International Journal of Research in Medical Sciences
Surana RN et al. Int J Res Med Sci. 2020 Aug;8(8):2924-2927
www.msjonline.org
pISSN 2320-6071 | eISSN 2320-6012
DOI: http://dx.doi.org/10.18203/2320-6012.ijrms20203439

Original Research Article

Evaluation of adjunctive analgesia with intrathecal fentanyl along with hyperbaric bupivacaine in spinal anesthesia for elective cesarean section

Ranu Neelamchand Surana*, Trishala Jain

Department of Anesthesiology, SMS Medical College, Jaipur, Rajasthan, India

Received: 01 June 2020
Accepted: 30 June 2020

***Correspondence:**
Dr. Ranu Neelamchand Surana,
E-mail: drranumail@gmail.com

ABSTRACT

Background: Cesarean section (CS) is one of the most common surgical procedures in female patients. Authors aimed to evaluate the postoperative analgesic efficacy of adding intrathecal fentanyl to bupivacaine, and its effect on the onset and duration of spinal anesthesia along with its effect on mother and neonate.
Methods: Study was performed on 60 cesarean section parturients divided into two groups. Group F received 2 ml of 0.5% hyperbaric bupivacaine (10 mg) plus 0.4 ml fentanyl (20 µg), and Group B received 2 ml of 0.5% hyperbaric bupivacaine (10 mg) plus 0.4 ml of normal saline. The parameters taken into consideration were pain scores, analgesic requirement, hemodynamic stability and side effects.
Results: It was found that duration of sensory block was prolonged in fentanyl group (111 minutes vs 86 minutes, p<0.001). Duration of effective analgesia (174.36 minutes vs 127.81; p value <0.001) were also found to be prolonged in Group F with requirement of fewer postoperative analgesics (1.02 vs 2.76, p=0.03). There was not much difference in the occurrence of side effects in both the groups.
Conclusions: Addition of fentanyl to intrathecal bupivacaine for cesarean section increases the duration of postoperative analgesia without increasing maternal or neonatal side effects.

Keywords: Adjunctive analgesia, Fentanyl with bupivacaine, Intrathecal analgesia, Lower segment caesarean section

INTRODUCTION

Subarachnoid block is the preferred anesthesia for caesarean section, being simple to perform and economical with rapid onset.[1] The routine doses of bupivacaine are associated with prolonged and intense sensory and motor block and significant sympathetic block, which may not be desirable in some patients. Low dose diluted bupivacaine limits the distribution of spinal block and yields a comparably rapid recovery, but may not provide an adequate level of sensory block.[2] The potentiating effect of short acting lipophilic opioid fentanyl is used to reduce the dose requirement of bupivacaine and its adverse effects and also to prolong analgesia.

The present study was done to evaluate the efficacy and safety of adding fentanyl to low dose bupivacaine for spinal anesthesia in patients undergoing Lower Segment Caesarean Section (LSCS).

METHODS

This prospective, randomized, double-blind, and placebo controlled clinical study was designed to include 60 adult patients (16-60 year) with ASA physical status Class I or II, posted for caesarean section in our institution. The study was done over a 6-month period from September 2019 to February 2020, after approval from the institutional ethical committee and written informed consent was obtained from all the patients.

Patients with a history of spine surgery, infection at the injection site, coagulopathy, hypovolemia, increased intracranial pressure, indeterminate neurologic disease, spinal deformities, communication problems, known hypersensitivity to local anaesthetics or opioids were excluded from the study.

The patients were randomized by computer-generated random numbers into two groups of thirty each. Preanesthetic evaluation and basic laboratory investigations were done in all the patients, and they were explained in detail about the procedure of the spinal anesthesia during the preanesthetic visit. Patients were familiarized with the visual analog scale (VAS) (0 - No pain, 10 - Worst pain) a day before surgery.

In the operating room, baseline blood pressure (BP) (systolic, diastolic, and mean), heart rate, respiratory rate, and peripheral oxygen saturation (SpO2) were recorded after attaching routine monitors (electrocardiogram, non-invasive BP, and pulse oximeter). Intravenous access was secured with 18G cannula, and all patients were preloaded with 10 ml/kg of Ringer's lactate solution. The study medication (2.4 ml of the drug solution) was prepared by an anaesthesiologist who did not take part in the study.

