International Journal of Medical and Pharmaceutical Research

Online ISSN-2958-3683 | Print ISSN-2958-3675
Frequency: Bi-Monthly
Available online on: https://ijmpr.in/

Research Article

A COMPARITIVE STUDY BETWEEN INTRATHECAL HYPERBARIC BUPIVACAINE 0.5% AND HYPERBARIC BUPIVACAINE 0.5% WITH FENTANYL 10 µGM IN CAESAREAN SECTION

Dr. Anoop Agarwal[1], Dr. Sangamsinh Solanki[2], Dr. Mukund Patil[3], Dr. Chetas Shah[4]

[1] *Professor & Head, Department of Anaesthesia, Namo Medical Education & Research Institute, Silvassa*
[2] *Senior Consultant, Department of Anaesthesia, Namo Medical Education & Research Institute, Silvassa*
[3, 4] *Anaesthesia Resident, Namo Medical Education & Research Institute, Silvassa*

OPEN ACCESS

Corresponding Author:

Dr. Mukund Patil
Anaesthesia Resident, Namo Medical Education & Research Institute, Silvassa

Received: 09-08-2025
Accepted: 25-08-2025
Available online: 10-09-2025

ABSTRACT

Background and Objectives: Spinal anaesthesia is routinely employed for caesarean sections. The use of neuraxial opioids has gained widespread popularity as they augment the analgesia produced by local anaesthetic through direct binding with specific receptors. Hence this study was undertaken to evaluate the effects of intrathecally administered fentanyl 10µgm on the onset of hyperbaric bupivacaine induced sensory and motor spinal block, quality of intraoperative anaesthesia and postoperative analgesia.

Methods: Sixty healthy pregnant women of ASA grade II scheduled for elective caesarean section were randomly allocated to receive either hyperbaric bupivacaine 2 ml with 0.20 ml of normal saline (group I n=30) or hyperbaric bupivacaine 2 ml with 0.20 ml (10µgm) fentanyl (group II n=30). All the patients were preloaded with 500 ml of Ringer's lactate and premedicated with injection Metoclopramide 10mg IV and injection Ranitidine 150mg IV. Vitals sign, sensory level, motor block, pain score and side effects were noted every 2 minutes for first 10 minutes, then at 15 minutes for first hour. Thereafter at 30 minutes interval until the patient complained of pain.

Contents Time of onset of sensory analgesia was faster in group II. Time for two segment regression, time for sensory regression to L1 and time for complete sensory recovery was significantly prolonged in group II. The total duration of analgesia was significantly prolonged in group II.

Interpretation and Conclusion: This study indicated that 10µg of fentanyl added to hyperbaric bupivacaine for spinal anaesthesia markedly improved intraoperative anaesthesia, reduces the incidence of nausea and vomiting, esp. during uterine and peritoneal handling and significantly reduces the demand for postoperative analgesics with good maternal satisfaction and fetal well being.

Keywords: *Spinal anaesthesia; hyperbaric bupivacaine; caesarean section; intrathecal fentanyl; postoperative analgesia; sensory block; complications.*

INTRODUCTION

Spinal anaesthesia is commonly employed for caesarean section. Currently it has become very popular because of addition of opioid to the local anaesthetic, for neuraxial blockade which will provide better intraoperative as well as postoperative analgesia.

Bupivacaine was introduced by Eckenstam in 1957 and used clinically by Telivuo in 1963. Currently bupivacaine along with opioids are used intrathecally for caesarean section.

Although intrathecal bupivacaine alone offers blockade upto T5 Dermatome, a substantial no. of patients still experience pain or discomfort and require analgesic supplement during caesarean section.

Addition of fentanyl not only improves intraoperative analgesia but it also extends to early postoperative period. [4,5,6,7]
The advantages of spinal anaesthesia include the simplicity of the technique and the rapid onset of anaesthesia. It also includes-
1. Less neonatal exposure to potentially depressant drugs
2. A decreased risk of maternal pulmonary aspiration
3. An awake mother at the birth of her child
4. The option of using spinal opioids for postop analgesia.

