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Research Article

A COMPARATIVE, RANDOMIZED, OPEN LABELLED STUDY OF THE CLINICAL EFFICACY AND SAFETY OF INTRATHECAL LEVOBUPIVACAINE AND BUPIVACAINE IN LOWER LIMB SURGERIES AT A TERTIARY CARE CENTRE

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A B S T R A C T

Spinal anesthesia is the anesthesia used for lower limb surgeries. Bupivacaine, the drug of choice for spinal anaesthesia is associated with serious cardiac toxicity. Levobupivacaine, the S enantiomer of Bupivacaine has better cardiovascular safety. Hence this study was conducted to compare the efficacy and safety of Levobupivacaine over Bupivacaine in lower limb surgeries.

Materials and Methods: This was an open labelled, prospective, randomized study done in 80 patients posted for elective lower limb surgeries. One group received 0.5% of isobaric Levobupivacaine 12.5 mg and other group received 0.5% of hyperbaric Bupivacaine 12.5 mg. The parameters observed were hemodynamic variations, onset and duration of motor and sensory blockade and adverse events.

Results: The hemodynamic variations in both the groups showed no significant variations. Onset of motor blockade was significantly faster in Levobupivacaine ($p<0.003$) group, but the onset of sensory blockade was similar in both groups. Duration of sensory and motor blockade in both groups was same.

Conclusions: This study showed a faster onset of motor blockade with Levobupivacaine compared to Bupivacaine, with similar hemodynamic changes, duration of motor and sensory blockade and post-operative analgesia in both the groups.

INTRODUCTION

There has always been a quest for newer and safer anesthetic agents in anesthesiology practice. Bupivacaine 0.5% heavy was the only drug used for spinal anaesthesia after the discontinuation of intrathecal use of lidocaine. Bupivacaine has a relatively faster and longer duration of action as compared to the other local anesthetics. Its selectivity towards sensory nerve endings are of clinical importance in conditions where the motor functions should be preserved[1,2].

Bupivacaine is used for intraoperative anesthesia, post-operative analgesia and treatment of chronic pain. Bupivacaine's use in obstetrics is very popular due to its insignificant motor blockade in concentration less than 0.5%. However, its cardiotoxic and central nervous system side effects have led to the development of its pure S (-) enantiomers:ropivacaine and levobupivacaine [3,4,5].Levobupivacaine is an S (-) enantiomer of the long-acting local anaesthetic bupivacaine, having less cardiotoxic and central nervous system effects in comparison with bupivacaine [5].

There have been very few studies conducted among the Asian population on the use of isobaric levobupivacaine 0.5% for spinal anaesthesia. .Hence this study was conducted to assess the efficacy and safety of Levobupivacaine over Bupivacaine in lower limb surgeries requiring spinal anesthesia.

MATERIALS AND METHODS

This was an open labelled, prospective, randomized, comparative study carried out at Dr B. R. Ambedkar Medical College Hospital, Bangalore from November 2015 to December 2016. The study was conducted after obtaining approval from the Institutional Ethics Committee and written informed consent from the participants. The study investigated the efficacy and safety of 0.5% isobaric Levobupivacaine with 0.5% hyperbaric Bupivacaine in lower limb surgeries who are given spinal anesthesia.

A total of 80 patients who met the inclusion criteria were included in the study and divided into two equal groups of 40 patients each. After administering the required pre-anesthetic medications, the previous night of the surgery, L group

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received 0.5% of isobaric Levobupivacaine 12.5 mg and the B group received 0.5% of hyperbaric Bupivacaine 12.5 mg. The parameters observed were hemodynamic variations every 5 minutes till the end of the surgery, onset and duration of motor and sensory blockade and adverse events.

Statistical analysis

Descriptive analysis of numerical data (mean ±SD) and categorical data (frequency and percentage) was performed. Statistical tests like student's unpaired t-test were used for continuous variables
as per normality distribution of data using SPSS Statistics software 18.0, and R environment ver.3.2.2 19 and a p-value of <0.05 was considered statistically significant.

RESULTS

Majority of the patients were in the age group of 20-30 years (35% in group B and 20% in group L). The pulse rate was compared every 5 minutes till the end of the surgery in both the groups. The mean pulse rate for both groups was between 80-90 beats per minute (Table 1).

