

Comparison of the Sensory Block parameters during and after caesarean delivery

Dr Pulin Bansal¹, Dr Mahima Lakhanpal^{2*}, Dr Shefali Singh³, Dr Abhishek Singh⁴, Dr Rahul Singh⁵,

1. Consultant Anaesthetist and MD, Bansal Nursing Home, Firozabad
2. Assistant Professor, Department of Anaesthesia, Santosh Medical College & Hospital, Santosh Deemed to be University, Ghaziabad.
3. Assistant Professor, Department of Anaesthesia, Santosh Medical College & Hospital, Santosh Deemed to be University, Ghaziabad.
4. Assistant Professor, Department of Anaesthesia, Santosh Medical College & Hospital Santosh Deemed to be University.
5. Associate Professor, Department of Anaesthesia, Santosh Medical College & Hospital, Santosh Deemed to be University, Ghaziabad.

***Dr. Mahima Lakhanpal- Corresponding Author**

ABSTRACT

Background: Spinal anesthesia is the method of choice for the cesarean section. Hypotension is a common complication of this method. Hypotension is the most common complication of spinal anesthesia that occurs with a 30-60% incidence . Fentanyl has a rapid onset and a shorter duration of action following intrathecal administration but its duration of action may be dose dependent.

Aim and Objective: To study the compare of the sensory block parameters during and after caesarean delivery

Methodology: The present study was conducted in the Department of Anesthesiology, Santosh Medical College and Hospital, after approval of the Institutional Research Committee. The present study was conducted between August 2016 to July 2017. Patients undergoing elective

caesarean section delivery surgery, under spinal anaesthesia during the study period. A sample size of 90 patients were randomly allocated in three groups of 30 each.

Result: The mean time for the commencement of sensory perception was 1.57 seconds for group BF2 and 1.8 seconds for group B, respectively. All three groups' values were comparable. Group B had the highest mean time for the highest level of block (8.031 ± 27), while group BF2 had the lowest mean time (7.530 ± 68).

Conclusion: Cesarean sections under spinal anesthesia in the lateral position than in the sitting position lead to a more rapid sensory and motor block, reduced ephedrine consumption, and enhanced satisfaction of women.

Keywords: Cesarean, ephedrine , consumption , intrathecal , bupivacaine , hypotension, lesser control.

INTRODUCTION

Spinal anesthesia is very popular for cesarean sections and currently both hyperbaric and plain (hypobaric) solution of bupivacaine along with opioids are used. Difference in baricity can affect the intrathecal distribution of bupivacaine.[1] However it also produces a fixed duration of anesthesia, post dural puncture headache, hypotension and lesser control of block height.[2] Although intrathecal bupivacaine alone offer sufficient blockade, a substantial number of patients still experience some pain or discomfort and require analgesic supplement during cesarean delivery.

The technique of subarachnoid block is quite simple and single injection results in ideal operating conditions with complete analgesia, profound muscular relaxation, decreased blood loss and minimal ventilatory disturbances.

Belzarena SD [18] conducted a study on Clinical effects of intrathecally administered fentanyl in patients undergoing caesarean section. The clinical effects of spinally (subarachnoid) administered, preservative-free fentanyl were assessed in 120 healthy women who underwent caesarean section with spinal anesthesia using 0.5% hyperbaric bupivacaine. Subjects were

divided at random into four groups (n = 30) the first of which received 2 mL of saline containing no fentanyl (group 0); the second, 0.25 micrograms/kg (group 25); the third, 0.5 micrograms/kg (group 50); and the fourth, 0.75 micrograms/kg (group 75) of fentanyl in a blinded manner. He came to a conclusion that the combination of bupivacaine and a low dose of fentanyl (0.25 micrograms/kg) provide excellent surgical anesthesia with short-lasting postoperative analgesia and very few negative side effects.