Spinal anaesthesia is often used for elective caesarean section. However, intrathecal bupivacaine alone may be insufficient to provide complete analgesia despite the high sensory block. 13% of the patients undergoing LSCS had visceral pain even after intrathecal administration of 15mg of bupivacaine. [4.10] Furthermore such large doses of intrathecal bupivacaine were associated with severe hypotension and delayed recovery of motor block." Therefore smaller doses of bupivacaine supplemented by opioids have been recommended for spinal anaesthesia in patients undergoing caeserian section, [3.6.7.8.12]

Intrathecal lipophilic opioids such as fentanyl, after administration diffuses into the epidural space and subsequently into the plasma, suggesting that intrathecal fentanyl not only acts through spinal opioid receptors but also acts systemically. 13
This study was designed to evaluate the effects of intrathecally administered fentanyl 10µg on the onset duration of hyperbaric bupivacaine induced sensory and motor block, quality of intraoperative surgical anaesthesia and requirement of rescue analgesia during early postoperative period.

MATERIAL AND METHODS
This prospective double blinded study was conducted on 60 patients posted for elective caesarean section at at NAMO Medical Institute and Research center. Subjects were randomly allocated in 2 groups each consisting 30 subjects. On obtaining written informed consent 60 term parturents of ASA grade II, aged between 19-40 years who had mild pregnancy induced hypertension were included in sample. Parturents with severe pregnancy induced hypertension, eclampsia, severe anaemia, bleeding disorders, cephalopelvic disproportion, breech presentation, allergy to local anaesthesia, psychological/neurological disorders and severe spinal deformities were excluded from study.

All cases underwent thorough clinical assessment preoperatively and relevant laboratory investigations. All the patients were preloaded with 500 ml of Ringer's lactate and premedicated with injection Metoclopramide 10mg IV and injection Ranitidine 150mg IV. Patients were randomly allocated to receive either hyperbaric bupivacaine 2 ml with 0.20 ml of normal saline (group I n=30) or hyperbaric bupivacaine 2 ml with 0.20 ml (10µgm) fentanyl (group II n=30). Spinal anesthesia was given in sitting position. For lumbar puncture 25 gauge needle was used. Vitals sign, sensory level, motor block, pain score and side effects were noted every 2 minutes for first 10 minutes, then at 15 minutes for first hour. Thereafter at 30 minutes interval until the patient complained of pain.

Inclusion criteria:
1. Consent
2. ASA grade II

Exclusion criteria:
1. Patient refusal
2. Bleeding disorder
3. ASA III or more
4. Patient with known hypersensitivity to bupivacaine or fentanyl
5. Infection at the site of needle placement

The patient will be randomly allotted to two groups and will receive Spinal anaesthesia with:
GROUP A: 2 ml of 0.5% hyperbaric bupivacaine with 0.20 ml of saline
GROUP B: 2ml of 0.5% hyperbaric bupivacaine with 10µg of fentanyl.

Routine investigations that were carried out were:
1. Haemogram, bleeding time, clotting time, urine routine
2. Random or fasting blood glucose level
3. Blood urea and serum creatinin
4. ECG
5. Chest screening

DISCUSSION
The study population consists of 60 female patients posted for elective caesarean section delivery. They were divided into two groups of 30 each.

Group I received 0.5% hyperbaric bupivacaine 10mg (2cc) + 0.20 ml of normal saline.
Group II received 0.5% hyperbaric bupivacaine 10mg (2cc) + 10µg of fentanyl (0.20ml) intrathecally.
The following observations were made

Time taken to achieve highest sensory analgesia

Time of highest sensory analgesia (minutes)	Group I		Group II	
	No. of patients	%	No. of patients	%
1 min – 2 min	1	3.33	6	20
3 min – 4 min	11	36.66	14	46.67
5 min – 6 min	14	46.67	9	30
7 min – 8 min	2	6.67	1	3.33
9 min – 10 min	2	6.67	0	0
Total	30	100	30	100

Mean time (minutes)

