Original Article

THE EFFECT OF SMALL DOSE BUPIVACAINE-FENTANYL IN SPINAL ANESTHESIA ON HEMODYNAMIC NAUSEA AND VOMITING IN CESAREAN SECTION

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ABSTRACT

Objective: To compare the hemodynamic, nausea and vomiting with small dose bupivacaine-fentanyl spinal anesthetic versus a conventional dose of spinal bupivacaine in parturients undergoing cesarean section.

Methodology: Forty patients aged 17-35 years old which underwent cesarean section were randomized into two groups. Group-A received spinal anesthesia with 8mg of bupivacaine and 10µg fentanyl, group B received 12mg bupivacaine.

Results: The mean dose of ephedrine needed was 4mg in group A and 11.75mg in group B (P=0.006). The mean ratio of lowest systolic pressure to baseline systolic pressure was 0.75 for group A and 0.65 for group B (P=0.04). Nausea and vomiting was observed in 10% of group A versus 20% in group B.

Conclusion: Small dose of bupivacaine and Fentanyl provides good spinal anesthesia for cesarean section with less hypotension, nausea and vomiting.

KEY WORDS: Spinal anesthesia, Fentanyl, Cesarean section, Hypotension, Nausea and Vomiting, Bupivacai.

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INTRODUCTION

Spinal anesthesia is often used for most cesarean sections and it offers some advantages.[1-3] However it has some disadvantages including higher incidence of hypotension and a finite duration of anesthesia.[2,3]

Hypotension can be defined as a systolic blood pressure of less than 100 mmHg, or a decline of 20% from baseline.[2] Treatment strategies for hypotension include left uterine displacement, head-down tilt, I.V fluids and ephedrine boluses. An approach has been to minimize HSA by using very small or titrated doses of local anesthetic.[2,4,5] Spinal anesthesia with a single dose of bupivacaine up to 5mg for patients undergoing hip surgery yielded only a moderate incidence of hypotension but in 15% of patients this low dosage did not provide an adequate level of sensory block.[4,6] Therefore although the use of a single-shot low-dosage local anesthetic for spinal block may limit hypotension, it may not provide acceptable anesthesia. Opioids and local anesthetics administered together intrathecally have a potent synergistic analgesic effect.[2,3] Intrathecal opioids enhance analgesia from sub therapeutic doses of local anesthetic and make it possible to achieve successful spinal anesthesia using otherwise inadequate doses of local anesthetic.[5]

The goal of this study was to compare the hemodynamic, nausea and vomiting with small dose bupivacaine-fentanyl spinal anesthetic versus a conventional dose of spinal

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bupivacaine in parturients undergoing cesarean section.

METHODOLOGY

Forty ASA physical status (American society of anesthesiologist) 1 or 2 patients who requested neuroaxial analgesia for cesarean section were randomized into two groups, each 20. After obtaining written informed consent the subjects were randomized by means of blinded opaque envelops that had been sorted by computer-generated random allocation. Group A was given 8mg bupivacaine 0.5% in 5% glucose, plus 10µg fentanyl, group B received 12mg bupivacaine 0.5% in glucose. Bupivacaine 0.5% in glucose was prepared by adding 4mg glucose 50% to 20ml bupivacaine 0.5%.[6]

In both groups distilled water was added to drug mixture for making drug volume 2.5ml in total. The syringe was prepared by one researcher and it was administered by second anesthetist who remained blinded to its contents. Patients assessment, care and data recording was done by blind observer. Before block each patient received a rapid infusion of 8ml/kg of lactated ringer's solution, in left lateral position during 15-30 minutes and the baseline blood pressure, heart rate, were noted. Subarachnoid injection was performed in the sitting position using a 25–gauge Quincke needle positioned midline at the L_3-L_4 interspace. After aspiration of 0.5ml of CSF the drug was injected. After injection the patient was immediately returned to the supine position, in 15-30 degrees head down, with left uterine displacement.