Bupivacaine, an amide type of local anesthetic, has high potency, slow onset (5-8 mins) and long duration of action (1.5-2 hrs). For cesarean section intrathecal dose of hyperbaric bupivacaine is 12-15 mg. [3] Cesarean delivery requires traction of peritoneum and handling of intraperitoneal organs, resulting in intraoperative visceral pain. With higher doses of hyperbaric bupivacaine, incidence of intraoperative visceral pain associated with higher blocks is reduced. [4,5]

For bupivacaine, the first pass pulmonary extraction is dose dependent, suggesting that the uptake process becomes saturated rapidly. There may be clinically significant transplacental transfer of local anaesthetic between the mother and fetus.[6-8] Plasma protein binding influences the rate and degree of diffusion of local anesthetics across the placenta. Bupivacaine, which is highly protein bound (approximately 95%) has an umbilical vein-maternal arterial concentration ratio of about 0.32.

Bogra et al.[9] conducted a study to evaluate the synergistic effect of intrathecal fentanyl and bupivacaine in spinal anesthesia for caesarean section. Study was performed on 120 caesarean section parturients divided into B8, B10, B12.5 (8mg, 10mg, 12.5mg of 0.5%hyperbaric bupivacaine) and FB8, FB10, FB12.5 received combination of 12.5 mcg of intrathecal fentanyl respectively. Here the synergistic, potentiating effect of fentanyl (opiod) on bupivacaine (a local anesthetic) in spinal anesthesia for caesarean section is presented.[10-14] Fentanyl is able to reduce the dose of bupivacaine and therefore its harmful effects.

MATERIALS AND METHODS

The present study was conducted in the Department of Anesthesiology, Santosh Medical College and Hospital, after approval of the Institutional Research Committee. The present study was conducted between August 2016 to July 2017. Patients undergoing elective caesarean section delivery surgery, under spinal anaesthesia during the study period. A sample size of 90 patients were randomly allocated in three groups of 30 each.

Pain was evaluated using a 10 cm linear visual analog scale with 0 corresponding to pain and 10 to worst pain possible. VAS scoring was done every 10 mins till 30 mins and thereafter every 15 mins. If VAS score is >3 then patient was given analgesic inj. Tramadol.

RESULTS

Table 1: Demographic data distribution of study subject

| Demographic Distribution | | Number (Percentage) | | |
|--------------------------|-------------|---------------------|-------------|-------------|
| | | Group B | Group BF1 | Group BF2 |
| Age Groups | 20-22 Years | 8 | 8 | 7 |
| | 23-24 Years | 5 | 3 | 1 |
| | 25-26 Years | 9 | 11 | 9 |
| | 27-28 Years | 4 | 4 | 7 |
| | 29-30 Years | 4 | 4 | 6 |
| | Mean±SD | 24.93±2.59 | 25.03±2.56 | 25.83±2.60 |
| Height | Mean±SD | 64.90±6.773 | 65.50±6.261 | 69.20±5.952 |

In Table 1, Distribution of sample among age groups shows maximum subjects belonged to 25-26 Years age group. P value 0.078, indicates the difference in the mean age of the patients in

the three groups was not significant and all the age groups were comparable. The mean age of the group B was 24.93 while the mean age in group BF1 and group BF2 was 25.03 and 25.83 respectively. P value 0.76, indicates the difference in the mean age of the patients in the three groups was not significant and all the three groups are comparable. Similarly, weight of patients has been maximum in group BF2 is 69.2 and least in Group B is 64.9. There was no significant difference in mean weight in the three groups and all the three groups are comparable.

