*, OLV Aalst; Dept of Anaesthesia**, University Hospital Ghent.

Introduction

Educational programmes and implementation of an acute pain service improve postoperative pain relief (1, 2). In a pilot study we investigated whether training of nurses combined with a standardised algorithm (nurse-driven, anaesthesiologist-supervised) improved treatment compliance and postoperative pain relief. We also evaluated patient satisfaction.

Methods

After institution of a standardized postoperative pain protocol in 2005 and proper training of the nurses on the ward, compliance with this scheme was compared with data from 2003, prior to this training. A total of 96 patients in 2005 were matched with 96 patients in 2003 (gynaecology, n = 40; orthopaedic surgery, n = 27; neurosurgery, n = 29, for both groups). Visual Analogue Scores (VAS) and Global Verbal Scores (GVS) during rest and movement were compared. Ethics committee approval and patient's informed consent were obtained. For statistical analysis T-test and Fisher's exact test were used as appropriate. P < 0.05 was considered significant.

Results

Compliance with doctors' prescriptions increased from 56% (2003) to 100% (2005) (P < 0.0001). VAS at rest decreased significantly in neurosurgical patients and during movement both in gynaecological and neurosurgical patients (table 1).

VAS (n = 96) during movement was 5.9 (2.9) vs 3.3 (2.4) at rest in 2003, and 5.1 (2.6) vs 2.5 (2.0) in 2005 (P < 0.0001 for both). Patient satisfaction increased from 48 to 76% (P = 0.0002). In 2005 there was a distinct

| | | 2003 | 2005 | P-value |
|---------|----------|-----------|-----------|---------|
| GYNAECO | rest | 3.1 (2.2) | 2.4 (2.1) | NS |
| | movement | 5.9 (2.5) | 4.6 (2.4) | 0.025 |
| NEURO | rest | 3.8 (2.7) | 2.4 (1.4) | 0.014 |
| | movement | 6.1 (3.3) | 4.5 (2.2) | 0.038 |
| ORTHO | rest | 3.1 (2.3) | 3.0 (2.5) | NS |
| | movement | 5.7 (3.1) | 6.4 (2.8) | NS |

VAS 1 day postoperatively. Data as mean (SD).

patient preference for GVS (72%) vs VAS (18%) to score pain (P < 0.0001).

Discussion

Our standardised pain protocol could reduce VAS at rest to 3 or below. However, despite a statistically significant decrease in VAS during movement, it should be acknowledged that the absolute VAS is too high and pain relief during movement needs to be improved.

Conclusion

Training the nursing staff combined with the use of a standardised algorithm improves therapy compliance, decreases postoperative pain and improves patient satisfaction. Patients prefer GVS to score postoperative pain.

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Thrombocytopenia in patients with the diagnosis of preeclampsia : use of thromboelastography to guide the anaesthetic technique used. Y.-M. VAN WIJNGAERDEN, F. DEBUCK, E. VANDERMEERSCH, M. VAN DE VELDE. *Department of Anaesthesiology, UZ Gasthuisberg, Leuven, Belgium.*

Introduction

Preeclampsia is a common problem during pregnancy occurring in 7% of patients. In a minority of these patients thrombocytopenia and the HELLP-syndrome complicate outcome further. In patients with thrombocytopenia regional anaesthesia may be contraindicated despite the clear maternal and fetal advantages of regional anaesthesia in preeclamptic patients. The present study correlated thromboelastography parameters to platelet count in all patients presenting with the diagnosis of preeclampsia and thrombocytopenia.

Methodology

Following institutional ethical approval, in all patients presenting at the labour and delivery ward of a tertiary obstetric department with the diagnosis of preeclampsia and thrombocytopenia (defined as a platelet count of < 150.000) a thromboelastography was performed. All patients presenting between September

2003 and December 2006 were included. Patient demographic data, obstetric data, coagulation results, haemoglobin levels, uric acid concentration, liver enzymes and thromboelastography parameters were recorded. Thromboelastography recordings were correlated to the platelet count using Pearson product-moment correlation.

