e-ISSN: 0976-822X, p-ISSN:2961-6042

Available online on http://www.ijcpr.com/

International Journal of Current Pharmaceutical Review and Research 2026; 18(1); 1315-1319

Original Research Article

Comparative Study of Ropivacaine Versus Levobupivacaine for Brachial Plexus Block: An Observational Study

Gunjan Kumar[1], Sakshi Kiran[2]

[1]Assistant Professor, Department of Anaesthesiology, Krishnanagar Institute of Medical Science, West Bengal, India

[2]Assistant Professor, Department of Anaesthesiology, Mahabodhi Medical College and Hospital, Gaya, Bihar, India

Received: 28-11-2025 / Revised: 27-12-2025 / Accepted: 29-01-2026

Corresponding Author: Sakshi Kiran

Conflict of interest: Nil

Abstract:

Background: Brachial plexus block is widely used for upper limb surgeries, providing effective intraoperative anesthesia and postoperative analgesia. Ropivacaine and levobupivacaine are newer long-acting amide local anesthetics with improved safety profiles compared to bupivacaine. However, evidence comparing their clinical efficacy in brachial plexus block remains limited.

Aim: To compare the onset, duration, quality of sensory and motor block, duration of analgesia, and adverse effects of ropivacaine versus levobupivacaine in brachial plexus block.

Materials and Methods: This study included 60 patients who underwent upper limb surgery under brachial plexus block at Krishnanagar Institute of Medical Sciences, West Bengal, from July 2024 to July 2025. Patients were divided into two groups: Group R (ropivacaine) and Group L (levobupivacaine). Block characteristics, duration of analgesia, and complications were analyzed statistically.

Results: Levobupivacaine demonstrated significantly longer duration of sensory and motor block and prolonged postoperative analgesia compared to ropivacaine ($p < 0.05$). Onset time was comparable between groups. No major adverse effects were observed.

Conclusion: Levobupivacaine provides longer duration of anesthesia and analgesia than ropivacaine, making it a preferable choice for prolonged upper limb surgeries requiring extended postoperative pain relief.

Keywords: Brachial Plexus Block, Ropivacaine, Levobupivacaine, Regional Anesthesia, Postoperative Analgesia.

DOI: 10.25258/ijcpr.18.1.222

Introduction

Regional anesthesia techniques, particularly brachial plexus block, have gained popularity for upper limb surgeries due to superior perioperative analgesia, reduced opioid consumption, and enhanced patient satisfaction [1]. Advances in local anesthetic pharmacology have led to the development of safer alternatives to racemic bupivacaine, notably ropivacaine and levobupivacaine [2].

Ropivacaine is the pure S-enantiomer of propivacaine and is characterized by lower lipid solubility, resulting in reduced cardiotoxicity and preferential sensory block over motor block [3]. Levobupivacaine, the S-enantiomer of bupivacaine, retains anesthetic potency while offering an improved cardiovascular and central nervous system safety profile [4].

Previous studies have demonstrated that both agents provide effective anesthesia for peripheral nerve blocks; however, differences exist in onset time, duration of block, and quality of analgesia [5–7]. Some authors report longer analgesia with levobupivacaine, while others suggest faster recovery and better motor-sensory separation with ropivacaine [8–10].

Despite these observations, limited data are available from tertiary care centers in eastern India comparing these agents in real-world clinical settings. This study was therefore conducted to compare ropivacaine and levobupivacaine for brachial plexus block in terms of block characteristics, duration of analgesia, and safety profile.

Materials and Methods

Study Design: An observational study.

Study Place: Department of Anesthesiology, Krishnanagar Institute of Medical Sciences, West

Bengal, India (741102).

Study Duration: One year (July 2024 to July 2025).

Sample Size: 60 patients.

Inclusion Criteria

- Age 18–60 years
- ASA physical status I–II
- Undergoing elective upper limb surgery under brachial plexus block

Exclusion Criteria

- Allergy to local anesthetics
- Coagulopathy
- Local infection at block site
- Pre-existing neurological deficits

Group Allocation

- **Group R (n = 30):** Ropivacaine
- **Group L (n = 30):** Levobupivacaine

Parameters Assessed

- Onset of sensory block (minutes)
- Onset of motor block (minutes)
- Duration of sensory block (hours)
- Duration of motor block (hours)
- Duration of postoperative analgesia (hours)
- Adverse effects

Statistical Analysis: Data were analyzed using SPSS software. Continuous variables were expressed as mean ± SD and compared using unpaired Student's t-test. Categorical variables were analyzed using the Chi-square test. A p-value <0.05 was considered statistically significant.

Results

A total of 60 patient records were analyzed, with 30 patients in each group: Group R (ropivacaine) and Group L (levobupivacaine). Data completeness was adequate for all evaluated parameters.

Demographic and Baseline Characteristics: The demographic variables including age, gender distribution, and ASA physical status were comparable between the two groups, with no statistically significant differences observed ($p > 0.05$), indicating homogeneity of study groups (Table 1).

Table 1: Demographic and Baseline Characteristics

Parameter	Group R (n=30)	Group L (n=30)	p-value
Age (years)	38.4 ± 9.2	39.1 ± 8.7	0.76
Gender (M/F)	18 / 12	17 / 13	0.79
ASA I / II	19 / 11	20 / 10	0.78

Onset of Sensory and Motor Block

The mean onset time of sensory block was 9.6 ± 2.1 minutes in Group R and 9.2 ± 1.9 minutes in Group L.
The mean onset time of motor block was 12.4 ± 2.8 minutes in Group R and 11.9 ± 2.5 minutes in Group L.