Table 2: Comparison of Sensory Block parameters between three groups of the study subject.

| Parameters | | Group B | Group BF1 | Group BF2 | p value |
|--|---------|-------------|--------------|-------------|---------|
| Onset of Sensory Block (Minutes) | Mean±SD | 1.8±0.5 | 1.63±0.38 | 1.57±0.68 | P<0.05 |
| Time To Achieve Highest Level Of Sensory Block (Minutes) | Mean±SD | 8.03±1.27 | 7.67±1.06 | 7.53±0.68 | |
| Mean Duration For Two Segment Regression (Minutes) | Mean±SD | 8.83±15.05 | 86.37±10.73 | 95.6±18.46 | |
| Mean Time Taken For Onset Of Max Motor Block Level | Mean±SD | 4.93±1.11 | 4.83±1.2 | 4.79±1.8 | |
| Mean Duration Of Motor Block (Minutes) | Mean±SD | 121.7±14.39 | 165.5±11.57 | 230.6±15.7 | |
| Regression to S1 | Mean±SD | 141.5±15.4 | 186.6±10.01 | 250.36±11.1 | |
| Duration Of Effective Block (Minutes) | Mean±SD | 153.86±11.6 | 198.03±11.71 | 262.76±15.8 | |

In Table 2 , The mean time for sensory onset was maximum in group B i.e 1.8±0.5 and least in group BF2 i.e. 1.57±0.68. The values in all the 3 groups were comparable. The mean time for

highest level of block was maximum in group B i.e. 8.03 ± 1.27 and least in group BF2 i.e. 7.53 ± 0.68 . The mean duration for two segment regression in the three groups was compared. The maximum being in group BF2 (i.e. 95.6 ± 18.46 min), followed by group BF1 (i.e. 86.37 ± 10.73 min) and the least in group B (i.e. 68.83 ± 15.05 min). There is statistically significant difference in the three groups when the mean duration of sensory block was analyzed. The onset of motor blockade was first attained in group BF1, the mean time for onset being 4.83 ± 1.11 min in this group being the least, followed by 4.93 ± 1.11 in group B, while it was 5.1 ± 1.18 in group BF2. The mean duration of motor blockade in the three groups was compared, it being maximum in group BF2 i.e. 230.6 ± 15.7 min, followed by that in group BF1 165.5 ± 11.57 min and 121.7 ± 14.39 min in group B. The mean time for regression to S1 was 141.5 ± 15.4 min in group B, while it was 186.6 ± 10.01 min in group BF1 and 250.36 ± 11.1 in group BF2. There is a significant statistical difference amongst the three groups. The mean time for effective analgesia was 153.86 ± 11.6 min in group B, while it was 198.03 ± 11.71 min in group BF1 and 262.76 ± 15.8 in group BF2. There is a significant statistical difference amongst the three groups

DISCUSSION

Nowadays, regional anaesthesia is frequently used during caesarean sections in our nation. It involves the administration of spinal or epidural anesthesia, which permits consciousness throughout the procedure.[15-17] Due to its relative simplicity of administration, lower systemic toxicity, and quicker onset of action and start of the procedure, spinal anaesthesia is very popular for caesarean sections and is preferred over epidural anaesthesia for elective and emergency caesarean procedures.

Due to early skin-to-skin contact, spinal anaesthesia has also been proven to be beneficial for caesarean sections with a moderate level of maternal satisfaction. Due to the lower dose required, it is also associated with a quicker start of effect, ease of administration, and reduced systemic toxicity; however, compared to epidural anaesthesia, the risk of maternal hypotension is

increased. [18]The occurrence and severity of these events may be influenced by the drug used as the spinal anesthetic.

This study aimed at comparing the effect of spinal anesthesia in the sitting and lateral positions on the onset time of the sensory block and hemodynamic condition in C/S. In the current study, mean systolic and diastolic blood pressures, Mean Arterial Pressure (MAP), and SpO₂ of patients under spinal anesthesia in the sitting position in minutes 6 and 8 after anesthesia were significantly lower than those of patients in the lateral position.