Group F patients received 2 ml of 0.5% hyperbaric bupivacaine plus 0.4 ml fentanyl (20 µg), and Group B patients received 2 ml of 0.5% hyperbaric bupivacaine plus 0.4 ml of normal saline. The subarachnoid block was performed by an anaesthesiologist who was not involved further in the study to ensure blinding. Both patients and observers were blinded to the drugs given. Patients were then immediately placed in the supine position, with a wedge under the right hip to maintain left uterine displacement. Oxygen was provided through Venturi mask at the rate of 4 l/min. BP (systolic, diastolic, and mean), heart rate, respiratory rate, and SpO2 were continuously monitored and recorded at 5, 10, 15, 20, 25, and 30 min after the injection, and subsequently every 15 min. Hypotension (defined as systolic BP of <90 mmHg or <20% of baseline BP) was treated with intravenous fluid initially (250 ml boluses repeated twice). Bradycardia (defined as heart rate of <60) was treated with 0.6 mg of intravenous atropine sulfate.

Sensory block was assessed by pinprick method and motor block by Modifed Bromage Scale. The onset of sensory blockade (defined as the time from the injection of intrathecal drug to the absence of pain at the T6 dermatome) and onset of complete motor blockade (time taken from the injection to development of Bromage's Grade 3 motor block) were recorded. The duration of sensory blockade (regression to L1 level from highest level of sensory blockade) was also recorded in each patient. Duration of motor blockade (time required for motor blockade to return to Bromage's Grade 1 from the time of onset of motor blockade) was also noted. Grades of sedation during surgery were assessed by the Modifed Ramsay's sedation scale. Postoperatively, pain scores (VAS) were assessed every 15 minutes in the first hour, then hourly for the first 4 h and at 12 and 24 h.

The duration of effective analgesia (time from the intrathecal injection to the first rescue analgesic requirement, VAS score >3) was noted. I

ntramuscular diclofenac (75 mg) was administered as rescue analgesic, and total number of rescue analgesics required postoperatively in 24 h period was recorded. Patients were also assessed for side effects such as nausea, vomiting and pruritis. Apgar scores were recorded at 1 and 5 min after delivery of baby.

The primary outcome of the study was to assess which group produced a longer duration of analgesia measured in terms of the first request for analgesia post-operatively.

The secondary outcome was to compare the two groups in terms of time of onset of analgesia, peak sensory level, time to reach peak block, degree of motor blockade and haemodynamic profile of the two groups.

Statistical analysis was done using Statistical Package for the Social Sciences (SPSS) version 22 (SPSS Inc, Chicago, Illinois, USA). Data were analysed by using unpaired 't' test. p value <0.05 was considered statistically significant. Data are presented as mean values±SD and numbers (percent).

RESULTS

Spinal anaesthesia was successfully accomplished in all patients. The demographic profile, which included patients age, sex, weight, height and ASA grading were similar and no significant difference was observed between the groups (Table 1).

Table 1: Demographic profile.

	Group B	Group F	p value
Age (Yrs)	25.6±5.4	26.8±4.1	0.43
Height (cm)	148±6.3	152±6.1	0.38
Weight (Kg)	56.3±4.8	54.2±4.2	0.56
Heart Rate (bpm)	84.3±8.4	78.3±6.9	0.14
SBP (mm Hg)	124.5±6.7	125±3.4	0.87
DBP (mm Hg)	76.3±3.8	79.2±5.3	0.36
Gestational age (wks)	38.2±1.5	38.0±1.4	0.27
ASA I/II	19/11	20/10	-

The onset of bupivacaine induced spinal block was not enhanced in fentanyl group. (Table 2). The time intervals (duration) for sensory level to regress to L1 dermatome were prolonged in fentanyl group but duration of motor blocks was not prolonged in fentanyl group (Table 2).

Table 2: Characteristics of sensory and motor block.

	Group B	Group F	p value
Highest sensory level achieved	T6 (T5-T7)	T5 (T4-T6)	-
Onset of sensory block (min)	5.10±1.18	4.58±0.53	0.054
Onset of motor block (min)	7.06±1.68	6.82±1.53	0.586
Duration of sensory block (min)	86.06±8.72	111.46±6.49	<0.001
Duration of motor block (min)	144.44±5.24	154.72±5.89	0.26

The primary outcome of the study which was the duration of effective analgesia was significantly less in the fentanyl arm. Additionally, the duration of complete analgesia was longer and the number of rescue analgesia required was lesser in the patients receiving bupivacaine with fentanyl compared to bupivacaine alone (Table 3).

