Original Article

Comparative study of quality of subarachnoid blocks for caeasarean section by using bupivacaine alone & bupivacaine - fentanyl combination

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Abstract

Background: *The popularity of subarachnoid block (SAB) in cesarean section in recent times is due to better understanding of the physiological changes associated with it and proper appreciation of its advantages & complications. Hyperbaric bupivacaine in adequate dose (12mg or more) for SAB often causes complications like hypotension, shivering, nausea, vomiting, chest pain & epigastric pain.*

Objectives: *The aim of study is to reduce these complications by using bupivacaine-fentanyl combination.*

Method: 150 patients of ASA grade I & II waiting for cesarean section under SAB were randomly allocated into three equal groups.

Group A : Received 0.5% hyperbaric bupivacaine-10 mg (2ml)
Group B : Received 0.5% hyperbaric bupivacaine-10 mg (2ml) & fentanyl- 15 µg [0.3ml]
Group C : Received 0.5% hyperbaric bupivacaine - 8 mg (1.6ml) & fentanyl- 15 µg. [0.3ml]

Parametric data like pulse, blood pressure, among the groups were analyzed by ANOVA test & nonparametric data like chest discomfort, epigastric pain, nausea, vomiting were analyzed by chi-square test.

Results: *In this study we found better analgesia & quality of block in bupivacaine-fentanyl group than bupivacaine alone group (p<.001).*

Conclusion: *By adding fentanyl we can reduce the dose of bupivacaine & also improve the quality of block.*

Key words: subarachnoid block, bupivacaine-fentanyl combination, quality of block.

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Introduction

Subarachnoid block (SAB) is popular for caesarean section, being simple to perform, economical & it avoids the complications of general anaesthesia. Successful spinal anesthesia for cesarean section requires upto T4 level block which can be achieved with 10-15mg intrathecal dose of 0.5% hyperbaric bupivacaine[1]. But intraoperative common complications of SAB like hypotension, shivering, nausea, vomiting, chest pain and epigastric pain are common when using bupivacaine alone in this dose. The addition of intrtathecal fentanyl10-20µg may reduce the dose of bupivacaine & thereby reducing the intraoperative complications[1]. Bogra et al showed that fentanyl as adjunct of local anesthetics in SAB in various doses has effects on following parameters - visceral pain, hemodynamic stability, intraoperative sedation, intraoperative & postoperative shivering & postoperative pain. They also showed that, fentanyl is able to reduce the dose of bupivacaine & therefore its harmful effects[2]. In view of these points discussed above, the current study is intended to make a comparison of quality of block with different small doses of bupivacaine along with fentanyl and various complications occurring intraoperatively during cesarean section under SAB.

Methods

After taking informed written consent 150 healthy women with term pregnancy, aged between 20-35 years, height between 150-157.5cm, ASA I & II undergoing elective cesarean section under SAB were randomly allocated into three equal groups by simple lottery method. None of the patients had any contradiction for spinal anaesthesia. Complicated pregnancies such as multiple pregnancies, pregnancy induced hypertension and placenta previa were excluded. Foetal and maternal distress patients are also excluded from the study.

Group A : Received 0.5% hyperbaric bupivacaine 10mg(2ml)

Group B : Received 0.5% hyperbaric bupivacaine-10mg(2ml) & fentanyl- 15 μg. (0.3ml)

Group C : Received 0.5% hyperbaric bupivacaine-8mg(1.6ml) & fentanyl- 15 μg (0.3ml).

No premedication was given. SAB was done in lateral decubitus position at L3-L4 interspace using 25G Quincke spinal needle in each patient. Drugs was injected as per allocated schedule. Then the patient were turned supine position with a wedge under right buttock & 4L / min O_2 by face mask was started. Heart rate, blood pressure & oxyhaemoglobin saturation were measured just after positioning the patient & was recorded continuously at 2 minutes interval from induction to 20 mins. & then at 5 min intervals upto the end of operation or 60 min whichever was longer. After assuming the supine position, the upper level of block was evaluated. Sensory block was evaluated by using pinprick & chlorhexidin soaked swab by wiping it up to the abdomen, starting from inguinal region up to 4th intercostal space in midclavicular line[4]. Hypotension was defined as a decrease in systolic arterial pressure below 90 mm Hg or 25% decrease from the base line and was treated with IV isotonic fluid & ephedrine 5mg incremental dose as required[5]. intraoperative sedation was used.

Shivering, nausea, vomiting, chest pain, epigastric pain, pruritus were observed during that period. Each patient was asked a complete standard questionnaire regarding nausea, vomiting, chest pain, epigastric pain, pruritus. Shivering was treated by wrapping the patient with warm blanket & warmed IV fluid.

Results

There was no significant difference between groups in ages, parity & gravida. Regarding sensory block 74% in group A, 70% in group B & 92% in group C was at the level of T_7. The level of sensory block was significantly ($p<0.05$) higher in group C.