The systolic & diastolic BP, HR was recorded every one minute up to the birth of neonate and then every five minutes, thereafter using an automated non-invasive device. A success was recorded if a bilateral T4-T5 sensory to pinprick was attained within 10 minutes after the time of intrathecal drug administration, otherwise a failure was recorded and these patients were excluded from study. Hypotension was treated promptly by increasing left uterine displacement and the rate of fluid administration. If hypotension persisted despite these measures; IV ephedrine 2.5–5 mg was injected and repeated.

If hypotension persisted after 2-3 minutes. All patients received 1500-2000ml of ringer solution during whole surgery. No additional sedative or narcotics were given during the operation. The systolic & diastolic BP, HR, number of hypotension episodes, number of ephedrine usage, total ephedrine dose for each patient and intraoperative patient complaints were recorded. The condition of the neonates was assessed by Apgar score. Statistical analysis was performed using SPSS 13. Results were considered significant at $P = <0.05$.

RESULTS

The demographic data in both groups were similar and there were not significant differences. Age, weight, height, time from spinal anesthesia to starting surgery, duration between spinal anesthesia and the end of surgery, baseline heart rate, systolic blood pressure, diastolic blood pressure and level of sensory block were recorded in both groups and results were compared with T-test (Table-I).

All of the patients (except one in group A which excluded from study) had satisfactory anesthesia. Six patients from 20 in group A were injected ephedrine for treatment of hypotension. The mean dose of 4 mg ephedrine was used in group A. In group B 14 patients from 20 needed ephedrine and the mean dose of 11.75mg ephedrine was injected. The difference between two groups was significant (P-value = 0.006).

The mean of lowest diastolic blood pressure, lowest systolic blood pressure, the ratio of lowest diastolic blood pressure to basic diastolic BP and the ratio of lowest systolic BP to basic systolic BP were, respectively 58.50, 95.00, 0.70, 0.75 for group A versus 47.00, 80.50, 0.60, 0.65 for group B.

According to P-values there were significant differences between 2 groups in the mean of the lowest diastolic blood pressure (P-value=0.003) and the ratio of the lowest systolic BP to basic systolic BP (P-value=0.04).

Table-I: The comparison of demographic data

	Group AFentanyl10µg plusBupivacain 8mg12mg	*Group BBupivacaine*	*P.Value*
Age X±SD(year)	24.85 ± 5.01	25.35 ± 5.13	0.76
Weight X±SD(kg)	74.60 ± 11.35	17.76 ± 8.50	0.39
Height X±SD(cm)	156.25 ± 7.95	158.05 ± 6.59	0.45
Time from spinal to start of surgery X±SD (minute)	5.03 ± 1.03	6.01 ± 1.80	0.19
Time from spinal to end of surgery (minute)	56.10 ± 14.34	63.03 ± 20.93	0.23
Baseline Heart rate X±SD	99.41 ± 18.49	97.05 ± 17.35	0.12
Baseline systolic blood pressure (mmHg) X±SD	128.25 ± 10.42	123.50 ± 18.64	0.33
Baseline diastolic blood pressure (mmHg) X±SD	84.25 ± 8.78	81.25 ± 17.00	0.49

The difference in the mean ratio of the lowest diastolic BP to basic diastolic BP wasn't significant between two groups (P-value=0.12). 10% of the patients in group A and 20% in group B had nausea and vomiting (Fig-1). Only one patient in group A complained from mild face pruritus. The level of sensory block was T4-T5 in all of the patients (except one in group A which excluded from study).

Ephedrine had not been injected in 70% of patients in group A and 30% in group B. This difference between two groups was significant (P-Value=0.04). Patients in groups A and B received ephedrine once, twice and three times respectively (20% versus 35%, 10% versus 25% and 0% versus 10%) (Fig-2).

