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

Original Article

Comparative Study of Analgesic Efficacy of 0.5% Ropivacaine Versus 0.5% Levobupivacaine in Combined Femoral Nerve and Sciatic Nerve Block in Lower Limb Surgeries

K Vani Subrahmaneyswari[1], Chembeti Gopalakrishnaiah[1], Jalaja Praveena[1], Priadharshini Shanmugam[2]

[1]Assistant Professor, Department of Anaesthesiology, Rangaraya Medical College, Dr. NTR University of Health sciences, Andhra Pradesh, India, [2]Post Graduate, Department of Anaesthesiology, Rangaraya Medical College, Dr. NTR University of Health sciences, Andhra Pradesh, India

Abstract

Aim : To compare the analgesic efficacy of 0.5% Ropivacaine Versus 0.5% Levobupivacaine in Combined Femoral Nerve and Sciatic Nerve Block in Lower Limb Surgeries.

Methodology : A Prospective, randomized, and double-blinded study is conducted in 50 patients of both gendrs between 18 and 60 years posted for the lower limb surgeries were randomized into two groups of 25 members each. Group R: Received 0.5% ropivacaine separately. 20mL for femoral nerve and 20mL for sciatic nerve block. L: Received 0.5% levobupivacaine separately, 20 ml for femoral nerve and 20mL for sciatic nerve block.

Results : Onset of sensory block was assessed by pinprick test and motor blockade by modified bromage scale for every 5min in the first 20 min and then every 10 min till complete blockade occurs. Statistical analysis was done by Chi-square test and unpaired t-test to know the statistical significance. P <0.05 was considered statistically significant. Results showed that demographic data are comparable between both groups. The study results showed that 0.5% levobupivacaine had earlier onset of sensory and motor block, prolonged duration of sensory and motor blockade, and longer duration for first rescue analgesia than 0.5% ropivacaine. There were no post – operative complications among the study subjects in both R and L groups.

Conclusion : Both levobupivacaine and ropivacaine can be used in combined femoral and sciatic nerve blocks with safety and good efficacy but levobupivacaine is preferable over ropivacaine due to its early onset of block and prolonged post – operative analgesic efficacy.

Key words: 0.5% Levobupivacaine, 0.5% Ropivacaine, Femoral and sciatic nerve block, Lower limb surgeries, Motor block, Sensory block

INTRODUCTION

Peripheral nerve blocks (PNBs) have gained trend in extremity surgeries for optimal pain relief in perioperative periods. Advancement in the newer techniques such as peripheral nerve stimulator and ultra sound anesthesia has shifted anesthetic technique from general anesthesia and central neuraxial blockade to peripheral nerve block for isolated limb surgery. The best option for long duration operations is regional block anesthesia where both general and central neuraxial anesthesia are risky. It does not require fasting, special preparation, or pre-operative optimization and can be given in emergency conditions. PNBs are also preferred for lower limb surgeries and orthopedic surgeries because of peripheral location of surgical site and the potential to block pain pathways at multiple levels. Furthermore, better cardiorespiratory stability is observed with PNBs compared to the central neuraxial blockade, which has side effects such as hypotension, bradycardia, meningitis, postdural headache, and neurological deficit.

Access this article online

www.ijss-sn.com

Month of Submission : 07 - 2022
Month of Peer Review: 08 - 2022
Month of Acceptance : 08 - 2022
Month of Publishing : 09 - 2022

Corresponding Author: K Vani Subrahmaneyswari, No: 57-1-2, Munsiff Junction, Jagannaicpur, Kakinada, Andhra Pradesh, India.

However, still there is no consensus on whether certain types of patients benefit more from a general, regional, or mixture of the two types of anesthesia and anesthesiologist may have different priorities and preferences. The onset of action of a peripheral nerve block is longer than spinal (subarachnoid block) and the success rate of a satisfactory block is generally lower than the neuraxial block; however, it is useful in elderly patients. Relief these regional blocks provide, make them worthwhile techniques to perform especially in the critical ill patients.

Ropivacaine was one of the first local anesthetic agents that came as a probable substitute for bupivacaine. Ropivacaine the S-enantiomer of S-1 propyl -2 6 pipe coloxylidide is an amino – amide local anesthetic agent with a chemical formula similar to that of bupivacaine levobupivacaine, the S-enantiomer of bupivacaine is the newest local anesthetic agent to enter into clinical practice. Research studies shown the enantiomers (R-dextrobupivacaine and the S-levobupivacaine) of bupivacaine possess anesthetic activity but the S-enantiomer had significantly lower cardiovascular system (CVS) and central nervous system (CNS) related toxic effects than bupivacaine, while having similar duration of sensory blockade. Levobupivacaine has proved to be safer and effective with a longer duration of analgesic effect compared with ropivacaine for neuraxial and peripheral nerve block.

