International Journal of Obstetric Anesthesia (2014) 23, 40–44
0959-289X/$ - see front matter
http://dx.doi.org/10.1016/j.ijoa.2013.08.009

ORIGINAL ARTICLE

ELSEVIER
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A randomized comparison of onset of anesthesia between spinal bupivacaine 5 mg with immediate epidural 2% lidocaine 5 mL and bupivacaine 10 mg for cesarean delivery

L.Z. Wang, Y.F. Zhang, X.X. Hu, X.Y. Chang
Department of Anesthesiology, Jiaxing Maternity and Child Health Care Hospital, Jiaxing, Zhejiang Province, China

ABSTRACT

Background: Previous studies using low-dose spinal anesthesia for cesarean delivery have focused on hypotension and efficacy. This study evaluated whether, using a combined spinal–epidural technique, there was a difference in onset of anesthesia for cesarean delivery between low-dose spinal with an immediate epidural local anesthetic bolus, and conventional-dose spinal anesthesia.

Methods: Forty healthy term nulliparous women undergoing elective cesarean delivery with a combined spinal–epidural technique were enrolled into this prospective, randomized, double-blind study. Patients were randomly allocated to the low-dose (Group L) or conventional-dose group (Group C). Patients in Group L received intrathecal isobaric bupivacaine 5 mg with sufentanil 2.5 μg followed by epidural 2% lidocaine 5 mL; patients in Group C received intrathecal isobaric bupivacaine 10 mg with sufentanil 2.5 μg followed by epidural saline 5 mL. The onset of anesthesia (defined as the time from spinal injection to a block to T6), incidence of hypotension, maximal sensory block, epidural supplementation and side effects were recorded.

Results: All blocks reached T6 within 11 min except for one patient in Group L. There were no differences in onset of anesthesia (9.9 ± 3.2 min in Group L vs. 8.5 ± 1.2 min in Group C, $P = 0.08$), maximal block level and the number of patients who required epidural supplementation in both groups. Hypotension occurred in 8 patients (40%) in Group L and 15 patients (75%) in Group C ($P = 0.02$).

Conclusions: Intrathecal bupivacaine 5 mg with immediate 2% epidural lidocaine 5 mL provided comparable onset and efficacy of anesthesia as bupivacaine 10 mg with immediate epidural normal saline 5 mL for cesarean delivery.

Keywords: Anesthesia; Spinal; Obstetrical; Cesarean section

Introduction

Low-dose intrathecal injections as part of a combined spinal–epidural (CSE) technique for cesarean delivery can reduce the incidence and severity of hypotension but make intraoperative pain and a shorter duration of anesthesia more likely.[1–7] Also, the slower onset of surgical anesthesia with a low-dose spinal may delay urgent cesarean delivery. In a CSE technique, the epidural dose is usually given after the spinal dose. It is unclear if an epidural component administered concomitantly with a low-dose spinal affects the onset of anesthesia. We conducted a prospective, randomized, double-blind study to evaluate whether there was a difference in the onset of surgical anesthesia for elective cesarean delivery between spinal bupivacaine 5 mg combined with an immediate epidural bolus of 2% lidocaine 5 mL, and conventional bupivacaine 10 mg with immediate epidural bolus of normal saline 5 mL.

Accepted August 2013
Correspondence to: Li-Zhong Wang, M.D., Department of Anesthesiology, Jiaxing Maternity and Child Health Care Hospital, Jiaxing 314000, Zhejiang Province, China.
E-mail address: jxlzw@sina.com

Methods

Local ethics committee approval (Jiaxing Maternity and Child Health Care Hospital, China) and written informed consent were obtained. Forty American Society of Anesthesiologists physical status I–II term nulliparous women at >37 weeks of gestation with a singleton pregnancy who presented for elective cesarean delivery over a 2-month period between May and June 2012 were recruited. Women who were in labor, those who had contraindications to neuraxial anesthesia or obstetric complications and body mass index (BMI) >35 kg/m^2 and height (<145 cm or >175 cm) were excluded.

