Print ISSN: 2321-6379
Online ISSN: 2321-595X

Original Article

To Compare the Efficacy of Intrathecal Hyperbaric Levobupivacaine versus Bupivacaine in Patients Undergoing Elective Lower Segment Caesarean Section

Reena Makhni[1], Kamal Jyoti Kashyap[2], Nandini Bommakanti[3], Pankaj Sarangal[4]

[1]Professor, Department of Anaesthesia, Government of Medical College, Amritsar, Punjab, India, [2]Associate Professor, Department of Anaesthesia, Government of Medical College, Amritsar, Punjab, India, [3]Junior Resident, Department of anaesthesia, Government of Medical College, Amritsar, Punjab, India, [4]Assistant Professor, Department of Anaesthesia, Government of Medical College, Amritsar, Punjab, India

Abstract

Background and Aim: Lower segment cesarean section rates have risen dramatically over the past two decades. Techniques for regional anesthesia are increasingly preferred for cesarean deliveries. Hence, we planned to conduct a study to compare the efficacy of spinal anesthesia using 0.5% hyperbaric levobupivacaine and 0.5% hyperbaric bupivacaine in patients undergoing elective lower segment cesarean section.

Materials and Methods: A double-blind, prospective, randomized clinical trial involving 60 patients with American Society of Anaesthesiologist grade-II, 18–40 years of age undergoing cesarean section were randomly allocated into two groups of 30 each; Group L- received 10 mg 0.5% hyperbaric levobupivacaine, Group B- received 10 mg 0.5% hyperbaric bupivacaine.

Results: The mean time to onset of sensory block was 2.6 ± 0.56 min in Group L and 1.9 ± 0.71 min in Group B. Similarly, mean time to onset of motor block in Group L and Group B was 4.26 ± 0.8 min and 3.82 ± 0.7 min, respectively. This difference was statistically significant ($P < 0.05$) both in terms of onset of sensory block and motor block. The mean duration of sensory block in Group L and Group B was 163.5 ± 5.8 min and 176.1 ± 8.1 min, respectively, and the mean duration of motor block in Group L and Group B was 130.4 ± 8.63 min and 159 ± 10.4 min. This difference was statistically significant ($P < 0.05$) both in terms of duration of sensory block and motor block. None of the patients in any group experienced any serious complications.

Conclusion: Although the onset of sensory and motor blockade was earlier and mean time duration of block was prolonged in bupivacaine group but, in terms of quality of surgical anesthesia both the groups were comparable. Furthermore, the hemodynamic stability and side effects profile was better in levobupivacaine group.

Key words: Bupivacaine, Hyperbaric, Levobupivacaine, Spinal anaesthesia

INTRODUCTION

In the past 20 years, it has been observed that there is an increase in the frequency of caesarean delivery; this has been related with an increasing desire in the mothers to remain awake during operative delivery of their child. With small amounts and various combinations of drugs, systemic and pharmacologic effects are avoided, a deep surgical anesthesia is required and a safer, beneficial and comfortable regional anesthesia is provided for the mother and child in contrast to alternative techniques.[1]

Access this article online

www.ijss-sn.com

Month of Submission : 08-2024
Month of Peer Review : 09-2024
Month of Acceptance : 10-2024
Month of Publishing : 10-2024

Spinal anesthesia has became popular because of the ease and effectiveness, in addition to the rapidity in establishing adequate levels of analgesia. In addition, the small amounts of drug administered make placental transfer and fetal uptake of the medication negligible in comparison with another regional techniques.

The pursuit for searching safer and newer anesthetic drugs has been among the most important requirements

Corresponding Author: Pankaj Sarangal, Department of Anaesthesia, Government of Medical College, Amritsar, Punjab, India.

in anesthesiology practice. Hence, newer local anesthetics came into existence like mepivacaine,[2] bupivacaine,[3] levobupivacaine,[4] and ropivacaine.[5] Among them, mepivacaine was related with the increased incidence of transient radicular irritation when given intrathecally.

Bupivacaine, an amino amide local anesthetic, synthesized by Ekenstan in 1957[6] has prolonged duration and decrease incidence of the transient radicular symptoms when used in higher doses, it leads to myocardial depression, hypotension, and bradycardia.[7] Although level of block needed for abolishing somatic pain during cesarean delivery is T10 level, a block as high as T4 is required to abolish visceral pain and maternal discomfort. If the volume of drug is reduced to avoid hypotension, it could result in visceral pain during procedure and reduced post-operative analgesia.[8]

To search for better alternative to bupivacaine, we aimed to evaluate the clinical efficacy, onset and duration of motor and sensory blockade, hemodynamic profile and adverse effects if any, with equivalent doses of 0.5% hyperbaric bupivacaine and 0.5% hyperbaric levobupivacaine in spinal anesthesia for parturient undergoing lower segment cesarean section.

