EFFICACY OF LOW DOSE HEAVY BUPIVACAINE WITH FENTANYL IN SPINAL ANESTHESIA FOR CAESAREAN DELIVERY

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ABSTRACT

Spinal anesthesia is a preferred anesthetic technique for elective caesarean deliveries, for which hypotension remains a significant side effect. We designed the present randomized trial to test the hypothesis that reducing the spinal dose of local anesthetics results in equally effective anesthesia and less maternal hypotension. One hundred patients with American Society of Anesthesiologists physical status (ASA) I–II, age 19 to 38 years, were randomized into two groups. The studied cases were admitted in Al-salam hospital, Misurata and Misurata central hospital.
Patients in group A (n=50) were given spinal anesthesia using 10 mg heavy Bupivacaine with 25 µg fentanyl. Patients in group B (n=50) were given spinal anesthesia using 7.5 mg heavy Bupivacaine with 25 µg fentanyl. Vital signs were monitored, the time it took to reach the T3 dermatomal level, duration of cesarean delivery, duration of adequate anesthesia. The Apgar score of the newborn were compared between the two groups. Duration of adequate anesthesia was longer in A group, more patients in the group experienced hypotension. However, Neonatal outcomes were similar in both groups. We conclude that small-dose spinal anesthesia (group B) better in preserving maternal hemodynamic stability with equally effective anesthesia that for shorter duration, it may be feasible only when the block can be reinforced using a functional epidural catheter.

KEY WORDS: Bupivacaine, Caesarean delivery, Fentanyl, Spinal Anesthesia, Hypotension.

INTRODUCTION

There are two general types of regional anesthesia for cesarean section and these are the spinal and epidural techniques. Both these techniques are commonly used to reduce the complications associated with general anesthesia such as pneumonia, post-operative pain, etc. Spinal anesthesia is simpler to place and it works fast enough to obtain effective sensory and motor block and so its use increase[1]. Many physiological and anatomical changes during pregnancy affect spinal anesthesia. The hormonal and mechanical factors make pregnant women require less local anesthetic than nonpregnant women to attain the same level of spinal anesthesia[2]. The factors that affect the sensorial blocked are baricity, dose, volume and concentration of local anesthetics, barbotage, and demographic properties of patients such as weight, height or age. Baricity is the most important factors for local anesthetic distribution. According to baricity conception, isobaric solution remains in proximity of the injection site and hyperbaric solution gravitate to dependent areas[3]. Bupivacaine is an amide local anesthetic with a moderately rapid onset and long duration of action, hyperbaric bupivacaine in 8% glucose has a specific gravity of 1021 at 37°C. Both isobaric and hyperbaric bupivacaine have been used for spinal anesthesia with

good results[4]. The addition of opioids to local anesthetics for spinal anesthesia is increasingly common both to enhance anesthesia and to provide postoperative analgesia[5]. Among the synthetic opioids, fentanyl is favorable due to greater potency, faster onset of action and rapid redistribution with an associated decrease in the plasma concentration of the drug[6] and thus enhancing the early postoperative analgesia[7]. The present randomized, double-blind trial was designed to compare the hemodynamic effects and anesthetic efficacy of two intrathecal mixtures combining two doses of bupivacaine, each with 25 µg fentanyl.

PATIENTS AND METHODS

With the approval of the hospital research ethics committee and written informed patient consent, 100 patients were enrolled from the admitted cases in Al-salam hospital, Misurata and Misurata central hospital. All enrolled patients with American Society of Anesthesiologists (ASA) physical status I and II, aged 19 to 38 years scheduled for elective caesarean section. Patients were randomized into two groups.
Patients in group A (n=50) were given spinal anesthesia using 10 mg heavy Bupivacaine with 25 µg fentanyl. Patients in group B (n=50) were given spinal anesthesia using 7.5 mg heavy Bupivacaine with 25 µg fentanyl.
Patients with preexisting hypertension or pregnancy induced hypertension requiring treatment, those with cardiac/renal or other end-organ disease, patients in active labor, multiple pregnancy, placenta previa and those with contraindication to neuraxial block were

excluded from the study. Obese patients (BMI>30) and patients with extreme height (<140 cm or >180 cm) were also excluded from the study.

Before the spinal block, a peripheral venous cannula 18-G was placed and intravenous infusion 10 ml/Kg Normal saline (0.9% sodium chloride) before induction. No vasopressors were administered before the procedure.

Under aseptic conditions, lumbar puncture was performed in a sitting position using a 25 gauge spinal needle at the level of the L3-4 interspaces. After the free flow of cerebral spinal fluid the specified drug in each group was injected slowly over 20 s, with the orifice of the spinal needle pointing cephalic. Patients were positioned immediately in supine position. The wedge was placed under patient's right buttock to avoid the supine hypotension syndrome. Oxygen was supplemented by face mask

Standard monitors such as electrocardiography, Pulse oximetry and noninvasive blood pressure cuff were applied.