Group I	4.96±1.75
Group II	3.83±1.41

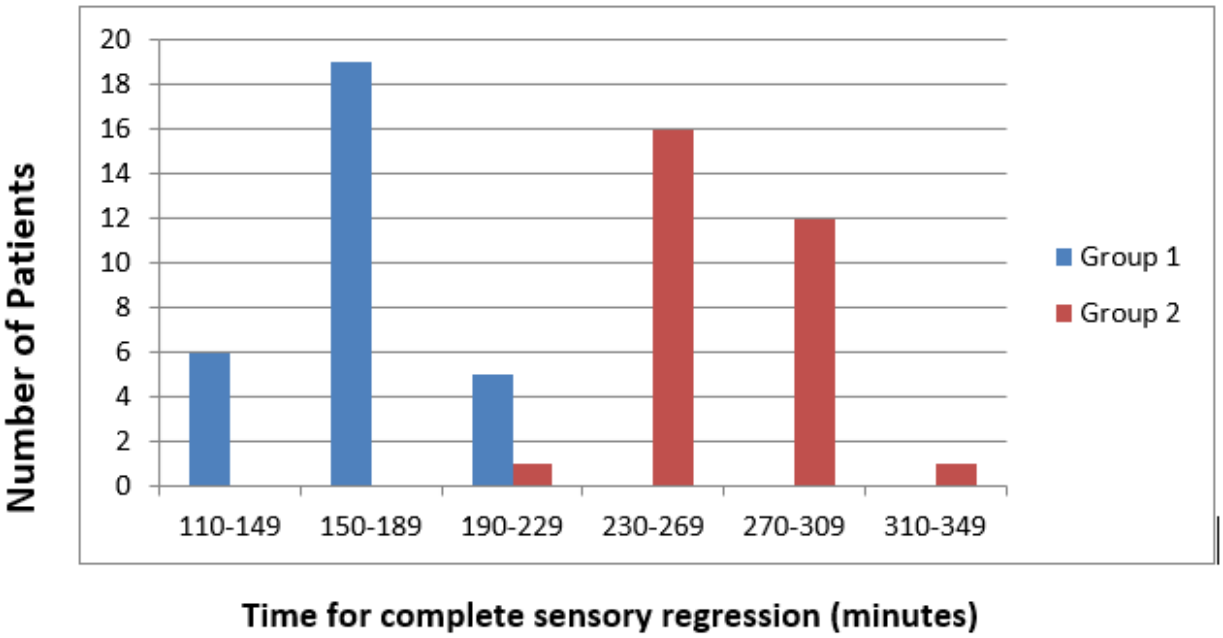
The mean time taken to achieve the highest level of sensory analgesia in group I was 4.961.75 minutes and in group II was 3.831.14 minutes. The difference In the mean time between group I and II was statistically significant ($p<0.05$).

Time for complete sensory recovery

Time for complete sensory recovery (minutes)	Group I		Group II	
	No. of patients	%	No. of patients	%
110-149	6	20	0	0
150-189	19	63.33	0	0
190-229	5	16.67	1	3.33
230-269	0	0	16	53.33
270-309	0	0	12	40
310-349	0	0	1	3.34
Total	30	100	30	100

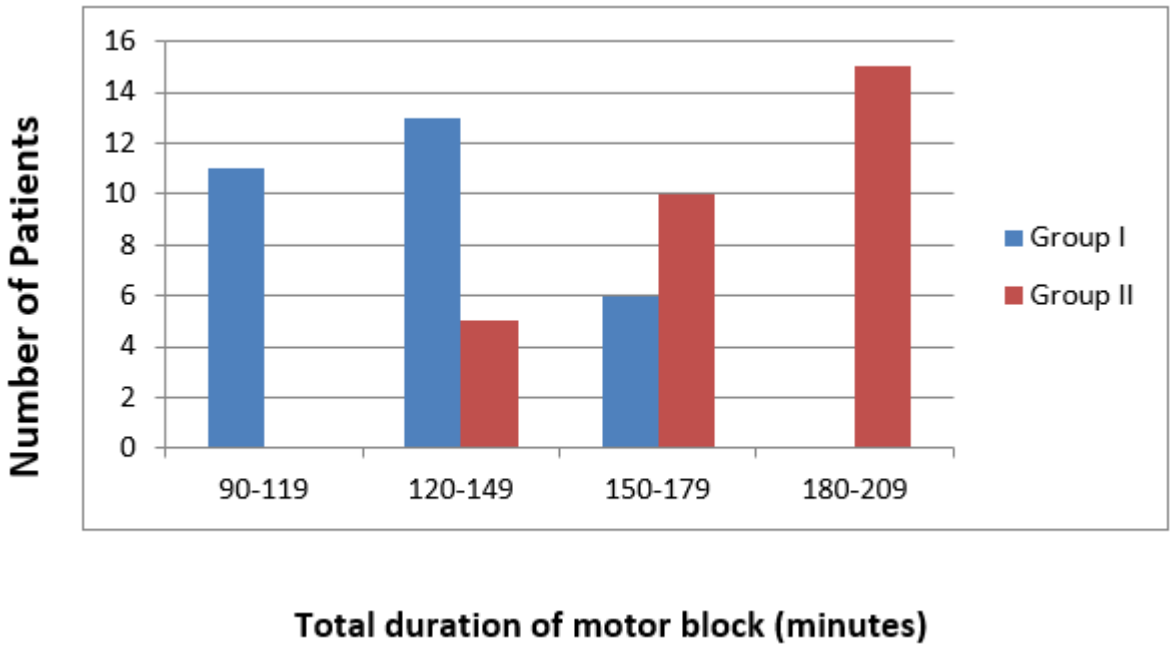
Mean time (minutes)