No premedication was given before elective surgery, as is our department's normal practice. On arrival in the operating room, a 20-gauge intravenous cannula was inserted and electrocardiogram, pulse oximetry

(SpO_2) and non-invasive blood pressure monitoring were applied. Lactated Ringer's solution was infused at 10 mL/kg/h throughout surgery, but no fluid preload or coload was given. Patients were randomly allocated to one of two groups, low-dose group (Group L) or conventional-dose group (Group C). Randomization was based on computer-generated codes (SPSS v13 Inc., Chicago, IL, USA), kept in sequentially numbered opaque envelopes until just before use. Anesthesia was performed using a needle-through-needle CSE technique with the patient in the left lateral position. A 16-gauge Tuohy needle was introduced into the epidural space using a midline approach with loss of resistance to saline at the L2-3 interspace. A 26-gauge pencil-point needle was then passed via the Tuohy needle to puncture the dura. After verifying free flow of cerebrospinal fluid, patients in Group L received isobaric bupivacaine 5 mg (1 mL of 0.5% bupivacaine with 1 mL saline) and those in Group C 10 mg (0.5% bupivacaine 2 mL), both with sufentanil 2.5 μg, injected slowly with the orifice pointing cephalad. The spinal needle was removed and an epidural catheter placed 3 cm into the epidural space. After a negative aspiration test, Group L received 2% lidocaine with epinephrine 1:200 000 5 mL epidurally, and Group C received saline 5 mL. The epidural catheter was secured in place and the patient placed supine with left uterine displacement using a wedge pillow under the right hip. The spinal and epidural solutions were prepared by an anesthetic nurse who had no role in patient assessment and management.

The level of dermatomal sensory block was tested bilaterally (defined by a loss of pain to pinprick) every minute after spinal injection until the block reached T6, then every 2 min until the maximal sensory block was achieved. If the sensory level did not reach T6 after 15 min, additional 2% lidocaine was administered in 5 mL increments up to a maximum of 20 mL via the epidural catheter, until the target dermatome was achieved.

Surgery via a Pfannenstiel skin incision was allowed as soon as a block to T6 was demonstrated. The uterus was exteriorized for repair in all cases. Patients were asked to report intraoperative pain at any time during surgery using a visual analogue scale (VAS 0–100 mm). If VAS pain score was $\geqslant$30 mm, an epidural bolus of 2% lidocaine 5 mL was administered, repeated every 5 min if necessary, until VAS score was <30 mm. If, after 20 mL, this failed, general anesthesia would be offered to the patient. At the end of surgery, all patients received patient-controlled epidural analgesia (PCEA) using a solution of 0.125% bupivacaine and fentanyl 1 μg/mL with an infusion rate of 2 mL/h, a 2 mL bolus and a lockout interval of 15 min.

Heart rate (HR) and SpO_2 were continuously monitored. Blood pressure was measured before anesthesia (baseline value), every minute until delivery and subsequently at 5 min intervals until the end of surgery. Hypotension, defined as a systolic blood pressure (SBP) <90 mmHg or a 30% decrease from baseline, was treated promptly with intravenous boluses of phenylephrine 50 μg or ephedrine 5 mg (when maternal HR was <60 beats/min) repeated as required. The total doses of vasopressors administered and the time from spinal injection to first appearance of hypotension were documented.

Time intervals from completion of spinal injection to achieving a T6 block (defined as the onset time of anesthesia) and to delivery, duration of surgery, maximal sensory dermatome and the need for intraoperative epidural supplementation were recorded. Lower limb motor blockade was assessed using the modified Bromage scale (0 = no impairment, 1 = unable to raise extended legs but able to move knees and ankles, 2 = unable to raise extended legs or to flex knees, able to move feet, 3 = unable to flex ankles, knees or hips) immediately before surgical incision and at the end of surgery. Side effects such as nausea, vomiting and pruritus were noted. After delivery, 1 and 5 min Apgar scores and umbilical arterial blood gases were measured.

The next day, all patients were followed-up by an independent observer. Patients were asked about complications, and to grade their satisfaction with anesthesia (categories: excellent, good, average or poor).

Statistical analysis

The primary outcome was the onset time of anesthesia. We assumed a 2-min difference would be clinically significant for the purposes of this study. Mean ± SD onset time of anesthesia in a pilot study using bupivacaine 10 mg was 9 ± 1.5 min. A sample size of 13 patients in each group was required for significance of 95% and power of 90% to detect this difference. Allowing for dropouts, 20 patients were recruited in each group. Secondary outcomes included the incidence of hypotension, maximal sensory block, epidural supplementation and side effects. Continuous variables were compared with the independent-sample t test or the Mann Whitney U test after testing for normal distribution with the Kolmogorov–Smirnov test. Categorical variables were compared with the Chi-square or Fisher's exact test as appropriate. All statistical analysis was accomplished with SPSS version 13.0; P values <0.05 were considered statistically significant.

Results

Forty patients were enrolled and completed the study (Fig. 1). No technical difficulty or block failure was encountered. There were no differences in patient demographic data and duration of surgery (Table 1).

There were no statistically significant differences between the two groups in the time intervals from spinal