Table-I

Distribution of level of sensory block

Level of Sensory Block	Group A (n = 50)		Group B (n = 50)		Group C (n = 50)		P Value
	n	%	n	%	n	%	
T6	10	20.0	14	28.0	0	0.0	0.35
T7	37	74.0	35	70.0	46	92.0	0.02*
T8	3	6.0	1	2.0	4	8.0	-
Total	50	100.0	50	100.0	50	100.0	

* Data are analysed by Chisquare test. Values are regared as significant P< .05

The mean difference of pulse at different times was not statistically significant.

The mean differences of systolic & diastolic blood pressure, SpO2, respiratory rate were not statistically significant.

Chest pain & epigastric pain of the patients were very highly significant($p<0.001$) higher in group A with compared to group B & C.

Table-II

Distribution of chest pain & epigastric pain.

Pain	Group A (n=50)		Group B (n=50)		Group C (n=50)		P value
	n	%	n	%	n	%	
Chest pain	23	46.0	0	0.0	1	2.0	0.001 ***
Epigastric pain	9	18.0	0	0.0	0	0.0	0.001 ***

Data are analysed by chisqare test.Values are regared as significant p<.05

Table-III

Distribution of patient's satisfaction level.

Satisfaction of	Group A (n=50)		Group B (n=50)		Group C (n=50)		P value
patient	n	%	n	%	n	%	
Excellent	17	34.0	48	96.0	49	98.0	0.010 **
Good	33	66.0	2	4.0	1	2.0	-
Total	50	100	50	100	50	100	

Data are analysed by Chisqare test.Values are regared as regared as significant P <.05

The incidence of nausea & vomiting was significantly (p<0.05) higher in group A with compared to group B& C . Mild nausea & vomiting was found 2(4.0%) in group A & none was observed in group B & C.

There was no significant difference between 3 groups in other complications like shivering, chest heaviness, pruritus. But the level of satisfaction of patients was significantly (p<0.05) higher in group B & C with compared group A.

Discussion

Recent trends of obstetrics anesthesia show increased popularity of regional anesthesia amongst obstetric anesthetists. The increasing use of low dose technique of local anesthetics & opioids in recent years become popular for elective cesarean sections. Hyperbaric bupivacaine at 10mg or less has been shown to carry a risk of inadequate block. For this reason most of the anesthesiologists have favoured the use of higher doses (12mg or more) to overcome the incomplete blocks during cesarean section.[6] But higher dose itself has some complications. Bogra et al in 2005 showed that fentanyl as adjunct of local anesthetics in SAB in various doses has effects on following parameters - visceral pain, hemodynamic stability, intraoperative sedation, intraoperative & postoperative shivering & postoperative pain. They also showed that fentanyl is able to reduce the dose of bupivacaine & its harmful effects[6].

This randomized prospective study was carried out with an objective to compare the incidence of intraoperative complications in cesarean section under spinal anesthesia with bupivacaine[2,6] alone & the addition of fentanyl with various doses of bupivacaine. Regarding the quality of block addition of fentanyl to hyperbaric bupivacaine significantly improved of intraoperative surgical anesthesia for caesarean section[7]. In this study we have found complete analgesia & quality of block were better in bupivacaine - fentanyl group than bupivacaine only group.

In our study the level of sensory block was up to T_7 in majority such as 74% in group A, 70% in group B & 92% in group C. The level of sensory block T_7 was significantly (p<0.05) higher in group C with compared to group A & group B, whereas T_6 level was not significant between group A and group B. Although ideally T_4 level of block is required for caesarean section[1], but in our study the level of analgesia achieved is T_6 which is sufficient for caesarean section.

In this study, there were no significant difference among three groups regarding haemodynamic parameters, SpO2 and respiratory rate.

Comparing of equipotent doses of bupivacaine alone & bupivacaine fentanyl combination, we found no significant change after four, six, eight & ten minutes. Bogra et al. also have found that intraoperative hypotension increases with increasing the doses of bupivacaine along with fentanyl[2].

In our study we use smaller dose of fentanyl in subarachnoid space thereby producing no effect on APGAR score of newborn babies in group B&C. Dahlgren et al has also showed that, use of the smallest effective opioid dose minimize potentially adverse maternal & neonatal risks[7].

Chest pain was very highly significant ($p<0.001$) in group A (46%) compared to group B (2.0%) & C (none). Palmer CM et al. proved that 47.3% patients developed symptoms of chest pain during cesarean delivery under regional anesthesia & electrocardiographic changes occurred[8]. The changes were suggestive of myocardial ischemia. No patient without electrocardiographic change developed symptoms of chest pain. Incidence of chest pain was similar to our study. But we did not monitor ECG changes of the patients. Moran C et al speculate that the myocardial ischemia is a likely cause of both the ECG changes & of the symptoms of chest pain that they sometimes experience. Significant ST changes were recorded in 42% of patients preoperatively who felt chest pain requiring opioid analgesia[9].