The onset time of the sensory block was lower in the lateral position than in the sitting position. Satisfaction with spinal anesthesia in the lateral position was significantly higher than that in the sitting position, but there was no statistically significant difference between the groups in terms of heart rate, quality of sensory and motor block, the maximum height of the sensory block, mean atropine and ephedrine doses, frequency of nausea and vomiting, and mean Apgar score in minutes 1 and 5.[19]

Hence, analgesic supplementation is also needed for anesthetic management of visceral pain intraoperatively. Thus, combination of local anesthetics with various adjuvants for spinal anesthesia has been studied. Lipophilic opioids, especially fentanyl, is increasingly being administered intrathecally as an adjuvant to spinal anesthesia because they act synergistically with local anesthetics and intensify sensory block without increasing sympathetic blockade and prolonging motor block.[20] The local anaesthetic agent used as a part of study is Bupivacaine. Bupivacaine, also known as Marcaine, is an amide anaesthetic administered at 10 mg to 15 mg in 0.5% to 0.75% concentrations, and is more commonly used for spinal block in caesarean procedures. Although its onset of action is slow, lasting about five to 10 minutes and dependent on baricity, the incidence of hypotension is low. It is popularly used due to a longer duration of action and good quality of motor block compared to tetracaine.[10]

The strengths of the present study included the sufficient sample size, evaluation made by the researcher (evaluation was not dependent on patient's response), and accurate monitoring of

the patient's hemodynamics. The limitations of this study included the lack of cooperation of some patients in establishing the correct position or participating in the study.

CONCLUSION

From the present study it can be concluded that intrathecal Fentanyl in the dose of 20 µg with bupivacaine results as follows-Decreases the mean onset time of sensory, motor blockade and time to reach peak sensory level. It produces higher level of sensory blockade. It produces prolonged duration of sensory and motor blockade. It prolongs the duration of effective analgesia. It has no significant hemodynamic changes. It also produces lesser adverse effects. Fentanyl used as an adjunct intrathecally along with bupivacaine prolongs the duration of effective analgesia in the immediate post-operative period with effective hemodynamic stability and without any significant adverse effects amongst the three groups compared. Hence it can be an attractive intrathecal adjuvant for prolonging the effect of bupivacaine.

Cesarean sections under spinal anesthesia in the lateral position lead to a more rapid sensory and motor block, reduced ephedrine consumption, and enhanced satisfaction of women when compared to spinal anesthesia in the sitting position.

REFERENCES

1. Manouchehrian N, Bakhshaei MH. Nitrous oxide effect on relieving anxiety and pain in parturients under spinal anesthesia for caesarean section. *Anesth Pain Med.* 2014;4(2). e16662. doi: 10.5812/aapm.16662. [PubMed: 24977119]. [PubMed Central: PMC4071269].
2. Jaafarpour M, Taghizadeh Z, Shafiei E, Vasigh A, Sayehmiri K. The Effect of Intrathecal Meperidine on Maternal and Newborn Outcomes After Cesarean Section: A Systematic Review and Meta-Analysis Study. *Anesth Pain Med.* 2020;10(2). e100375. doi: 10.5812/aapm.100375. [PubMed: 32637349]. [PubMed Central: PMC7322789].
3. Zangouei A, Zahraei SAH, Sabertanha A, Nademi A, Golafshan Z, Zangoue M. Effect of Low-Dose Intravenous Ketamine on Prevention of Headache After Spinal Anesthesia in