Table 1 Comparison of Pulse rate (bpm) distribution in two groups of patients studied

Pulse rate (bpm)	Group B	Group L	P value
0min	87.55±7.43	88.83±7.74	0.455
5 min	86.73±8.40	89.40±7.12	0.129
10 min	84.65±7.76	86.03±7.07	0.410
15 min	81.33±9.09	86.38±6.18	0.005**
20 min	79.83±8.55	85.55±6.37	0.001**
25 min	79.85±8.93	83.45±5.89	0.037*
30 min	77.48±8.79	81.83±6.37	0.013*
35 min	78.84±8.76	80.45±6.30	0.354
40 min	78.47±9.50	77.53±6.50	0.610
45 min	76.44±8.88	75.62±7.01	0.659
50 min	79.60±8.85	73.39±5.35	0.001**
55 min	79.59±8.06	74.83±6.10	0.030*
60 min	81.18±10.00	71.90±4.41	0.001**

The systolic blood pressure was measured and compared every 5 minutes till the end of the surgery in both the groups and it was seen that the mean systolic blood pressure in group B was 124.8 mm of Hg and the mean systolic blood pressure in group L was 130 mm of Hg. No significant changes were noticed among both the groups (Table 2).

Table 2 Comparison of SBP (mm Hg) distribution in two groups of patients studied

SBP (mm Hg)	Group B	Group L	P value
0min	131.98±12.00	144.78±9.10	<0.001**
5 min	131.65±11.17	143.85±9.58	<0.001**
10 min	129.88±12.48	142.62±7.69	<0.001**
15 min	126.08±16.91	141.05±8.40	<0.001**
20 min	124.40±16.41	136.30±7.58	<0.001**
25 min	123.70±15.21	132.30±6.60	0.002**
30 min	122.63±13.82	130.63±9.34	0.003**
35 min	124.03±11.94	125.70±9.49	0.497
40 min	121.58±12.78	123.93±14.78	0.465
45 min	123.79±12.06	121.26±14.28	0.419
50 min	122.63±11.14	117.06±13.45	0.080+
55 min	125.09±9.52	117.00±12.99	0.020*
60 min	122.83±9.25	119.29±13.87	0.362

The diastolic blood pressure was measured and compared every 5 minutes till the end of the surgery in both the groups and the mean diastolic pressure in group B was 79.1 mm of Hg and for group L was 82.4 mm of Hg. No significant changes were noticed among the two groups (Table 3).

Table 3 Comparison of DBP (mm Hg) distribution in two groups of patients studied

DBP (mm Hg)	Group B	Group L	P value
0min	83.75±11.27	88.43±7.52	0.032*
5 min	83.08±11.39	86.30±8.90	0.162
10 min	80.35±11.83	86.41±6.18	0.006**
15 min	77.10±12.24	83.65±6.06	0.003**
20 min	77.78±9.85	84.00±5.43	0.001**
25 min	81.98±9.01	80.60±6.13	0.427
30 min	79.33±8.63	82.35±8.46	0.117
35 min	76.81±9.69	80.18±9.30	0.124
40 min	77.72±11.58	82.48±9.78	0.056+
45 min	76.12±9.40	80.44±11.03	0.078+
50 min	76.80±8.65	78.88±9.80	0.377
55 min	79.91±7.56	80.09±11.60	0.952
60 min	79.67±9.33	79.57±10.78	0.977

The respiratory rate of patients in each group was counted every 5 minutes till the end of the surgery and compared. The mean respiratory rate for group B was 16.85 cycles/minute and for group L was 16.96 cycles/minute. No significant difference was noted between both the groups (Figure 1).