DISCUSSION

The difference in demographic data between two groups weren't significant (Table-I). So two groups are comparable. The hemodynamic stability of group A patients was reflected in the minimal need for vasopressor support of blood pressure. Only 6 patients from 20 in group A were injected ephedrine for treatment of hypotension (30% of patients) and the mean dose of 4mg ephedrine was used, in contrast to the marked reduction in blood pressure and significant vasopressor requirements (the mean dose of 11.75mg ephedrine) seen in the group B (70% of patients). Fluid administration may prevent a decrease in central venous pressure and may diminish or even reverse the decrease in cardiac index, but blood pressure falls nevertheless because of a substantial decrease in systemic vascular resistance.[6,7]

Fluid loading, has rapidly been shown to be of little benefit if used without an adrenergic agonist.[6,7] Ephedrine, probably the most commonly used pressor for HAS,[8] but, it is the agent of choice in cesarean section, because it does not have detrimental effect on uterine blood flow, thus, it is widely used as pressor in the

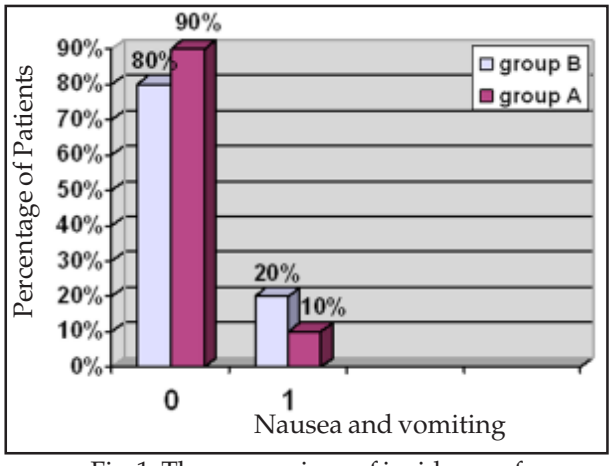

Fig-1: The comparison of incidence of nausea and vomiting.

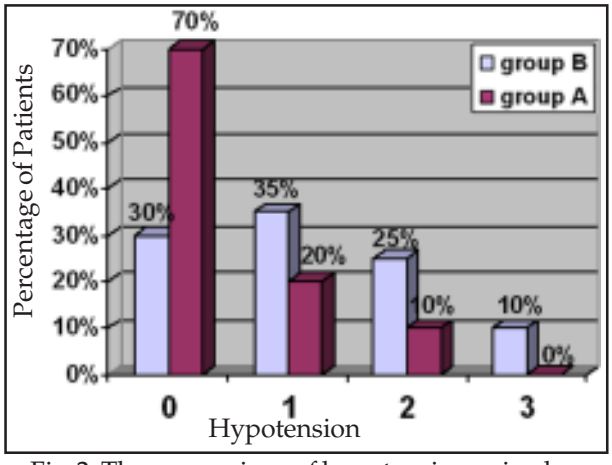

Fig-2: The comparison of hypotension episodes.

parturients. But ephedrine is capable of producing tolerance or tachyphylaxis.[2]

In this study the incidence of hypotension in group B was higher than group A (p=0.006), and the need for ephedrine was significantly greater in group B than group A (p=0.04). 70% of the patients in group B required IV ephedrine at least once. Bruce Ben-David studied 32 women undergoing cesarean section with spinal anesthesia, and their study showed that a mini dose of 5mg bupivacaine in combination with 20µg fentanyl provides successful spinal anesthesia and cause less hypotension, vasopressor requirement and nausea than 10mg bupivacaine.[8]

Nausea and vomiting during spinal anesthesia may be related to a postural hypotension and hypoxemia of the vomiting center, excessive rise in blood pressure following administration of a vasopressor is also to produce nausea.[3] This problem is unpleasant during surgery.