Systolic and diastolic blood pressure were recorded every 2 min for the first 30 min and thereafter for every 5 min intraoperatively. A decrease of systolic blood pressure <95 mmHg or decrease >20% from baseline was considered as hypotension and treated with 6-9 mg of ephedrine. Sensory level of the block was assessed by loss of cold sensation bilaterally at 2 min intervals and confirmed by a pinprick method. Adequate anesthesia was defined as an upper sensory spread (absence of sensation to cold) to a level of T3. We measured the time it took to reach the T3 dermatomal level, duration of caesarean delivery and duration of adequate anesthesia (time from the start of spinal anesthesia to the time breakthrough pain occurred or the upper sensory level decreased to bellow T3).

If a bilateral T3 sensory level was not attained within fifteen minutes after the administration of the intrathecal drug, the patients were excluded from the study and given general anesthesia. If intraoperative pain persists after delivery, the treatment options are intravenous fentanyl 50 – 100 μg, A 50: 50 mixtures of nitrous oxide and oxygen given through the anesthetic machine.

Each newborn was examined by a pediatrician and was given an Apgar score.

Data Analysis:

The t-test was used to compare the results in the two groups, A P value < 0.05 was considered statistically significant.

RESULTS

(Table 1) shows no significant differences between groups regarding their age, weight, height or duration of surgery (P > 0.05).

All patients had satisfactory anesthesia, with the exception of only one case in Group B, converted to

(Table 1) Demographic Data of patient undergoing C\S using spinal anesthesia

Parameters	Group A (mean±SD)	Group B (mean±SD)
Age (years)	31± 4.8	33.2±5.4
Weight (Kg)	76.3± 10	78± 12.5
Height (Cm)	162.1± 4.2	160± 8.3
*Duration of surgery (min)	62± 9	61± 13

*Duration of surgery = time from the start of spinal injection and the end of surgery.

Thirty nine of the fifty patients in Group A had hypotension (systolic arterial pressure {SAP} dropped >20%). The incidence of hypotension in Group A was 78% (table 2).

Six of the forty nine patients in Group B had hypotension (SAP dropped >20%). The incidence of hypotension in Group B was 12.24% (table 2).

The t test was used to compare the incidence of hypotension in both groups. P value < 0.05 (significant).

(Table 2) Hemodynamic Data and Satisfactory for anesthesia of patient undergoing C\S using spinal anesthesia

Group	Total Number of patients	Number of Patients Satisfactory for Anesthesia	Number of Patients who Developed Hypotension
A	50	50	39 (78%)
B	50	49	6 (12.24)

The computed mean time in minutes required to achieve adequate anesthesia was 4.9± 1.3 SD in Group A versus 7.8±2 SD in group B (table 3) (P<0.05). The mean duration of adequate surgical anesthesia was significantly shorter in group B (low dose) {66±12 SD than 96±17 SD in group A, P < 0.05} (table 3). Four patients in group B required analgesia for control of pain, P < 0.05} (table 3).

(Table 3) Anesthetic and Surgical Data of patient undergoing C\S using spinal anaesthesia

	Group A	Group B
Time to T3 (min)	4.9±1.3	7.8±2
*Supplement required before delivery	0	0
Supplement required after delivery	0	4
**Duration of adequate anesthesia (min)	96±17	66±12

Time to T3 = Time required to reach dermatomal level T3 as assessed by cold discrimination.*

*Supplement required = the treatment option are intravenous fentanyl 50 – 100 μg, A 50: 50 mixture of nitrous oxide and oxygen.

*Duration of adequate anesthesia = the time from the start of spinal anesthesia to the time breakthrough pain occurred or the upper sensory level decreased to bellow T3.

There was no difference in neonatal Apgar scores in both groups at 1 min and 5 min after birth.

DISCUSSION

Spinal anesthesia is the preferred method for elective caesarean section as being simple to perform, econom-

ical and producing rapid onset of anesthesia with complete muscle relaxation. It carries high efficiency, involves less drug doses, minimal neonatal depression and lesser incidences of aspiration pneumonia. However, it also produces a fixed duration of anesthesia, lesser control of block height, postdural puncture headache and hypotension[2,8,9]. Subsequently, hypotension is known to result in maternal morbidity, nausea, vomiting, dizziness and can also directly influence the neonate well-being by reducing uteroplacental blood flow[2,10]. The link between the extent of sympathetic block and the incidence of hypotension has led to numerous attempts at reducing the dose of local anesthetic and also the addition of opioids due to their synergistic action with local anesthetics on the sensory block without increasing sympathetic block for cesarean section[2,11]. Several research papers have argued that the addition of various opioid to local anesthetic showed improved the intra and post-operative analgesic effect[12,13,14,15].

We observed that the systolic blood pressure was decreased significantly in group A (High dose) when compared to group B (low dose), mostly due to more sympathetic blockade by higher doses of bupivacaine in group A. Similar findings were observed by Himabindu et al and Bogra et al[2,16].

Our results revealed that the time required for the onset of sensory blockade up to T3 was faster in group-A than in group-B and is statistically significant with ($P < 0.05$).

The low dose bupivacaine combined with fentanyl in present trial produced adequate anesthesia, although of limited duration. Low dose spinal anesthesia is only feasible if epidural catheter backup is possible, as with a combined spinal- epidural technique.

CONCLUSION

In this study, we concluded that low dose spinal anesthesia with bupivacaine and fentanyl better preserves maternal hemodynamic stability while resulting in equally effective anesthesia. However, duration of adequate surgical block is limited, suggesting that these low doses only be used when the block can be reinforced with a catheter.

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