Group I	160.66±23.18
Group II	263.33±21.22



The difference in the mean value between group I and II is statistically significant ($p<0.05$).

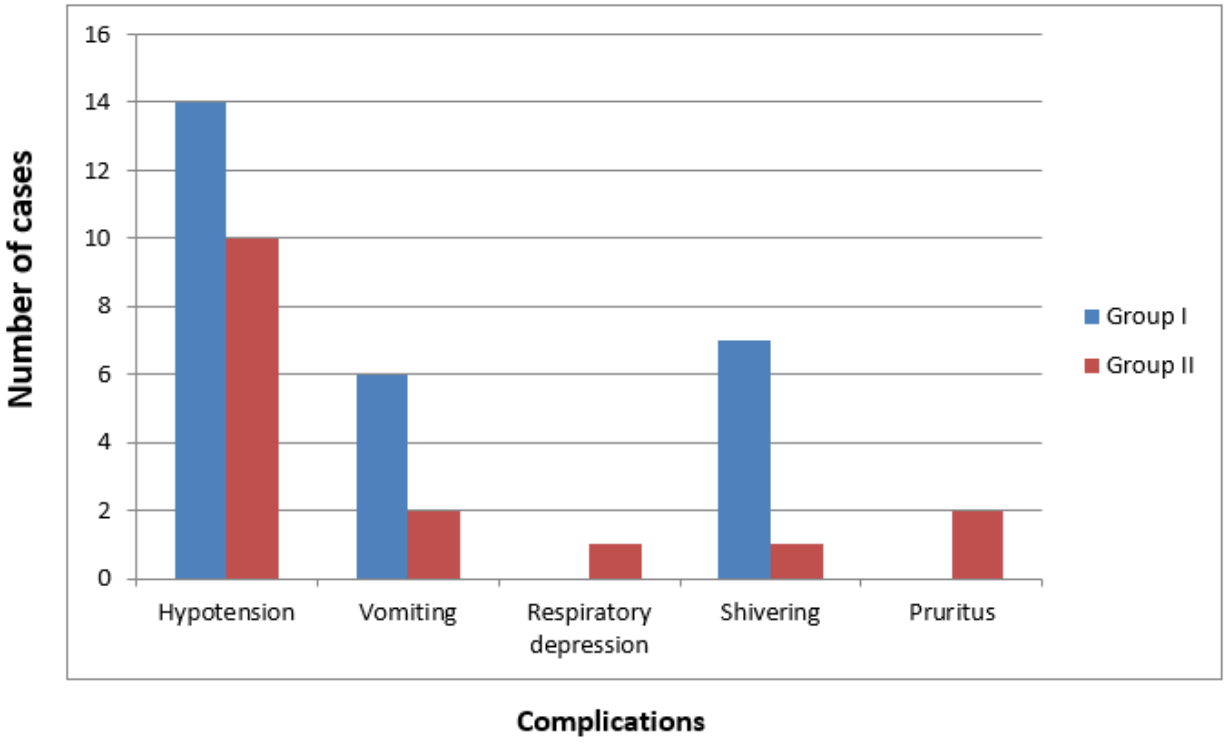
Total duration of motor block



The mean time of group I was 123.33±19.88 minutes and that of group II was 171.3±23.71 minutes. This difference is statistically significant ($p<0.05$).