The present study is aimed to compare the analgesic efficacy of 0.5% ropivacaine versus 0.5% levobupivacaine in the lower limb surgeries using femoral and sciatic nerve block with nerve stimulator. The objectives were to study duration of sensory block, motor block, duration of post-operative analgesia, and incidence of any post-operative complications.

MATERIALS AND METHODS

This was a prospective, randomized, and double-blinded study.

Study Setting

The study was conducted at Tertiary care hospital – Rangaraya Medical College, Government General Hospital, Kakinada.

Study Population

Fifty patients undergoing lower limb surgical procedure in the age range of 18–60 years.

Study Period

The study period was from December 2021 to May 2022.

Inclusion Criteria

Patients in the age range of 18–60 years of age, American Society of Anesthesiologists Grade I and II, and Undergoing lower limb surgeries were included in the study.

Exclusion Criteria

Patient refusal, associated hepatic or renal disease, infection at the site of block, risk of bleeding, known allergy to local anesthetic, and h/o any neuromuscular disease/neuropathy were excluded from the study.

After taking written informed consent, 50 patients of both genders between 18–60 years posted for the lower limb surgeries were randomized into two groups of 25 members each. All patients had preanesthetic check-up which included history taking, general examination, and systemic examination. Routine investigations such as hemoglobin, urine examination, blood sugar, blood urea, serum creatinine, bleeding time, and clotting time were done for all. Other specific investigations were done depending on history and examination. All patients were kept nil by mouth for at least 6 h. After taking the patient to operation theater, multipara monitor was attached, baseline pulse rate, blood pressure, respiratory rate, and oxygen saturation.

SPO_2 was recorded. An intravenous line was secured with a wide bore cannula (18 G) and injection DNS was started at 100 mL/h.

Block Technique

The selected drugs either 0.5% ropivacaine or 0.5% levobupivacaine for giving the block were drawn up in a syringe and were kept ready in a bowl. Resuscitation and emergency medications were kept available and ready to use.

Sciatic Nerve Block

Sciatic nerve was blocked by classic approach of Labat technique.

Standard regional anesthesia tray with sterile towels, 4 × 4 inches gauze packs, 20 mL syringe with local anesthetic, sterile gloves, marking pen, surface electrode, one 1.5 inch 25G needle for skin infiltration, 10 cm long short bevel insulated stimulating needle, and peripheral nerve stimulator were kept. The land marks are (1).greater trochanter, (2). posterior superior iliac spine, and (3) needle insertion site 4 cm distal to the mid-point between the two land marks. The patient was placed in lateral decubitus position with slight forward tilt; the foot on the side to be blocked was positioned over the dependent leg, so that twitches of the foot or toes can be easily noted. After cleaning with antiseptic solution, local anesthetic was infiltrated at the needle insertion site. Needle was introduced perpendicular to the skin; the nerve stimulator was set to deliver 1 – 1.5 mA current. The goal was to achieve visible or palpable twitches of the hamstrings, calf muscles, and foot. The current was gradually decreased until the twitches are seen at 0.3–0.5 mA current (approximately at a depth of 5–8cm). 20 mL of local anesthetic was injected.

Femoral Nerve Block

Patient was placed in supine position. Ipsilateral extremity was abducted 10–20 degrees and slightly externally rotated with lateral side of the foot resting on the table. The land marks are inguinal ligament, inguinal crease, and femoral artery. Needle insertion site is just below the inguinal crease, 1–2 cm lateral to the pulse of femoral artery. Needle is connected to nerve stimulator, set at current of 1 mA and introduced at 30–45 degree angle to the skin cephalad direction. The position of the needle is adequate when patellar twitches are elicited with current output between 0.3 and 0.5 mA. After negative aspiration, 20 mL of LA was injected.

Group R: Received 0.5% ropivacaine 20 mL separately for femoral nerve and 20 mL for sciatic nerve block.

Group L: Received 0.5% levobupivacaine 20 mL separately for femoral nerve and 20 mL for sciatic nerve block.

Onset of sensory block was assessed by pinprick test and motor blockade by modified bromage scale for every 5 min in the first 20 min and then every 10 min till complete blockade occurs. Intraoperative monitoring of blood pressure, pulse rate, O_2 saturation, and respiratory rate was done at 5 min interval.