MATERIALS AND METHODS

A prospective, randomized, double blind study was done following acceptance by the Institutional Thesis and Ethics Committee. The present study was conducted in department of anesthesiology and intensive care unit, at Government Medical College, Amritsar. It was carried out on 60 female pregnant patients affiliated to American Society of Anaesthesiologist (ASA) grade II, in the age group (18–40 years) undergoing elective lower segment cesarean section. Written informed consent was taken from each patient before enrolling them for study.

In the operating room, IV line secured with a 20G three-way intravenous cannula and started with ringer lactate solution and standard monitors including blood pressure (BP), pulse rate, respiratory rate, pulse oximetry, and electrocardiography was attached and vitals recorded. Patient was placed in lateral decubitus position. Following thorough scrubbing, cleaning and donning sterile gown and gloves under aseptic precautions, the patient's back painted with povidone iodine solution and draped with sterile towels. L3-L4 inter vertebral space was located. Skin wheal was created by 26G needle with 2% lignocaine. Spinal needle number 26G Quincke was introduced into subarachnoid space using a midline approach. On free flow of CSF, the patient received one of the research medication intrathecally based on the random number chart. Our study was double blinded study as we choose equal volume of the drug to be administered in both the groups. Anesthesiologist performing the subarachnoid block was blinded to study drugs and drugs were prepared by another anesthiologist.

1. Group L – received 10 mg (2 mL) 0.5% hyperbaric levobupivacaine
2. Group B – received 10 mg (2 mL) 0.5% hyperbaric bupivacaine.

After performing the subarachnoid block, patients were immediately placed in the supine position. The anesthesiologists who performed spinal anesthesia documented the intra operative parameters and also postoperatively till patient got discharged from post anesthesia care unit.

Statistical Analysis

The data from the present study were systematically collected, compiled and statistically analyzed using software IBM SPSS 23.0 to draw relevant conclusions. Data were expressed as means, standard deviation, number, and percentages. The patient characteristics (non-parametric data) were analyzed using the "Chi-square tests" and the intergroup comparison of the parametric data was done using the "Unpaired 't' test". The "P"-value was determined to finally evaluate the levels of significance. $P < 0.05$ was considered as significant; $P < 0.001$ was considered to be highly significant. Power analysis was done to calculate the power of the study by taking α error 0.05. Effect size was calculated by taking parameters (mean onset of sensory block, mean time to maximum sensory level, mean duration of sensory block, mean time to maximum motor block, mean duration of motor block, and total duration of analgesia). The power achieved was well above 90%.

OBSERVATIONS AND RESULTS

Table 1 shows comparison of physical characteristics between the two groups such as age, weight, ASA grade, and duration of surgery. Our study revealed that as far as above parameters were concerned, there was no statistically significant difference between the two groups and the data were comparable between the groups.

Table 1: Demographic details of the patients

Parameters	Group L (*n*=30)	Group B (*n*=30)	*P*-value
Age group (years)	27.36±3.71	26.83±6.14	0.686
Weight (kg)	62.56±5.79	63.53±8.99	0.672
Duration of surgery (minutes)	52.90±5.04	54.83±5.33	0.155
ASA grade	II	II	

S-significant (*P*=0.05), HS-Highly significant (P<0.001), NS: Non significant (*P*>0.05)