Table 3: Postoperative analgesia.

	Group B	Group F	p value
Duration of effective analgesia (min)	168.28±7.55	232.70±13.15	<0.001
Duration of complete analgesia (min)	127.81±12.88	174.36±24.32	<0.001
Number of rescue analgesics	1.02±0.6	2.76±0.580	<0.03

Table 4: Adverse events.

	Group B	Group F	p value
Nausea/vomiting	5 (17%)	2 (7%)	0.06
Pruritis	0 (0%)	3 (10.3%)	0.08
Respiratory depression	1 (3.5%)	1 (3.5%)	0.98
Hypotension	6 (20%)	5 (17%)	0.55
Bradycardia	3 (10%)	3 (10%)	0.37
APGAR 1	8-10	7-10	-
APGAR 5	9-10	9-10	-

The number of patients having hypotension or bradycardia were similar in the 2 groups suggesting no significant effect on hemodynamics when fentanyl is added to bupivacaine. Additionally, nausea and vomiting were less in the fentanyl group (Table 4).

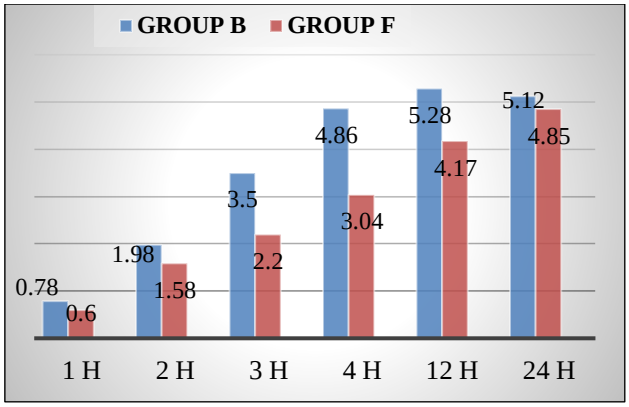

Figure 1: Post-operative VAS scores in the two groups.

Pain scores were also less in the fentanyl arm and the efficacy was especially better in the first 4 hours after spinal anesthesia, after which the difference in VAS scores was less till 24 hours (Figure 1).

DISCUSSION

Hyperbaric bupivacaine is the most common drug used in spinal anesthesia for caesarean section. The use of neuraxial opioids has gained popularity over the last few years; they may augment the analgesia produced by local anaesthetics through direct binding with the specific spinal receptors. Fentanyl is a lipophilic opioid with a rapid onset following intrathecal injection and does not migrate to the 4th ventricle to cause respiratory depression.

The present study found that sensory recovery time was longer in the group with fentanyl added to bupivacaine than with bupivacaine alone. However, the onset of sensory block was comparable in the two groups. Similar results were observed by Biswas et al, Gauchan et al and Yun et al.[3-5] Adding fentanyl to bupivacaine did not affect the onset or duration of motor block.

Intrathecal fentanyl when added to spinal local anaesthetics reduces visceral and somatic pain.[6] Authors found that patients receiving intrathecal fentanyl along with bupivacaine had better analgesic efficacy in terms of effective analgesia, complete analgesia and the number of rescue analgesics required. Opioids interrupts pain transmission in the dorsal horn, while local anesthetics block conduction in the motor and sensory nerves.[7] Therefore, adding an opioid to the local anesthetic may offer local anesthetic sparing effects and lead to shorter onset time and prolonged duration for sensory block.

Regarding haemodynamics, no significant difference was observed in the incidence of bradycardia or hypotension by adding fentanyl to low dose bupivacaine. A review by Abate and Belihu has shown that incidence of hypotension is less likely in mothers undergoing LSCS with low dose bupivacaine with intrathecal fentanyl.[8]

Authors found that the incidence of nausea/vomiting were less in the group receiving fentanyl with bupivacaine compared to bupivacaine alone. This might be due to fewer episodes of hypotension incidents in low dose bupivacaine with fentanyl as a result of relatively less tense sympathetic blockade, in which parasympathetic vagal dominance in gastrointestinal tract is balanced unlike with conventional bupivacaine dose where vagal dominance is pronounced. Similar results have been reported in other studies and some authors have attributed an antiemetic role to fentanyl.[1,3,9]