Postoperatively, duration of motor block was assessed by the time elapsed from the maximum to the lowest Bromage scale, duration and quality of sensory block by pinprick test, and visual analog scale (VAS) score every 15 min in the first 2 h and every 4 h till, complete regression of block occurs.

RESULTS

Statistical analysis was done by Chi-square test and unpaired *t*-test to know the statistical significance. $P < 0.05$ was considered statistically significant.

Results showed that demographic data are comparable between both groups, as shown in Table 1.

Onset of sensory blockade in Group R was 16.24 m compared to 10.24 min in Group L with a significant $P = 0.001$. Onset of motor blockade in Group R was 20.64 min compared to 16.78 min in Group L with $P = 0.001$ which is significant [Table 2 and Figure 1].

Duration of sensory blockade in Group R is 564.05 min compared to 715.28 min in Group L, with $P = 0.001$ which is highly significant. Duration of motor blockade in Group R is 494.80 min compared to 599.150 in Group L. $P = 0.001$ is statistically highly significant [Table 2 and Figure 2].

Table 1: Demographic variables are similar in both L and R group

VARIABLES		GROUP R	GROUP L	P VALUE
AGE(MEAN VALUE)		43.41	41.94	> 0.05
GENDER	MALE	34 (68%)	40 (80%)	> 0.05
	FEMALE	16 (32%)	10 (20%)	
WEIGHT(MEAN)		66.540	67.580	> 0.05
ASA GRADE	GR 1	36 (72%)	35 (70%)	> 0.05
	GR 2	14 (28%)	15 (30%)	
DURATION OF SURGERY(MEAN)		96.500	99.400	> 0.05

Table 2: Onset, duration of sensory and motor blockade, and time to rescue analgesia in L and R group

PARAMETERS		LEVOBUPIVACAINE (N=25)	ROPIVACAINE (N=25)	P VALUE
ONSET OF BLOCKADE (min)	SENSORY	10.24 ±1.27	16.24±1.32	0.001
	MOTOR	16.78±1.26	20.64±1.43	0.001
DURATION OF BLOCKADE (min)	SENSORY	715.28±11.08	564.05±8.02	0.001
	MOTOR	599.15±15.96	494.80±16.86	0.001
TIME TO FIRST RESCUE ANALGESIA (min)		801.2±12.85	629.45±11.82	0.001

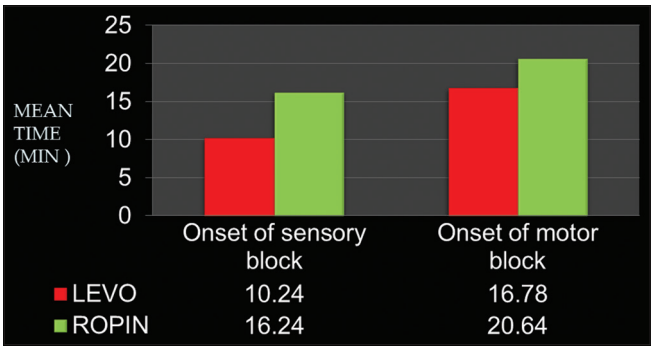

Figure1: Comparison of mean time of onset of sensory and motor block in Group L and Group R

Time to first rescue analgesia was 629.450 min in Group R compared to 801.218 min in Group L with a significant $P = 0.001$ [Table 2 and Figure 3].

There were no post-operative complications among study subjects in both R and L Groups.

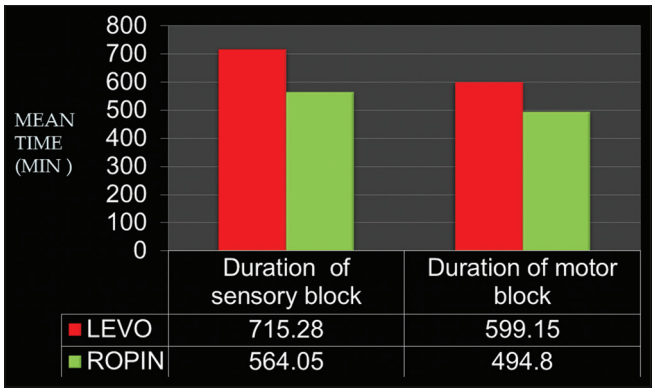

Figure 2: Comparison of duration of sensory and motor block in Group L and Group R, more in Group L