Complications

Complications	Group I		Group II	
	No. of patients	%	No. of patients	%
Hypotension	14	46.67	10	33.33
Nausea and vomiting	6	20	2	6.67
Respiratory depression	0	0	1	3.33
Shivering	7	23.33	1	3.33
Pruritus	0	0	2	6.67



CONCLUSION

From the present study, it can be concluded that:

1. Onset of sensory analgesia was achieved in 2-3 min in majority of patients in Group I and 1-2 min in majority of patients in Group II which was significant (p .<0.05) The time taken to achieve the highest sensory level was 4.96±1.75 minutes in Group 1 and 3.83±1.41 minutes in Group II which was significant ($p < 0.05$)

2. Time for two segment regression, time for sensory regression to LI and time for complete sensory recovery was significantly prolonged in bupivacaine with fentanyl combination when compared to bupivacaine alone.

3. Time of onset to Grade III motor block was not significant (3.1± 1.09 minutes in Group 1 and 2.26 ±0.82 minutes in Group II).

4. The addition of fentanyl 10 µg to bupivacaine 2 ml (10 mg) was not associated with any significant haemodynamic changes.

5. Hypotension, nausea-vomiting, shivering, pruritus were the only few side effects observed. Though the incidence of hypotension (46.67%) was more in Group I (i.e., bupivacaine alone) but it was not significant $p > 0.05$ when compared to the same with Group II (i.e., bupivacaine and Fentanyl). Nausea, vomiting and shivering were significantly more in bupivacaine alone group. I case of respiratory depression was observed in group II. No cases of post dural puncture headache or neurological complication were observed during 24 hours postoperative

REFERENCES

1. Uma Srivastava, Aditya Kumar, Gandhi NK. Surekha Saxena. Davesh Dutta, Parul Chandra et al. Hyperbaric or plain bupivacaine combined with fentanyl for spinal anaesthesia during caesarean delivery. Indian J Anaesth 2004; 48(1):44-46.
2. Davidson. Churchill. In: A practice of anaesthesia, Wylie and Churchill Davidsons. Fifth edition. PG Publishing Pvt Ltd. 1986.
3. Clur, Duck-Hwan, Ahn, Hyun-Joo. Spinal anesthesia for cesarean section- a comparison of three doses of hyperbaric bupivacaine mixed with fentanyl. Br J Anaesth 1999; 82:159.
4. Belgarena S. Clinical effects of intrathecally administered fentanyl in Patients undergoing caesarean section. Anesth Analg 1992; 74:53-7.
5. Dahlgren G, Hultstrand C, Jakobsson J, Norman M, Eriksson EW, Marrin H. Intrathecal sufentanil, fentanyl or placebo added to bupivacaine for cesarean section. Anesth Analg 1997; 85:1288-1293.
6. Shende D, Cooper GM, Bowden MIO. The influence of intrathecal Fentanyl on the characteristics of subarachnoid block for caesarean section. Anaesthesia 1998; 53:706-710.
7. Ben-David B, Miller G, Gavriel R, Gurevitch A. Low dose bupivacaine fentanyl spinal anaesthesia for cesarean delivery. Reg Anesth and Pain: Med 2000: 25:235-239.
8. Catherine O Hunt, Stephen J Naulty, Angela M Bader, Martha A Hauch, Jasmine V Vartikar, Sanjay Datta, et al. Perioperative analgesia with subarachnoid fentanyl-bupivacaine for cesarean delivery. Anesthesiology 1989; 71:535-540.
9. Abouleish E. Rawal N. Shaw J. Loreny T. Rashad MN. Intrathecal morphine 0.2 mg versus epidural bupivacaine 0.125% or their combination; effects on parturiouts. Anesthesiology 1991:74:711-16.
10. Sahar M Siddik Sayyid, Marie T Aouad, Mava I Jalbout, Merra I Zalaket, Carina E Berzina, Anus S Baroka. Intrathecal versus Intravenous fentanyl for supplementation of subarachnoid block during caesarean delivery. Anesth Analg 202:95:209-13.
11. Chung CJ, Bae SH, Choeky, Chin YJ. Spinal anesthesia with 0.25% Hyperbaric bupivacaine for caesarean section, effects of volume Br J Anaesth 1996; 77:145-9.
12. Theodore R. Momullang, Christopher M Criscomi, Nathan L Pace. Intrathecal fentanyl is superior to intravenous ondanstron for the prevention of perioperative nausea during caesarean delivery with spinal anesthesia. Anesth Analg 2000; 90:1162-6.
13. Ummenhofer WC, Arends RH, Shen DD, Bernards CM. comparative Spinal distribution and clearance kinetics of intrathecallyadministered morphine, fentanyl, alfentanil and rufentanil A Anesthesiology 2000; 92:739-53.
14. Robert K Stoelting. Pharmacology and physiology in anesthetic practice. Third edition. Lippincott-Raven Publishers 1999; 78
15. Ronald D Miller. Anesthesia. Fifth edition. Churchill Livingstone Publisher 2000; 1.
16. Ashok Kumar Saxena, Shivakumar Arava. Current concepts in neuraxial administration of opioids and non-opioids: An overview and future perspectives. Indian J Anaesth 2004; 48(1):13-24.
17. Sean C Sweetnian Martindale. The complete drug reference. Thirty-third edition. PnP Publishers.
18. Colin Dollery. Therapeutic drugs. Second edition. Churchill Livingston Publishers.
19. Biswas BN, Rudra A, Bose BK, Nath S, Chakrabarty S, Bhattacharjee S. Intrathecal fentanyl with hyperbaric bupivacaine Improves analgesia during caesarean delivery and in early Postoperative period. Indian J Anaesth 2002; 46(6):469-472.