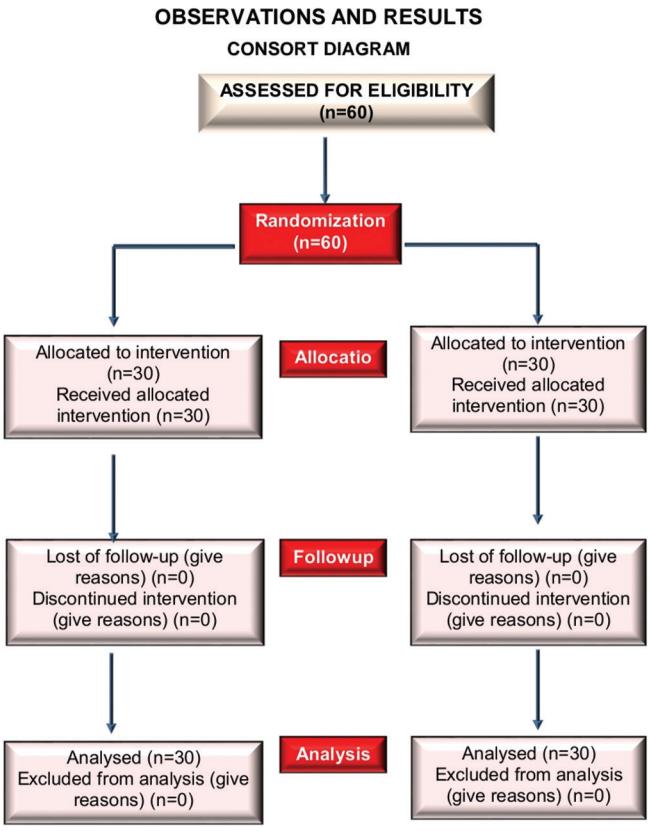

Table 2 shows, in Group B, the mean time to onset of sensory block to T10 was earlier, that is, 1.9 ± 0.712 min as compared to Group L which was 2.6 ± 0.56 min. The difference between both the groups was statistically highly significant ($P = 0.001$).

The mean total duration of sensory block in Group L was 163.5 ± 5.8 min and 176.1 ± 8.1 min in Group B. In Group L, total duration of sensory block was earlier when compared to Group B in which sensory block was prolonged and this difference was found to be statistically significant ($P < 0.05$).

The mean time taken to achieve maximum motor block in Group L was 4.262 ± 0.863 min and in Group B was 3.821 ± 0.717 min. In Group B, the time taken to onset of motor block was earlier compared to Group L and this difference between the two groups was found to be statistically significant ($P < 0.05$).

The mean total duration of motor block (recovery to Bromage 0) in Group L and Group B was 130.4±8.63 min and 159 ± 10.4 min, respectively. In Group L, the mean time for the total duration of motor block was earlier compared to Group B, in which motor block was prolonged till 159 ± 10.4 min. Hence, the difference between the two groups L and B was statistically highly significant ($P = 0.001$).

Table 2: Onset and duration of sensory and motor blockade

Parameters	Group L (*n*=30) (min)	Group B (*n*=30) (min)	*P*-value
Sensory blockade			
Onset	2.60±0.56	1.90±0.71	0.001
Duration	163.567±5.852	176.167±8.166	0.015
Motor blockade			
Onset	4.262±0.863	3.821±0.717	0.035
Duration	130.46±8.62	159.00±10.45	0.001

S-significant (P=0.05), HS: Highly significant (P<0.001), NS: Non significant (P>0.05)

Table 3: Side effects

Side effects postoperative	Group L (*n*=30)	Group B (*n*=30)	*P*-value
Hypotension	5	8	0.347
Bradycardia	2	4	0.389
Backache	1	2	0.553
Nausea	1	2	0.553
Shivering	3	4	0.687
Vomiting	0	1	0.313

Mean arterial BP was comparable at all the measured intervals and the difference between the two groups was statistically non-significant $P > 0.05$ (non-significant).

Hypotension was seen in 5 (16.67%) patients in Group L and 8 (26.66%) patients in Group B ($P > 0.05$). Bradycardia was observed in 2 (6.67%) patients in Group L and 4 (13.33%) patients in Group B ($P > 0.05$). The difference between the two groups with respect to complications and side effects was statistically non-significant ($P > 0.05$). Although clinically side effects were observed more in Group B compared to Group L, but on statistical evaluation, no such difference was observed ($P > 0.05$) [Table 1].

DISCUSSION

Sub arachnoid block is the most popular technique and commonly used worldwide. The advantage of an awake patient, lower drug cost, and rapid patient turn over has made this the method of choice for many surgical procedures. Better understanding of the physiological aspects of regional block, availability of long-acting local anesthetic agents, and understanding of pharmacokinetics and pharmacodynamics of these agents have greatly contributed to the reincarnation of subarachnoid block during the last two and half decades. Regional anesthesia gives pain management both during and after surgery while maintaining mental clarity and reflexes.