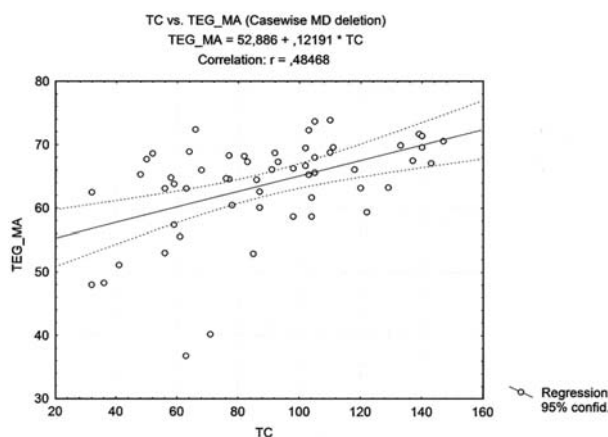
Results

During the study period 5780 patients delivered in the unit. Fifty-nine presented with preeclampsia and thrombocytopenia. Average thrombocyte count was 89 ± 30 . Only a minority of patients were diagnosed with the HELLP syndrome (Table 1). Most patients with thrombocytopenia had normal thromboelastography parameters. Maximum amplitude was correlated to the platelet count ($r = 0.48468$) (Fig. 1). In four patients regional anaesthesia was not used : three had low platelets and a low maximal amplitude and in one platelet count was > 70000 but maximum amplitude was abnormal.

Table 1

Number of patients with HELLP syndrome depending on the criteria used

| Criteria for HELLP syndrome | Sibai | Martin | Van Pampus | Visser |
|-----------------------------|---------|--------|------------|---------|
| Number of patients (%) | 13 (22) | 2 (46) | 15 (25) | 32 (54) |



Discussion

A minority of patients with preeclampsia and thrombopenia has the HELLP syndrome based on published criteria. Platelet count correlates with the

maximum amplitude of the thromboelastogram. Thromboelastography seems to be a valuable tool in guiding anaesthetic management in these patients. Hower further research is still requested.

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Memantine for the treatment of Complex Regional Pain Syndrome type I. E. VANDEN DAELE, G. HANS, M. VERCAUTEREN. Universitair Ziekenhuis Antwerpen, Wilrijkstraat, Edegem.

Introduction

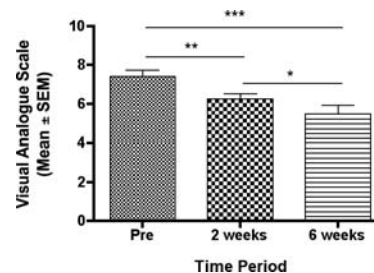
NMDA (N-Methyl-D-Aspartate)-receptor antagonists have been examined in different types of neuropathic pain. Although many highly-selective molecules have been tested pre-clinically, none of them have made it into routine clinical use due to serious side effects or absence of analgesic efficacy (1). Ketamine therefore remains the most powerful, clinically available, NMDA-antagonist. Unfortunately its use is limited due to the intolerable side effects: restlessness, hallucinations and anxiety disturbances. Memantine has recently become available on the Belgian market. Memantine is a low affinity, uncompetitive, clinically well-tolerated NMDA antagonist that is registered for the treatment of Alzheimer disease. Preclinical studies with memantine have shown a preventive effect on the development of chronic pain in animals as well as in healthy human controls. However, in the treatment of chronic neuropathic pain memantine has shown only minor analgesic effect in the few small clinical studies that are currently published (2). A recent study by Sinis (3) demonstrated an involvement of the central nervous system in the development and maintenance of CRPS type 1 and provided promising results for its treatment with memantine.

Methods

The present prospective observational study was conducted in order to investigate the effect of memantine 10 mg per day (during 6 weeks) in patients suffering from CRPS. Twelve patients with CRPS type 1 were included. All patients gave informed signed consent. The study was approved by the Ethical Committee. Their analgesic medication was continued and memantine was added to their baseline analgesic therapy. VAS-scores ranging from 1 to 10 were registered before treatment as well as after 2 weeks and 6 weeks of memantine therapy.