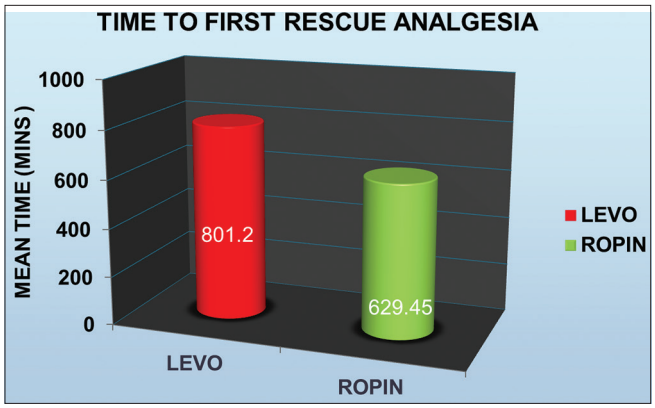

Figure 3: Comparison of time to first rescue analgesia in Group L and Group R, more in Group L

DISCUSSION

PNBs have gained trends in extremity surgeries for optimal pain relief in perioperative periods. They also provide better hemodynamic stability and offer advantages of shorter recovery time especially in elderly and high-risk patients. This analgesia method is considered the safest with regard to the development of complications typical for endotracheal intubation and neuraxial block. Skill full application of these blocks broadens the anesthesiologist's range of options in providing optimal anesthetic care.

Many comparative studies between ropivacaine and bupivacaine proved that ropivacaine produced less CVS and CNS adverse effects, less motor block, and almost equal duration of sensory block and pain free hours. This advantageous discovery caused many clinicians to move from bupivacaine to ropivacaine for all types of neural blockades. However, with clinical use, it was found that, with ropivacaine latency of sensory analgesia was two-thirds of bupivacaine. Hence, it is less effective in prolonging post-operative analgesia.

Research studies have shown that the enantiomers (R-dextrobupivacaine and the S-levobupivacaine) of bupivacaine possess anesthetic activity but the S-enantiomer had significantly lower CVS-and CNS-related toxic effects than bupivacaine, while having similar duration of sensory blockade. Levobupivacaine has proved to be safer and effective with a longer duration of analgesic effect compared with ropivacaine for neuraxial and peripheral nerve block.

The present study is aimed to compare the analgesic efficacy of 0.5% ropivacaine versus 0.5% levobupivacaine in the lower limb surgeries using femoral and sciatic nerve block with nerve stimulator. The objectives are to study duration of sensory block, motor block, duration of post-operative analgesia, and incidence of any post-operative complications. Results of study were comparable between both groups in terms of demographic data [Table 1]. Onset of sensory blockade in Group R was 16.24 min compared to 10.24 min in Group L with significant $P = 0.001$. Onset of motor blockade in Group R was 20.64 min compared to 16.78 min in Group L with $P = 0.001$ which is significant [Table 2 and Figure 1].

In study by Malav *et al*.[2] group in November 2017, results were equivalent with respect to the onset of sensory and motor blockade and in demographic variables. Group L compared to Group R had significantly longer median (95% confidence interval). Duration of sensory block was 647.50 min versus 535 min as well as motor block was 1065.0 min and 945 min, respectively. In the present study, duration of sensory blockade in Group R is 564.05 min compared to 715.28 min in Group L, with $P = 0.001$ which is highly significant. Duration of motor blockade in Group R is 494.80 min compared to 599.150 in Group L. $P = 0.001$ which is statistically highly significant [Table2 and Figure 2]. Results of present study are similar to Malav *et al*. group with regard to duration of motor and sensory blockade.

Kumar and Kaushik (2018)[3] did a comparative study in orthopedic surgeries of the lower limb under combined femoral and sciatic nerve block [International Journal of Innovative Research in Medical Science, 3(05), 2024–2027].

In their prospective study, 50 patients in the age group of 20–65 years of both sexes were included who were posted for the lower limb surgeries. Patients were randomly divided into two groups of 25 each, Group A: 20 mL each of 0.5% ropivacaine for femoral and sciatic nerve blocks. Group B: 20 mL of 0.5% ropivacaine with Fentanyl 25 μg each for femoral and sciatic nerve blocks. In their study, significant difference was not seen by adding fentanyl but the technic was found to be useful for prolonged analgesia [Table 3]. Similar to above study present study is also found useful in providing prolonged analgesia postoperatively also.