20. Benhamou, Dan, Thorin, Dominique, Brichant, Jean-Francois, Dailland, Philippe, Milon Dominique, Schneider, Marcus. Intrathecal Clonidine and fentanyl with hyperbaric bupivacaine improves analgesia during cesarean section. Anesth Analg 1998; 87:609-13.
21. Harbhej Singh, Jay Yang, Katina Thoranton, Adolph H Giesecke. Intrathecal fentanyl prolongs sensory bupivacaine spinal block. Can J Anaesth 1995; 42(11):987-97
22. Connolly C. Mcleod GA, Wildsmith JAW. Spinal anesthesia for caesarean section with bupivacaine 5 mg ml-1 in glucose 8 or mgml-1 Br J Anesth 2001; 86:805-7.
23. Martin Cascio, Bernard Pyigon, Cathleen Bernett BS, Sivam Ramanathan. Labour analgesia with intrathecal fentanyl decreases maternal stress. Can J Anesth; 1997; 44(6):605-60.
24. Parlow JI, Money P, Chan PS, Raymond J, Milne B. Addition of opioids alters the density and spread of intrathecal local anaesthetics An in vitro study. Can J Anesth 1999; 46:66-70.
25. Buvanendran Asokumar, Michael L Newman, Robert J McCarthy, Pharm P, Anthony D, Ivankovich et al. Intrathecal bupivacaine reduces pruritus and prolongs duration of fentanyl analgesia during labor: A prospective, randomized controlled trial. Anesth Analg 1998; 87:1309-15.
26. Lee JA, Atkinson, Wett MJ (eds). Sir Robert Machintoshi's lumbar puncture and spinal analgesia intradural and extradural. Fifth edition. Churchill Livingstone Publisher.
27. Chu CC. Shu SS. Lin SM et al. The effect of intrathecal bupivacaine with combined fentanyl in caesarean sections. Acta Anaesthesiol Sin 1995 Sep; 33(3):149-54.
28. Wang, Chen, Chakrabarti, Mihir K, Whitwam James G. Specific enhancement by fentanyl of the effects of intrathecal bupivacaine on no receptive afferent but not on sympathetic efferent pathways in dogs. Anesthesiology 1993; 79:766-73.