In our study those patients who received intrathecal fentanyl did not complain any chest pain. Sivam Ramanthan et al[10] showed that the chest pain may be due to hyperkinetic myocardial contractility state which causes ST segment depression & it was heralded by tachycardia occurring within 15 mins after delivery. The time of onset of chest pain is similar to our study.

In same way, epigastric pain was found 18% in group A & none was found in group B & C. Cesarean section required traction of peritoneum & handling of intraperitoneal organs resulting in intraoperative visceral pain[2]. In our study time appearance of epigastric pain during operation was correlated with the time of peritoneal closing. Most probably this visceral pain might be expressed by patients as epigastric pain.

In this study, nausea & vomiting was significantly ($p<0.05$) higher in group A with compared to group B & C. Jaishri et al[2] also reported that incidence of vomiting was more in bupivacaine alone group than fentanyl combination group. Nausea & vomiting have multiple etiologies, which include hypotension, vagal hyperactivity, visceral pain, I/V opioid supplementation, uterotonic agents & increased gut motility[11]. In our study all 3 groups were heamodynamically stable. Despite achieving an adequate sensory level nausea during manipulation of the uterus & at the time of peritoneal closure was sometimes a problem in the present study group A. Christer Hulstrand et al. have shown beneficial effects of adding various opioids to the local anesthetic solution administered intrathecally[7]. Subarachnoid opioids successfully decrease the incidence of intraoperative visceral pain[12]. In our study incidence of nausea & vomiting was negligible in group B&C. Chest heaviness was highly significant ($p<0.001$) in group A compared to group B&C which were 66.0% in group A, 2.0% in group B & none was found in group C. Gunner Dahlgren et al. have showed that co-administration of small doses of opioids & bupivacaine for spinal anesthesia reduces intraoperative feeling of discomfort in the chest.

Bruce et al. showed in their study that pruritus was common in the patients receiving intrathecal fentanyl, although in most cases, it is mild as do not require treatment. They found that the use of 20 μg dose of fentanyl lead to more pronounced pruritus that although well tolerated. In our study we found that pruritus after a 15 μg dose of fentanyl was less prominent which did not cause any ill effect to the patient. Christer Hulstrand et al. also observed that intraoperative pruritus was almost exclusively related to the use of sufentanyl[11].

Incidence of intraoperative complications (like chest pain, epigastric pain, nausea - vomiting) during elective caesarean section under SAB in mentioned and in our study are same. We can minimize the intraoperative complication by reducing the dose of bupivacaine and adding small dose of fentanyl (15μg)

Conclusion

We can routinely use fentanyl in combination with bupivacaine intrathecally to improve the quality of subarachnoid block.

References

1. Farragher Rachel A and Kodali Bhavani Shankar. anesthesia, In: Thomas E J Healy, Paul R Knight, Wylie Churchill-Davidson's A practice of anesthesia; 7th ed. London, Arnold; 2003: 930.
2. Bogra Jaishri, Arora Nomita, Srivasta Pramita, Synergistic effect of intrathecal fentanyl and bupivacaine in spinal anesthesia for cesarean section, BMC Anesthesiology 2005,5:5.
3. Barua PC, Rahman AKM, Rahman A. Reports on awareness workshop on research methods for the specialists and program managers. Institute of Child and Maternity Health. 2001; 80.
4. Nagata E et. al., Comparison of 8 mg and 10 mg hyperbaric bupivacaine during spinal anesthesia for cesarean section in Japanese parturient, Masui. 2004; 53(2):131-6.
5. Gupta S. Controversies in obstetric anesthesia, Indian J. Anesthesia, 2005; 49(3):180-189.
6. Choi DH, Ahn Hj, Kim MH, Bupivacaine-sparing effect of fentanyl in spinal anesthesia for cesarean delivary, Reg Anes Pain Med. 2000; 25(3): 240-5.
7. Gunnar Dahlgren, Hulsrnd christer, Jakobson JPN et al. Intrathecal sufentanyl, fentanyl or placebo added to bupivacaine for caesarean section, Anaesth Analg 1997; 85(6): 288-93.
8. Palmer CM, Norris MC, Giudici MC, Leighton BL, DeSimone CA. Incidence of electrocardiographic changes during cesarean delivery under regional anesthesia, Anesth Analg.1990; 71(1):36-43.
9. Moran C.I, Bhuinneain NI, Cunningham MI et al. Myocardial ischemia in normal patients undergoing elective Cesarean section : a peripartum assessment, Anesthesia 56, 11; 2001: 1051-1058(8).
10. Roy Louise, Ramanthan Sivam, ST-segment depression and myocardial contractility during Cesarean section under spinal anesthesia, Can J Anesth 1999; 46 (1): 52-56.
11. Balki M, Carvalho JC intraoperative nausea and vomiting during cesarean section under regional anesthesia. Int J Obstetrics Anesth.2005, Jul; 14(3):230-41.
12. B.H. Minzter, Pain Relief and Anesthesia in Obstetrics, 1st edition, Andre van Zundert; 257.