Results

ANOVA-analysis gives a significant result after two weeks ($p < 0.01$) and 6 weeks ($p < 0.001$) of treatment with memantine 10 mg. Interestingly enough, there was a further significant decrease in pain between 2 and 6 weeks of treatment ($p < 0.05$). When the total analgesic effect over the 6 weeks time period was considered (repeated measurements ANOVA), a highly significant decrease in pain was observed ($p < 0.0001$).



Discussion

NMDA receptor antagonists have shown to display a preventive effect on the development of chronic pain in animals as well as in healthy human controls. In the treatment of clinical chronic neuropathic pain conditions, however, memantine seems to have only minor analgesic effects. Mechanisms mediated by NMDA receptor activation are probably necessary to induce plastic synaptic changes on a spinal and cortical level during the development of chronic neuropathic pain conditions. However, when such neuroplastic changes are already present and locked-in, delivery of NMDA antagonists might not be able anymore to undo these plastic changes. This could explain the failure of memantine in the treatment of chronic neuropathic pain. However, the study by Sinis as well as our findings, demonstrated good results for patients suffering from chronic CRPS conditions. The reason why memantine seems to be effective in chronic sympathetically mediated pain conditions and not in pure neuropathic conditions remains unclear and clearly needs further investigation.

Conclusion

Memantine 10 mg per day seems to be effective as add-on therapy in the treatment of CRPS 1. Longer follow-up and inclusion of multiple dosages of memantine is of course mandatory to further investigate the full clinical analgesic effect of this new and promising drug.

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Comparison of two epidural loading dose concentrations of levobupivacaine for postoperative patient controlled epidural analgesia. E. VANDER STICHELE, A. NEYRINCK, E. VANDERMEERSCH, J. DE COSTER. UZ Gasthuisberg, Herestraat 49, 3000 Leuven.

Introduction

Levobupivacaine is a widespread used local anaesthetic. Nevertheless there is conflicting data about the ideal volume and concentration used as a loading dose for epidural analgesia (1, 2, 3). In this double blind randomised prospective study we compared two concentrations of levobupivacaine in a fixed volume as a loading dose for postoperative patient controlled epidural analgesia.

Methods

After Ethical Committee approval, 22 patients scheduled for a variety of abdominal and thoracic procedures were randomised after informed consent, in two groups (12 in group A and 10 in group B). In all patients a thoracic epidural catheter was inserted before surgery. A balanced anaesthesia technique was used intra-operatively 30 minutes before the end of surgery, both groups received 10 ml levobupivacaine in two boli of 5 ml each, with an interval of 10 minutes. Group A received levobupivacaine 0.25% and group B received levobupivacaine 0.5%. Hemodynamic changes were managed if required. After surgery, patients were transferred to the postoperative care unit, where the extend of the epidural block was assessed, using cold discrimination test. Pain-level was indicated on a Visual Analogue Scale (VAS). If the epidural block was insufficient an extra bolus of 5 ml lidocaine 2% was administered. Rescue analgesics were administered when insufficient block or pain persisted.

| GROUP / TIME | A after 15 min. | B after 15 min. | A after 45 min. | B after 45 min. |
|--------------------|-----------------|-----------------|-----------------|-----------------|
| VAS > 0 | 7/12 (58,3%) | 6/10 (60%) | 5/12 (41,6%) | 6/10 (60%) |
| EXTRA LOADING DOSE | 4/12 (33%) | 3/10 (30%) | | |

Discussion

Due to the dose of sufentanil needed for surgery, most patients showed restsedation immediately after the procedure which made evaluation of VAS and block levels possible only 15 minutes after emergence. We found no differences in quality of analgesia, the need for additional local anaesthetic and side effects. This can be explained by the small sample size and the heterogeneous group of patients.

Conclusion

This small study shows no statistical difference between the two concentrations of levobupivacaine used

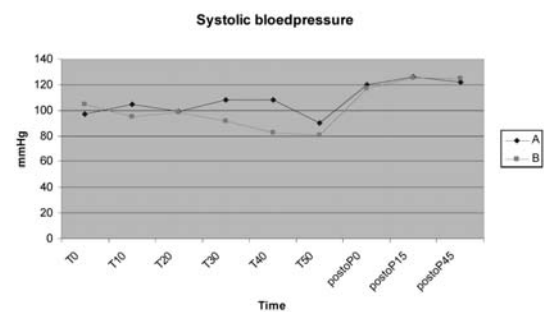
Differences between the two groups were tested using the Kruskal-Wallis test. A *P* value of less than 0.05 was considered as statistically significant.