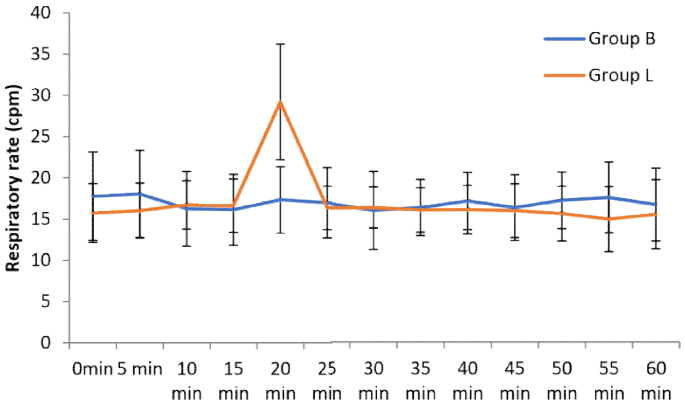

Fig 1 Comparison of Respiratory rate (cpm) distribution in two groups of patients studied

At all intervals intraoperatively, Sp02 saturation was found to be >95% in both the groups.

It was observed that it required 4-6 minutes for the onset of sensory blockade in 52.5% patients of group B and 57.5% patients in group L.

The onset of motor blockade was noted in both the groups with the help of Modified Bromage scale. The onset of motor blockade was significantly faster within 1-3 minutes in 70% pqatients of group L compared to 4-6 minutes in 50% patients of group B (p< 0.003). (Table 4).

Table 4 Distribution of onset of sensory block and Onset of Motor block in two groups studied

variables	Group B (n=40)	Group L (n=40)	Total (n=80)	P value
Onset Sensory block				
•1-3	14(35%)	16(40%)	30(37.5%)	
•4-6	21(52.5%)	23(57.5%)	44(55%)	0.306
•7-10	5(12.5%)	1(2.5%)	6(7.5%)	
Onset Motor block				
•1-3	15(37.5%)	28(70%)	43(53.8%)	
•4-6	20(50%)	12(30%)	32(40%)	0.003**
•7-10	5(12.5%)	0(0%)	5(6.3%)	

Table 5 Duration of sensory block and Motor Block in two groups studied

Duration	Group B (n=40)	Group L (n=40)	Total (n=80)	P value
Sensory block				
•<2hr40min	0(0%)	1(2.5%)	1(1.3%)	
•2hr40min-3	10(25%)	11(27.5%)	21(26.3%)	0.803
•>3hr	30(75%)	28(70%)	58(72.5%)	
Motor block				
•<2hr40min	0(0%)	4(10%)	4(5%)	
•2hr40min-3	23(57.5%)	17(42.5%)	40(50%)	0.104
•>3hr	17(42.5%)	19(47.5%)	36(45%)	

The duration of sensory blockade when compared in both groups was found to be identical in both the groups. The duration of motor blockade for 57.5% patients in group B was 2 hours 40 minutes on an average and in group L 47.5% patients had more than 3 hours of motor blockade. (Table 5)

DISCUSSION

The mean pulse rate was similar in both the groups. The blood pressure was compared in both groups every 5 minutes till the end of the surgery and it was noticed that the mean BP in group B was 124.8/79.1 mm of Hg and in group L it was 130/82.4 mm of Hg. Therefore, no statistically significant change was seen among both the groups. Although in two cases of levobupivacaine it was seen that there was a spike in the blood pressure 10-15 minutes before the end of the surgery (200/120 mm of Hg and 170/110 mm of Hg respectively) and it was managed conservatively, in another case there was hypotension (86/60 mm of Hg) associated with bradycardia seen 10 minutes before the surgery ended. It was managed by giving Inj. Atropine.

Similarly, when the mean respiratory rates of both the groups were compared they were 16.85 and 16.96 cycles per minute respectively and did not show any statistically significant changes.

The mean spO2 was also similar in both the groups.

In a study done by Glaser C, *et al*[6] there was slight decrease in mean heart rates and blood pressures over 30 minutes post anesthesia but was not associated with any significant inter group variations. In a study done by Burke *et al*[7], there were slight reductions in heart rate and mean arterial pressure, but there was no significant intergroup differences in hemodynamics, similar to our study.

In this study, it was observed that sensory blockade was achieved within 4-6 minutes in majority of patients in both the groups, therefore, no statistical significance could be appreciated.

But motor blockade (score 3 in modified Bromage scale) was achieved by 4-6 minutes in 50% of the patients in group B and in 70% patients in group L by 1-3 minutes in majority showing a statistically significant variation ($p<0.003$). This indicates patients receiving Levobupivacaine showed faster onset of motor blockade as compared to Bupivacaine group.

