

ORIGINAL RESEARCH

A comparative study of intrathecal bupivacaine versus fentanyl as adjuvant to low dose bupivacaine in cesarean section: Report from a tertiary care centre of Maharashtra

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ABSTRACT

Introduction: The choice of anesthesia for cesarean section is determined by multiple factors, including the indication for operative delivery, its urgency, patient and obstetrician preference and skill of anesthetists. The aim of this study was to compare and determine the efficacy of intrathecal fentanyl as an adjuvant to bupivacaine in cesarean section.

Materials and Methods: An observational study was conducted by Department of Anesthesiology and critical care, Dr. Balasaheb Vikhe Patil Rural Medical College & hospital, Loni. The study duration was 12 months from November 2021 to October 2022. A total of 100 pregnant females were randomly divided into two groups, with 50 patients in each group: Group I: Received intrathecal injection of 0.5% hyperbaric bupivacaine 2 mL (10mg). Group II: Received intrathecal injection of 1.8 ml (8 mg) of 0.5% hyperbaric bupivacaine plus 0.5 ml (25 ug) fentanyl. Results were expressed as mean \pm standard deviation or number (%). Comparison between different parameters were performed using unpaired t test. Comparison between categorical data was performed using chi square test. The data was considered significant if p value < 0.05.

Results: The mean age of the patients enrolled in the study was 24.7 with a SD of 7.2 years. The duration of the surgery ranged from 76.2 minutes to 44.5 minutes with a mean duration of 50.4 minutes and a SD of 11.2 minutes. There was no significant difference between group I and II based on age distribution and duration of surgery.

Conclusion: By its synergistic effect with 0.5% hyperbaric bupivacaine it provides better intraoperative and postoperative analgesia, good hemodynamic stability, less incidence of complications like nausea, vomiting and shivering without compromising the safety of mother and the fetus.

Key Words: intrathecal bupivacaine, fentanyl as adjuvant to low dose bupivacaine, cesarean section:

INTRODUCTION

The choice of anesthesia for cesarean section is determined by multiple factors, including the indication for operative delivery, its urgency, patient and obstetrician preference and skill of

anesthetists. Regional anesthesia has a number of advantages including less neonatal exposure to potentially depressant drugs, decreased risk of maternal pulmonary aspiration, an awake mother at the birth of her child. There is option of using spinal opioid for postoperative pain relief. [1] The intrathecal (spinal) anesthesia has some complications like hypotension, post-dural puncture headache etc.

Drug used mainly hyperbaric bupivacaine 10 to 15 mg with or without fentanyl 10 to 25 micrograms [1,2].

Spinal anesthesia is the most common method of regional block in cesarean section [3]. Many physiological and anatomical changes during pregnancy affect spinal anesthesia. The hormonal and mechanical factors make pregnant women require less local anesthetic than non-pregnant women to attain the same level of spinal anesthesia [4]. They stand at a greater risk of toxicity to local anesthetics due to the increased penetration through tissue membranes, decreased plasma protein binding and progesterone enhanced cardiotoxicity [5]. Any dose alterations can cause hemodynamic instability leading to increased maternal and neonatal morbidity and mortality. Studies on hemodynamic alterations in spinal anesthesia show that the hypotension after spinal anesthesia is caused due to the enhanced sympathetic segmental block due to higher dose of local anesthetic [6].

Among the local anesthetics hyperbaric bupivacaine is the preferred local anesthetic. The unique characteristics of this drug are the highest potency, slow onset of action (5- 8min) and longer duration of action. Further, studies have shown that the combination of bupivacaine and fentanyl produce less hypotension [7]. Studies have also shown that by adding intrathecal opioids to bupivacaine in cesarean section enhance the quality of surgical analgesia [8]. The opioids act on opioid receptors present in the substantia gelatinosa of dorsal horn of spinal cord. They are commonly

used as additive with local anesthetics for potentiating their effects, thus offering hemodynamic stability by reducing the dose and side effects of local anesthetics. They also prolong the duration of postoperative analgesia [9]. 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 [10].

The aim of this study was to compare and determine the efficacy of intrathecal fentanyl as an adjuvant to bupivacaine in cesarean section.

MATERIALS AND METHODS

An observational study was conducted by Department of Anesthesiology and critical care, Dr. Balasaheb Vikhe Patil Rural Medical College & hospital, Loni. The study duration was 12 months from November 2021 to October 2022. Patients above 18years of age, of either gender, willing to give informed written and verbal consent who got directly admitted in ICU, Pravara rural hospital were enrolled in the study.