Results

First VAS were obtained 15 minutes after arrival at the postoperative care unit.

There was no statistical difference in VAS at 15 and 45 minutes after recovery from anaesthesia, although there was a tendency towards lower VAS-scores in group B.

As expected the blood pressure was lower in group B and this was statistically significant at 30 and 40 minutes after injection of the local anaesthetic.



4 patients in group A and 3 patients in group B needed an additional epidural dose to improve the block.

to initiate epidural analgesia toward the end of the procedure.

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Clinical Utility of Doppler derived indices to non-invasively quantify pulmonary capillary wedge pressure (PcWP) in the operating theatre. Steven VISSERS, Emmanuel BEKAERT, Patrick WOUTERS. University Hospitals KULeuven, Department of Acute Medical Sciences, Herestraat 49, B-3000 Leuven, Belgium.

Introduction

The measurement of left ventricular filling pressure, or its clinical surrogate PcWP, provides important information on preload and diastolic function but still requires an invasive technique. New echocardiographic indices, based on the ratio of load-dependent (peak early transmitral flow (E)) to load-independent Doppler measurements (peak early mitral annular velocity (E') and flow propagation velocity (VpE)) appear to correspond well with PcWP in subjects without heart disease (1, 2, 3). It is not known whether this finding also applies in the operating theatre where mechanical ventilation, general anesthesia and rapid changes in volume status may act as confounding factors. In this study, we prospectively tested the clinical utility of Doppler-derived indices to quantify PcWP during cardiac surgery.

Methods

Twenty eight patients undergoing off-pump coronary artery bypass grafting were included. The study was approved by the Institutional Ethics Committee and written informed consent was obtained. After induction of anesthesia, mechanical ventilation was started and monitoring was installed according to institutional standards. Prior to the start of surgery, global hemodynamic measurements including PcWP were obtained simultaneously with transesophageal echocardiographic data during end-expiration in two conditions for each patient : 1) the control supine position and 2) after elevation of the legs to acutely increase cardiac loading conditions. Colour Doppler Myocardial imaging (Vivid 7, EchoPAC Dimension, GE Healthcare Diegem, B) was used to quantify lateral and septal mitral annular tissue velocities. PcWP was compared to E/E' and E/VpE as well as to more traditional measurements of transmitral and pulmonary venous flow velocity using linear regression analysis. ROC curves were constructed to quantify the clinical utility of echo-indices in detecting an abnormally elevated PcWP (> 18 mmHg).

Results

A significant correlation was found between PcWP and E/E' for early annular velocities measured at the

lateral ($p < 0.01$; $r^2 = 0.12$) and septal ($p < 0.001$; $r^2 = 0.21$) mitral ring. There was no significant correlation between PcWP and E/VpE. Amongst the more traditional indices, the ratio between peak early and late diastolic mitral inflow velocity (E/A ratio) correlated best with PcWP ($p < 0.0001$; $r^2 = 0.35$). The ROC curve analysis also showed superiority for the classic E/A ratio (AUC 0.82) over the newer indices (AUC 0.57 and 0.67 for lateral and septal E/E' respectively and 0.63 for E/VpE) in predicting a PcWP higher than 18 mmHg.

Discussion

The ratio between E and E' correlates only moderately with absolute values of PcWP in anesthetized patients with ischemic heart disease. Proper alignment is crucial for Doppler based measurements and this may explain why data based on septal measurements of E' correlated better than lateral equivalents with the echoprobe in the transesophageal position. Our data show no value for E/VpE in estimating cardiac filling pressures. The latter may be due to load dependency of VpE, which has been reported previously, or to measurement error. The traditional E/A flow ratio outperformed all newly introduced indices and provided the best estimate of PcWP in this study.

Conclusion

Our data show only limited clinical utility of the new Doppler-derived indices to quantify PcWP non-invasively in the operating theatre.

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