Worldwide, 0.5% hyperbaric bupivacaine is most commonly used for spinal anesthesia for cesarean section. However,

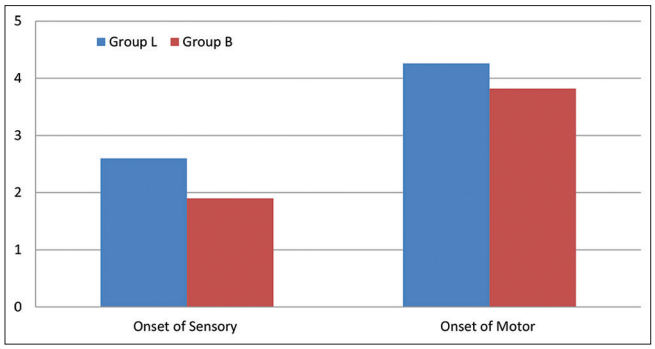

Figure 1: Comparison of onset of sensory and motor blockade in both the groups

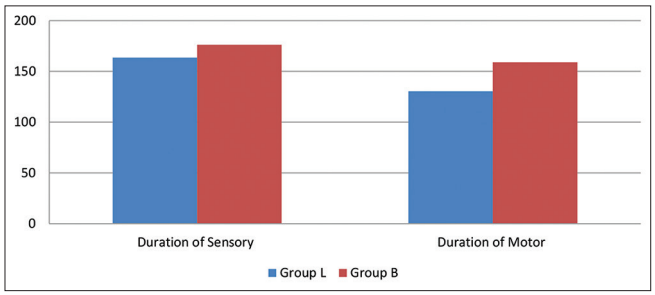

Figure 2: Comparison of duration of sensory and motor blockade in both the groups

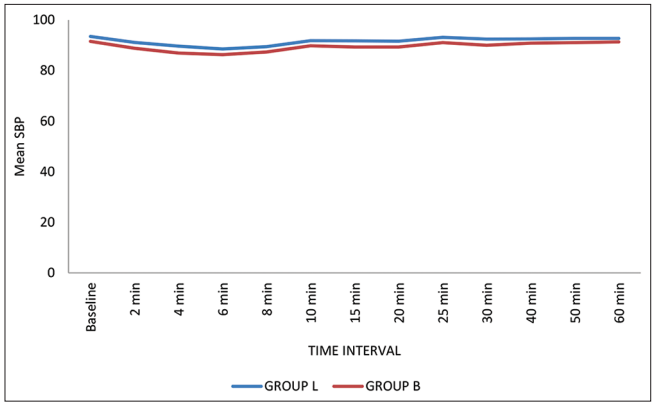

Figure 3: Intraoperative mean arterial blood pressure (mmHg)

compared to other local anesthetics, it has considerable adverse effects on the cardiovascular and central nervous system.

Levobupivacaine, the S (-) enantiomer of bupivacaine, recently introduced for obstetric spinal and epidural anesthesia has been shown to provide a more selective neuraxial blockade than racemic bupivacaine.

Hyperbaric preparations of local anesthetics are preferred in subarachnoid block as they produce more predictable and reliable motor and sensory block with faster onset.

The current investigation was done to evaluate and compare the efficacy of intrathecal 0.5% hyperbaric levobupivacaine (10 mg) versus 0.5% hyperbaric bupivacaine in lower segment cesarean section. We accomplished our aim by carrying out the study in 60 patients who were randomly split up in to both groups of 30 women each in the 18–40 years range, ASA Grade 2 selected for cesarean section after pre anesthetic checkup. Parturient in Group L was given 10 mg (2 mL) of 0.5% hyperbaric levobupivacaine and Group B parturient given 10 mg (2 mL) of 0.5% hyperbaric bupivacaine intrathecally. The groups were compared in terms of the onset and duration of motor and sensory block, hemodynamic changes, and any side effects. The data were compiled, tabulated, and statistically analyzed.