Authors observed a low incidence of pruritus among the women who received spinal anesthesia with local anesthetic alone, as has been reported in other studies.[3,10] The incidence of pruritus reached 10% among patients in the fentanyl group, which was also consistent with results of other studies that have reported rates of pruritus ranging from 10% to 24%.[3,10] Authors observed that chest pain and abdominal pain due to uterine contractions after giving oxytocin was significantly reduced in patients receiving fentanyl along with bupivacaine. Visceral pain is a common problem in cesarean section under spinal anesthesia. In this study authors found no pain in the group receiving fentanyl. However, visceral pain was not fully abolished with bupivacaine alone.

A limitation of the present study was that we could not compare the extended postoperative pain relief according to each group. Also, we did not consider height and used the same dose of bupivacaine (10 mg) in all patients, which might be associated with high incidence of hypotension in patients with short stature.

CONCLUSION

In this study, it was found that addition of fentanyl to low dose bupivacaine increased the level of sensory block and post-operative analgesic efficacy without significant adverse effects. Authors recommend the use of intrathecal fentanyl for CS in medical centers that do not use any other intrathecal opioid at present, provided that patients are monitored during the early postoperative period, especially for sedation.

Funding: No funding sources
Conflict of interest: None declared
Ethical approval: The study was approved by the Institutional Ethics Committee

REFERENCES

1. Bogra J, Arora N, Srivastava P. Synergistic effect of intrathecal fentanyl and bupivacaine in spinal anesthesia for cesarean section. BMC Anesthesiol. 2005 Dec;5(1):1-6.
2. Kim SY, Cho JE, Hong JY, Koo BN, Kim JM, Kil HK. Comparison of intrathecal fentanyl and sufentanil in low-dose dilute bupivacaine spinal anaesthesia for transurethral prostatectomy. Br J Anaesth. 2009;103:750-4.
3. Biswas BN, Rudra A, Bose BK, Nath S, Chakraborty S, Bhattacharjee S. Intrathecal fentanyl with hyperbaric bupivacaine improves analgesia during caesarean delivery and in early postoperative period. Indian J Anaesth. 2002;46:469-72.
4. Gauchan S, Thapa C, Prasai A, Pyakurel K, Joshi I, Tulachan J. Effects of intrathecal fentanyl as an adjunct to hyperbaric bupivacaine in spinal anesthesia for elective caesarean section. Nepal Med Coll J. 2014;16:5-8.
5. Yun SH, Song SW, Park JC. Beneficial effects of the addition of intrathecal fentanyl to bupivacaine for spinal anesthesia in cesarean section. Anesth Pain Med. 2017;12:233-9
6. Nayagam HA, Singh NR, Singh HS. A prospective randomised double blind study of intrathecal fentanyl and dexmedetomidine added to low dose bupivacaine for spinal anesthesia for lower abdominal surgeries. Indian J Anaesth. 2014;58:430-5.
7. Ali MA, Ismail S, Sohaib M, Aman A. A double-blind randomized control trial to compare the effect of varying doses of intrathecal fentanyl on clinical efficacy and side effects in parturients undergoing cesarean section.J Anaesthesiol Clin Pharmacol. 2018;34:221-6
8. Abate SM, Belihu AE. Efficacy of low dose bupivacaine with intrathecal fentanyl for cesarean section on maternal hemodynamic: Systemic review and meta-analysis. Saudi J Anaesth. 2019;13:340-51.
9. Weigl W, Bierylo A, Wielgus M, et al. Analgesic efficacy of intrathecal fentanyl during the period of highest analgesic demand after cesarean section: a randomized controlled study. Medicine. 2016;95:e3827.
10. Weigl W, Bierylo A, Wielgus M, Krzemień-Wiczyńska S, Szymusik I, Kolacz M, et al. Perioperative analgesia for caesarean section: comparison of intrathecal morphine and fentanyl alone or in combination. Int J Obstet Anesth 1997;6:43-8.

Cite this article as: Surana RN, Jain T. Evaluation of adjunctive analgesia with intrathecal fentanyl along with hyperbaric bupivacaine in spinal anesthesia for elective caesarean section. Int J Res Med Sci 2020;8:2924-7.