INCLUSION CRITERIA

Patient/Relative willing to give written, informed and verbal consent for study, Patients with age more than 18 years, Spinal anaesthesia for cesarean section, ASA physical status 1 or 2, Normal coagulation profile and Patients directly getting admitted to Pravara Rural Hospital, Loni.

EXCLUSION CRITERIA

Patient / Relative not willing to give written, informed, verbal consent, Referred cases, Patients who took discharge against medical advice, ASA 3 or 4 and Complicated pregnancy such as placenta previa, fetal distress were excluded.

A total of 100 pregnant females were randomly divided into two groups, with 50 patients in each group:

Group I: Received intrathecal injection of 0.5% hyperbaric bupivacaine 2 mL (10mg).

Group II: Received intrathecal injection of 1.8 ml (8 mg) of 0.5% hyperbaric bupivacaine plus 0.5 ml (25 ug) fentanyl.

All patients received Inj. Pitocin 10 units in drip after delivery of baby.

Base line systolic blood pressure (SBP), diastolic blood pressure (DBP) and pulse rate were recorded in supine position with a wedge under the right buttock. Patients were allocated into two groups of 40 patients each allocation into Group I and Group II. Group I received total volume of 2.5 ml with a combination of 10 mg 0.5% hyperbaric bupivacaine and 25 microgram fentanyl, whereas Group II received 2.5 ml with 12.5 mg 0.5% hyperbaric bupivacaine. Under aseptic conditions, lumbar puncture was performed with 25 gauge spinal needle at the level of L4-5 interspace. After the free flow of cerebro-spinal fluid the specific drug in each group was injected slowly over 20 seconds. Patients were positioned immediately in supine position. The wedge was placed under patients right buttock to avoid the supine hypotension syndrome. Oxygen was supplemented with face mask at 5 liters per minute. Systolic and diastolic blood pressure and maternal heart rate were recorded every 2 minutes for the first 30 minutes and thereafter for every 5 minutes intraoperatively. A decrease of systolic blood pressure <95 mm Hg or Decrease $> 25\%$ from base line was considered hypotension and treated with 5 mg ephedrine and as required. Vasopressor requirements were noted; sensory level of block was assessed by loss of cold sensation bilaterally at 2 minutes and confirmed by a pinprick method. All patients were evaluated for quality of sensory block on a descriptive scale (good, satisfactory and poor). Degree of motor block was assessed by modified Bromage scale. An intraoperative pain assessment was done using visual analog scale (VAS) (0-10cm where 0 = no pain and 10= worst possible pain). Postoperative pain was also assessed using VAS scale. Duration of effective analgesia was taken from the time of intrathecal injection to a VAS score >4 . Side effects such as nausea, vomiting, pruritus and shivering were noted. Duration of two segment regressions of the sensory blocked was noted. Apgar score of newborn was recorded at 1 minute and 5 minutes. Results were expressed as mean \pm standard deviation or number (%). Comparison between different parameters was performed using unpaired t test. Comparison between categorical data was performed using chi square test. The data was considered significant if p value < 0.05 .

RESULTS

The mean age of the patients enrolled in the study was 24.7 with a SD of 7.2 years. The duration of the surgery ranged from 76.2 minutes to 44.5 minutes with a mean duration of 50.4 minutes and a SD of 11.2 minutes. There was no significant difference between group I and II based on age distribution and duration of surgery.

Time required for the onset of sensory analgesia was comparable in both groups. Peak level of sensory analgesia was comparable in both groups. The addition of fentanyl to bupivacaine did not change the height of block. The mean time required to reach peak sensory level was earlier in group I than group II and this was statistically significant. The duration of effective analgesia was prolonged in group I compared to group II and was statistically significant. The onset of motor blockade was clinically earlier in group II but statistically not significant. All patients in both groups had complete motor blockade. The mean duration of motor recovery was shorter in group I than group II and was statistically significant. [Table 1]

The mean maximum heart rate was significantly more in group II than group I. The decrease in systolic blood pressure in group II was significantly more than group I. More patients in group II required additional fluid and vasopressors as compared to patients in group I. [Table

2] the difference of Spo₂ and respiratory rate was not significant in both the groups. Group II patients encountered more side-effects as compared to group I patients. Hypotension that called for medical attention followed by nausea was the most common side-effect for patients of both the groups. Vomiting and shivering was reported by one patient each of group II. Pruritis was complained by 1 patient in group I.