- Patients Undergoing Elective Cesarean Section: A Double-Blind Clinical Trial Study. *Anesth Pain Med.* 2019;9(6). e97249. doi: 10.5812/aapm.97249. [PubMed: 32280620]. [PubMed Central: PMC7118677].
4. Derakhshan P, Imani F, Koleini ZS, Barati A. Comparison of Adding Sufentanil and Low-Dose Epinephrine to Bupivacaine in Spinal Anesthesia: A Randomized, Double-Blind, Clinical Trial. *Anesth Pain Med.* 2018;8(5). e69600. doi: 10.5812/aapm.69600. [PubMed: 30538940]. [PubMed Central: PMC6252044].
 5. Gousheh MR, Akhondzade R, Asl Aghahoseini H, Olapour A, Rashidi M. The Effects of Pre-Spinal Anesthesia Administration of Crystalloid and Colloid Solutions on Hypotension in Elective Cesarean Section. *Anesth Pain Med.* 2018;8(4). e69446. doi: 10.5812/aapm.69446. [PubMed: 30250818]. [PubMed Central: PMC6139530].
 6. Manouchehrian N, Bashar FR, Arab M. Efficacy of intrathecal injection rate of bupivacaine 0.5 on sensory and motor block. *J Babol Univ Med Sci.* 2014;16(9):21–8.
 7. Manouchehrian N, Rabiei S, Moradi A, Lakpur Z. Comparison of Intrathecal Injection of Fentanyl and Sufentanil on the Onset, Duration, and Quality of Analgesia in Labor: A Randomized, Double-Blind Clinical Trial. *Anesth Pain Med.* 2020;10(3). e99843. doi: 10.5812/aapm.99843. [PubMed: 32944556]. [PubMed Central: PMC7472646]
 8. Atashkhoei S, Abri R, Naghipour B, Hatami Marandi P, Fazeli Danesh MT. Effect of Glucose Containing Crystalloid Infusion on Maternal Hemodynamic Status After Spinal Anesthesia for Cesarean Section. *Anesth Pain Med.* 2018;8(4). e80184. doi: 10.5812/aapm.80184. [PubMed: 30271752]. [PubMed Central: PMC6150926].
 9. Danilenko-Dixon DR, Heit JA, Silverstein MD, et al. Risk factors for deep vein thrombosis and pulmonary embolism during pregnancy or post partum: a population-based, case-control study. *Am J Obstet Gynecol.* 2001;184:104–110.
 10. Sowmya N, Ravi M, Sujatha M P, Dinesh K, Kavya K. Intrathecal Fentanyl in Different Doses(10mcg,15mcg) with Hyperbaric Bupivacaine (10mg) for Caesarean Section: A Comparative Study. *IOSR- JDMS* 2016;15:40-43

11. Sebel PS, Lang E, Rampil IJ, et al. A multicenter study of bispectral electroencephalogram analysis for monitoring anesthetic effect. *AnesthAnalg*. 1997; 84(4):891–899
12. Albanese J, Durbec O, Viviand X, et al. Sufentanil increases intracranial pressure in patients with head trauma. *Anesthesiology*. 1993; 79(3):493– 497.
13. Werner C, Kochs E, Bause H, et al. Effects of sufentanil on cerebral hemodynamics and intracranial pressure in patients with brain injury. *Anesthesiology*. 1995; 83(4):721–726.
14. Nadal M, Munar F, Poca MA, et al. Cerebral hemodynamic effects of morphine and fentanyl in patients with severe head injury: absence of correlation to cerebral autoregulation. *Anesthesiology*. 2000; 92(1):11–19.
15. Bailey PL, Pace NL, Ashburn MA, et al. Frequent hypoxemia and apnea after sedation with midazolam and fentanyl. *Anesthesiology*. 1990; 73(5):826–830
16. Bonica JJ. Evolution and current status of pain programs. *J Pain Symptom Manage*. 1990 Dec;5(6):368-74.
17. Srivastava U, Kumar A, Gandhi NK, Saxena S, Dutta D, Chandra P et al. Hyperbaric or plain bupivacaine combined with fentanyl for spinal anaesthesia during cesarean delivery. *Indian J Anaesth* 2004; 48(1):44-46.
18. Belzarena SD. Clinical effects of intrathecally administered fentanyl in patients undergoing cesarean section. *Anesth Analg*. 1992 May; 74(5):653-7.
19. Biswas BN, Rudra A, Bose BK, Nath S, Chakraborty S, Bhattacharjee S. Intrathecal fentanyl with hyperbaric bupivacaine improves analgesia during casarean delivery and in early postoperative period. *Indian JAnaesth* 2002; 46(6):469-472.
20. Obara M, Sawamura S, Satoh Y, Chinzei M, Sekiyama H, Tamai H, Yamamoto H, Hanaoka K. The effect of intrathecal fentanyl added to hyperbaric bupivacaine for caesarean section. *Masui*. 2003 Apr;52(4):378- 82.