The duration of sensory blockade was also compared in both groups and was indicated by the need of the 1st dose of analgesia post-operatively. In both groups, it lasted for more than 3 hours ($p= 0.803$) and therefore was not statistically significant.

Motor blockade lasted for 2hours 40 minutes to 3 hours in 57.5% patients in group B whereas more than 3 hours in 47.5% patients in group L but the difference was not statistically significant ($p= 0.104$).

Guler *et al*[8] compared the clinical effi cacy of spinal anesthesia for cesarean section in sixty females with bupivacaine and levobupivacaine(hyperbaric solutions). He concluded that motor blockade time was lesser with levobupivacaine.

In a study done by Glaser C *et al*[6], there were no significant differences between groups except for the fact that the transition from Bromage scale 0 to 2 was significantly faster in the Levobupivacaine (4 mins) than in the Bupivacaine group (6 mins; $P < 0.03$) in concordance to our study.

In a study done by Alley E *et al*[9] the duration of motor and sensory blockade was similar in both the groups ($P> 0.56$ to 0.86) In contrast to study done by Burke *et al*[7] which reported 25 / 15 minutes, we observed shorter onset time for both sensory and motor blockade (1-3 minutes). The post-operative analgesia was assessed by the VNS immediately post-surgery, after 30 minutes, after 1 hour and after 3 hours of completion of the surgery.

After 3 hours, it was observed that all the patients in both the groups had received their 1st dose of analgesia, indicating the need for analgesia as the pain had increased above 5 which falls under moderate pain and demands requirement of analgesia.

In a study done by Glaser C *et al*[6] Visual analogue scale was used to determine post-operative pain and it was noticed that the mean score in Levobupivacaine group was 2.6 +/- 1.5 as compared to 3.4+/-2.4 in Bupivacaine group. This was not statistically significant, similar to our study.

Thus, results of this study indicates that both isobaric Levobupivacaine and hyperbaric Bupivacaine show similar efficacy for spinal anesthesia for lower limb surgeries with regards to duration of sensory and motor blockade and intra-operative hemodynamic changes with slightly faster onset of motor blockade in the levobupivacaine group.

Limitations

It is an open labelled study and the sample size is small, therefore further larger studies are indicated regarding comparison of both these drugs.

References

1. Conino BG. Clinical Pharmacology of local Anesthetic agents. In neural blockade in clinical anesthesia and management of pain.2nd edition, eds cousins MJ Bridenbaugh BO. JB Lippincott co. 1988;111-114.
2. Brennum J, Nielson PT, Horn A. Quantitative sensory examination of Epidural Analgesia and Anesthesia in Man; dose response effect of Bupivacaine. Pain 1994; 56:315-326.
3. McClellan KJ, Faulds D: Ropivacaine: an update of its use in regional anaesthesia . Drugs. 2000, 60:1065-1093
4. Whiteside JB, Wildsmith JA: Developments in local anaesthetic drugs. Br J Anaesth. 2001, 87:27-35.
5. Foster RH, Markham A: Levobupivacaine: a review of its pharmacology and use as a local anaesthetic .Drugs. 2000, 59:551-579.

6. Glaser C, Marhofer P, Zimpfer G, Heinz MT, Sitzwohl C, Kapral S, *et al*. Levobupivacaine versus racemic bupivacaine for spinal anesthesia. Anesth Analg. 2002;94:194–8.
7. Burke D, Kennedy S, Bannister J. Spinal anesthesia with 0.5% S ()- Bupivacaine for elective lower limb surgery. Reg Anesth Pain Med 1999; 24:519-23.
8. Guler G, Cakir G, Ulgey A, *et al*. A Comparison of Spinal Anesthesia with Levobupivacaine and Hyperbaric Bupivacaine for Cesarean Sections: A Randomized Trial *Open Journal of Anesthesiology* 2012;2:84–89.
9. Alley EA, Kopacz DJ, McDonald SB, Liu SS. Hyperbaric spinal levobupivacaine: A comparison to racemic bupivacaine in volunteers. Anesth Analg. 2002;94:188–93

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