Table 1: Comparison of both the groups based on their sensory and motor blockade

Parameter	Group I	Group II	P value
Onset of sensory blockade (sec)	62 ± 8	66 ± 8	>0.05
Peak sensory level (min)	5.1 ± 2.1	7.2 ± 2.5	<0.05
Complete sensory recovery (min)	138.4 ± 11.8	115.8 ± 5.6	<0.05
Onset of motor blockade (sec)	76.8 ± 5.9	74.5 ± 8.1	>0.05
Complete motor recovery (min)	91.3 ± 11.9	115.7 ± 8.1	<0.05

Table 2: Comparison of both the groups based on hemodynamic variables

Hemodynamic variable	Group I	Group II	P value
Basal heart rate (min)	94.7 ± 5.1	97.3 ± 4.1	>0.05
Minimal heart rate (min)	88.7 ± 7.1	90.8 ± 6.3	>0.05
Maximum heart rate (min)	102.5 ± 4.6	111.8 ± 3.8	<0.05
Basal SBP (mm Hg)	115.7 ± 7.8	114.5 ± 7.1	>0.05
Minimum SBP (mm Hg)	100.8 ± 6.9	90.6 ± 10.2	<0.05
Minimum DBP (mm Hg)	65.5 ± 9.7	59.9 ± 11.2	<0.05
Patients required ephedrine	2	9	<0.05
Patients required additional crystalloid	1	5	<0.05

DISCUSSION

Anesthesia related complications accounted for 5.2% maternal death [11]. The relative risk of fatality during general anesthesia is 16 times more than that of regional anesthesia [12]. Spinal anesthesia is the preferred method for elective cesarean section as being simple to perform, economical and producing rapid onset of anesthesia with complete muscle relaxation. It carries high efficiency, involves less drug doses, minimal neonatal depression and lesser incidence of aspiration pneumonitis. However, it also produces a fixed duration of anesthesia, lesser control of block height, post dural-puncture headache and hypotension [13,14]. This hypotension may cause maternal morbidity, nausea, vomiting and influence the neonatal well-being by reducing utero-placental blood flow [15]. The link between the extent of sympathetic block and the incidence of hypotension has led to numerous attempts at reducing the dose of local anesthetics and also addition of opioids due to their synergistic action with local anesthetics on sensory block without increasing sympathetic block for cesarean section [16].

The current study showed that the systolic and diastolic blood pressure were decreased significantly after spinal anesthesia in group II when compared to group I, mostly due to more sympathetic blockade by higher dose of bupivacaine $p < 0.05$. Similar findings were observed by Bogra et al [17] and also by Seyedhejaze and Madarekl [18] wherein they studied by using 8 mg of bupivacaine and 10 microgram of fentanyl for spinal anesthesia in cesarean section. The quality of analgesia was assessed by VAS was excellent in the bupivacaine and fentanyl group, similar observations were made by Choi et al. also study done by Ngiam and Chong [19] who observed that the duration of effective analgesia was significantly prolonged with addition of fentanyl to hyperbaric bupivacaine. Idowu et al [20] made a study, the result of which is similar to this study. Further, in group I two patients

complained of mild pruritus, may be because of side effect of fentanyl, but the etiology of it was not ascertained. Similar findings were observed by Cowan et al [21] but the study by Jashri et al observed no incidence of pruritus. No patients complained of nausea and vomiting may be due to reduction of dose of bupivacaine from 12.5 mg to 10 mg causing less hypotension in bupivacaine with fentanyl group. Negligible incidences of shivering or respiratory depression were observed in both the groups, which were similar to findings of Kang et al. In this study, none of the newborn babies had 1 and 5 minutes Apgar score < 8. Similar observations were made by Belzarena indicating that the dose of fentanyl used may not have a significant effect on the newborn. By reducing the doses of bupivacaine from 12.5 mg to 10 mg and the addition of fentanyl, we have been able to decrease the incidence of episodes of low blood pressure and subsequently poor neonatal outcome.

CONCLUSION

Thus, it can be concluded that intrathecal fentanyl helps in reducing the dose of 0.5 % hyperbaric bupivacaine for spinal anesthesia in cesarean section thus reducing the incidence of side effects associated with it. By its synergistic effect with 0.5% hyperbaric bupivacaine it provides better intraoperative and postoperative analgesia, good hemodynamic stability, less incidence of complications like nausea, vomiting and shivering without compromising the safety of mother and the fetus.

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