In one study Chung and co-workers reported that the incidences of hypotension in patients given 10-11mg bupivacaine (Group-I) was significantly higher than in group received 8-9mg bupivacaine (Group-II) but the efficacy of intraoperative analgesia in group I was significantly better than group II.[6]

Yehuda Ginosar reported that the ED_{95} (11.2mg) of intrathecal bupivacaine under the conditions of their study is considerably in excess of the low doses proposed for cesarean section in some recent publication, when doses of intrathecal bupivacaine less than the ED_{95} particularly near the ED_{50} (7.6 mg) are used, the doses should be administered as part of a catheter based technique.[9]

P. Dadakar suggested that reduced doses of hyperbaric bupivacaine 0.75% median 9.38mg and fentanyl 15µg and left sitting for two minutes prevent high block, and suggested that spinal anesthesia for cesarean section following suboptimal cesarean labor epidural analgesia be considered avoiding epidural boluses immediately preceding spinal injection.[10] In the study by Jaishri Bogra on comparing the hemodynamic stability of equipotent doses of bupivacaine and bupivacaine – fentanyl for spinal anesthesia, the group with bupivacaine 8mg and fentanyl 12.5µg was stable than other groups, and they proved that by adding fentanyl adequate depth of spinal anesthesia can be achieved at much lower doses of bupivacaine. Incidence of hypotension as well as fall in the systolic BP increases with the dose of bupivacaine.[11]

In summary this study has shown that a minidose of 8mg hyperbaric bupivacaine in combination with 10µg fentanyl provides completely satisfactory spinal anesthesia for cesarean section. The small dose combination, in comparison with a 12mg dose of hyperbaric bupivacaine causes dramatically less hypotension and less ephedrine support of blood pressure, and decreases the incidence of nausea and vomiting.

REFERENCES

1. Chestnut DH, Obstetric Anesthesia, Principles and Practice, Second Edition, New York, Mosby 1999;465-92.
2. Ronald D, Miller MD. Anesthesia, 6th ed, New York, Churchill Livingstone 2005;232-329.
3. Collins VJ. Principles of Anesthesiology. Third edition, Uunited states of America, library of congress catalog in publication data, 1993;1445-1555.
4. Hunt CO, Datla S, Hauch M. Perioperative analgesia with subarachnoid fentanyl-bupivacaine. Anesthesia, 1987;67:A 621.
5. Ben – David, Solomon E, Levin H, Admoni H, Goldic Z. Intrathecal fentanyl with small dose dilute bupivacaine: better anesthesia without prolonging recovery, Anesthesia and Analgesia 1997;85:560-5.
6. Chung CJ, Bae SH, Chae KY, Chin YJ. Spinal anesthesia with 0.25% hyperbaric bupivacaine for cesarean section: Effects of volume. Brit J Anesthesia 1996;77:145-9.
7. Rikey ET, Cohen SE, Ajetal R. Prevention of hypotension after spinal anesthesia for cesarean section six percent hetastarch versus lactated ringer's solution. Anesth Analg 1995;81:838.
8. Ben-David B, Miller G, Gavriel R, Gurevitch A. Low dose Bupivacaine-Fentanyl spinal Anesthesia for cesarean delivery. Reg Anesthesiology Pain Med 2001;26(2):180-2.
9. Yehuda G, Edward M, David R, Drover, $ED_{50,}$ ED_{95} of Intrathecal Hyperbaric Bupivacaine coadministered with opioids for Cesarean Delivery. Anesthesiology 2004;100:676-82.
10. Dadakar P, Philip J, Weidner C, Perez P, Slaymaker E, Tabaczewska L. Spinal Anesthesia for cesarean section following inadequate labor epidural analgesia. A retrospective audit, Inter J Obstetric Anesthesia 2004;13(4)239-43.
11. Bogra J, Arora N, Srivastava P. Synergistic effect of intrathecal fentanyl and bupivacaine in spinal anesthesia for cesarean section. BMC Anesthesiology 2005;17:253-60.