Chauhan *et al*.[4] group in September 2020 did a comparative study of block characteristics and post-operative analgesia

Table 3: Sensory and motor block in both groups after induction of anesthesia

Onset/duration min/h	Group A (*n*=25)	Group B (*n*=25)	*P* value
Mean onset of sensory block (min)	12.54+3.25	13.22+2.54	NS
Mean onset of motor block (min)	18.22+2.45	18.78+3.44	NS
Total duration of sensory block (h)	14.56+0.22	13.95+1.23	NS
Total duration of motor block (h)	12.88+1.28	13.05+1.88	NS

Kumar and Kaushik (2018). NS: Not significant

of 0.5% levobupivacaine with 0.5% ropivacaine in ultrasound guided supraclavicular block for orthopedic forearm surgeries. In their study, mean time for onset and peak effect of sensory block was drastically reduced and the total duration of sensory block was effectively prolonged in Group L patients. Onset time of sensory block was 90.33 s in Group L while it was 192.33 s in Group R. Duration of sensory block was 428.5 min in Group L compared to 345.17 min in Group R ($P < 0.05$). Onset time and total duration of motor block was 265.67sec and 331 min in Group L and 283 s and 310 min in Group R ($P > 0.05$). Duration of post-operative analgesia was for 12 h in Group L and 7.7 h. in Group R ($P < 0.001$). This difference was highly statistically significant. Similar to their study, in the present study, also onset is quick and duration of sensory block is prolonged in L group compared to R group. Duration of motor block is also more in L group with significant $P = 0.001$.

In the present study, postoperatively, duration of motor block was assessed by the time elapsed from the maximum to the lowest Bromage scale and duration and quality of sensory block tested by pinprick test and VAS score every 15 min in the first 2 h and every 4 h till complete regression of block occurs. Time to first rescue analgesia was 629.450 min in Group R compared to 801.218 min in Group L with a significant $P = 0.001$.Time to rescue analgesia is longer in Group L compared to Group R, in concurrence with Chauhan *et al.* study.

CONCLUSION

From the present study, it can be concluded that both levobupivacaine and ropivacaine are useful in combined femoral and sciatic nerve blocks with safety and good efficacy. Levobupivacaine can be preferred over ropivacaine due to its early onset and prolonged post-operative analgesic efficacy.

REFERENCES

AQ3

1. Mankad PP, Makwana JC, Shah BJ. A comparative study of 0.5% ropivacaine and 0.5% levobupivacaine in supraclavicular brachial plexus block. Int J Med Sci Public Health 2016;5:74-9.
2. Malav K, Singariya G, Mohammed S, Kamal M, Sangwan P, Paliwal B. Comparison of 0.5% ropivacaine and 0.5% levobupivaine for sciatic nerve block using labat approach in foot and ankle surgery. Turk J Anaesthesiol Reanim 2018;46:15-20.
3. Kumar DP, Kaushik DA. Comparative study in orthopaedic surgeries of lower limb under combined femoral and sciatic nerve block. Int J Innov Res Med Sci 2018;3:2024-7.
4. Chauhan AP, Pandya J, Jain A. Comparison of block characteristics and postoperative analgesia of 0.5% levobupivacaine with 0.5% ropivacaine in ultrasound-guided supraclavicular block for orthopaedic forearm surgery-a prospective, comparative, randomized, clinical study. Indian J Clin Anaesth 2020;7:399-404.
5. Wedel DJ,Brown DL. Nerve blocks. In: Miller RD, editor. Anaesthesia. 3rd ed. New York: Churchill-Livingstone; 1990. p. 1407-37.
6. Malroj M. Regional Anaesthesia: An Illustrated Practice Book. 3rd ed. Philadelpha: Wilters Kluwer/Lippincott Williams and Wilkins; 2002. p. 333.
7. Labat G. Its Technique and Clinical Applications: Regional Anaesthesia. 2nd ed. Philadelphia: Saunders; 1924. p. 45-55.
8. Santorsola R, Casati A, Cerchierini E, Moizo E, Fanelli G. Levobupivacaine for peripheral blocks of the lower limb: A clinical comparison with bupivacaine and Ropivacaine. Minerva Anestesiol 2001;67:33-6.
9. Mehrotra S, Meharota M. Regional block anaesthesia how effective is it for extremity trauma? Med J Armed Forces India. 2002;58:205-9.

How to cite this article: Subrahmaneyswari KV, Gopalakrishnaiah C, Praveena J, Priadharshini. Comparative Study of Analgesic Efficacy of 0.5% Ropivacaine Versus 0.5% Levobupivacaine in Combined Femoral Nerve and Sciatic Nerve Block in Lower Limb Surgeries. Int J Sci Stud 2022;10(6):57-61.

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

Author Queries???
AQ3: Kindly cite references 1,5-10 in the text part
AQ5: Kindly provide the table in editable format