- In our study, time to onset of sensory block in Group B (1.9 ± 0.712) min was earlier when compared to Group L (2.6 ± 0.56) and this difference was found to be statistically highly significant (P = 0.001). Our study results were comparable with the study done by Thakore *et al.* and found that time to onset of sensory block in Group B (4.0 ± 1.30) min was earlier when compared to Group L (4.7 ± 1.20) min and this difference was found to statistically highly significant (P = 0.0097) [Figure 1].[9]
- In our study, time to onset of motor block in Group B (3.82 ± 0.71) min was earlier when compared to Group L (4.26 ± 0.86) min and this difference was statistically significant (P = 0.035). Our study results were comparable with the study done by Girish *et al.* which also found that time to onset of motor block in group L (4.21 min) was longer when compared to group B (3.58 min) and this difference was statistically highly significant (P = 0.003) [Figure 1].[10]
- In our study, the mean total duration of sensory block was higher in group B (176.1 ± 8.10) min when compared to Group L (163.5 ± 5.8) min and this difference was found to be statistically highly significant (P = 0.007). Our study results were comparable with Girish *et al.* study and found that the mean total duration of sensory block was higher in Group B (207.6 min) when compared to group L (193.1 min) and this difference was found to be statistically highly significant (P = 0.001) [Figure 1].
- In our study, the mean total duration of motor block was higher in Group B (159.0 ± 10.40) min when compared to Group L (130.4 ± 8.62) min and this difference was statistically highly significant (P = 0.001). Our study results were comparable with the study done by Thakore *et al.* and found that Group B (133.9 ± 28.10) min has higher duration of motor block compared to Group L (88.40 ± 12.40) min and this difference was statistically highly significant (P = 0.001) [Figure 2].
- In our study, clinically, it was noticed that there existed a decrease in heart rate and BP in both the groups in

between 4 min and 20 min which was more in Group B when compared to Group L, but when compared this difference was observed to be near to non-significant statistically. Our study results were comparable with the study done by Girish *et al.* and found that the mean heart rate changes and BP changes were similar in two groups and found to be statistically non-significant ($P > 0.05$) [Figure 3].

CONCLUSION

- Although the onset of sensory and motor blockade was earlier and mean time duration of block was prolonged in bupivacaine group, in terms of quality of surgical anesthesia both the groups were comparable. Furthermore, the hemodynamic stability and side effects profile were better in levobupivacaine group
- Hence, we concluded that though bupivacaine is an incredible drug for cesarean section, its cardiotoxicity increases in pregnancy. Hence, hyperbaric levobupivacaine is a better alternative for cesarean section due to its better hemodynamic profile.

REFERENCES

1. Erdil F, Bulut S, Demirbilek S, Gedik E, Gulhas N, Ersoy MO. The effects of intrathecal levobupivacaine and bupivacaine in the elderly. Anaesthesia 2009;64:942-6.
2. Luduena FP, Bogado EF, Tullar BF. Optical isomers of mepivacaine and bupivacaine. Arch Int Pharmacodyn Ther 1972;200:359-69.
3. Albright GA. Cardiac arrest following regional anesthesia with etidocaine and bupivacaine. Anesthesiology 1979;51:285-7.
4. Burlacu CL, Buggy DJ. Update on local anesthetics: Focus on levobupivacaine. Ther Clin Risk Manag 2008;4:381-92.
5. McClure JH. Ropivacaine. Br J Anaesth 1996;76:300-7.
6. Mantouvalou M, Ralli S, Arnaoutoglou H, Tziris G, Papadopoulos G. Spinal anesthesia: Comparison of plain ropivacaine, bupivacaine and levobupivacaine for lower abdominal surgery. Acta Anaesthesiol Belg 2008;59:65-71.
7. Bardsley H, Gristwood R, Baker H, Watson N, Nimmo W. A comparison of the cardiovascular effects of levobupivacaine and rac-bupivacaine following intravenous administration to healthy volunteers. Br J Clin Pharmacol 1998;46:245-9.
8. McLeod GA. Density of spinal anaesthetic solutions of bupivacaine, levobupivacaine, and ropivacaine with and without dextrose. Br J Anaesth 2004;92:547-51.
9. Thakore S, Thakore N, Chatterji R, Chatterjee CS, Nanda S. Evaluating the efficacy of low-dose hyperbaric levobupivacaine (0.5%) versus hyperbaric bupivacaine (0.5%) along with fentanyl for subarachnoid block in patients undergoing medical termination of pregnancy and sterilization: A prospective, randomized study. J Obst Anaesth Crit Care 2018;8:90-5.
10. Girish BK, Srinivas HT, Reddy SM. A comparative study of hyperbaric 0.5% levobupivacaine with bupivacaine 0.5% for spinal anaesthesia in elective surgeries. Indian J Anesth Analg 2018;5:2013-20.

How to cite this article: Makhni R, Kashyap KJ, Bommakanti N, Sarangal P. To Compare the Efficacy of Intrathecal Hyperbaric Levobupivacaine versus Bupivacaine in Patients Undergoing Elective Lower Segment Caesarean Section. Int J Sci Stud 2024;12(7):27-31.

Source of Support: Nil, **Conflicts of Interest:** None declared.