Although onset was slightly faster in the levobupivacaine group, the differences were not statistically significant ($p = 0.42$ for sensory onset; $p = 0.48$ for motor onset), as shown in Table 2 and illustrated in Figure 1.

Duration of Sensory and Motor Block

The duration of sensory block was significantly longer in Group L (9.3 ± 1.4 hours) compared to Group R (6.8 ± 1.1 hours), and this difference was highly statistically significant ($p < 0.001$).

Similarly, the duration of motor block was longer in Group L (8.1 ± 1.3 hours) than in Group R (5.9 ± 1.0 hours), with a statistically significant difference ($p < 0.001$).

These findings are summarized in Table 2 and graphically represented in Figure 2.

Table 2: Comparison of Block Characteristics

Parameter	Group R	Group L	p-value
Sensory onset (min)	9.6 ± 2.1	9.2 ± 1.9	0.42
Motor onset (min)	12.4 ± 2.8	11.9 ± 2.5	0.48
Sensory block duration (h)	6.8 ± 1.1	9.3 ± 1.4	<0.001*
Motor block duration (h)	5.9 ± 1.0	8.1 ± 1.3	<0.001*

*Statistically significant

Duration of Postoperative Analgesia: The mean duration of postoperative analgesia was significantly prolonged in Group L (10.1 ± 1.6 hours) compared to Group R (7.2 ± 1.3 hours). This difference was statistically significant ($p < 0.001$), as detailed in Table 3 and depicted in Figure 3.

Table 3: Duration of Postoperative Analgesia

Group	Duration of Analgesia (hours)	p-value
Group R	7.2 ± 1.3	
Group L	10.1 ± 1.6	<0.001*

*Statistically significant

Adverse Effects and Complications: No major complications such as hypotension, bradycardia, local anesthetic systemic toxicity, or neurological deficits were documented in either group. Minor adverse effects were absent in both groups, and the difference was not statistically significant, as shown in Table 4.

Table 4: Adverse Effects

Adverse Effect	Group R (n=30)	Group L (n=30)	p-value
Hypotension	0	0	—
Bradycardia	0	0	—
Nausea/Vomiting	0	0	—
Neurological deficit	0	0	—

Figures

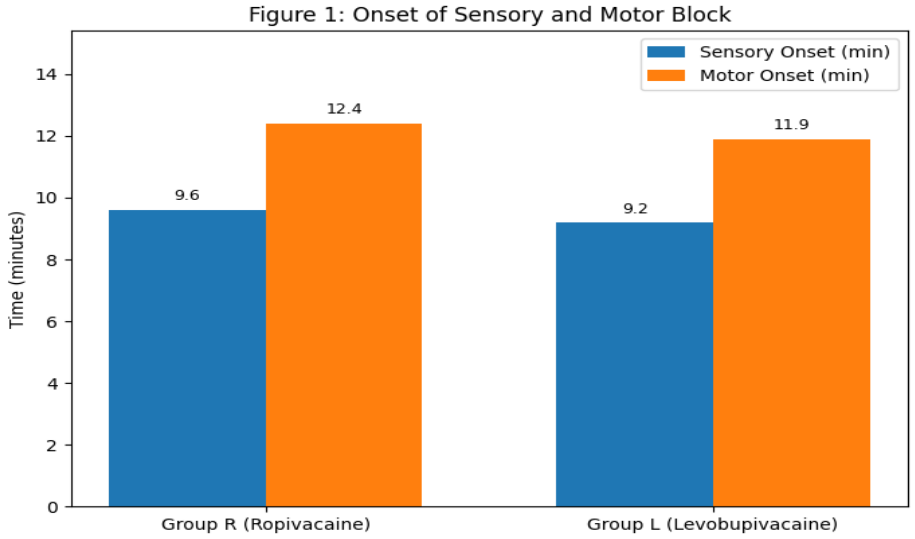

Figure 1: Comparison of onset time of sensory and motor block between Group R and Group L

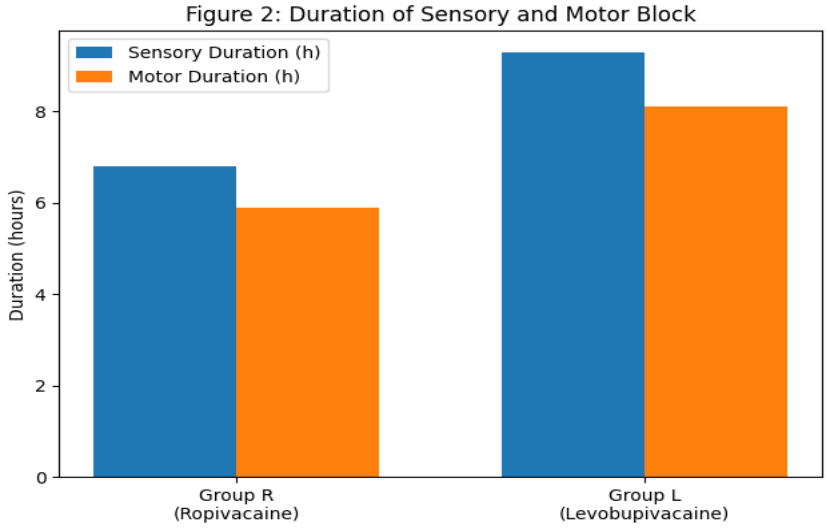

Figure 2: Comparison of duration of sensory and motor block between Group R and Group L

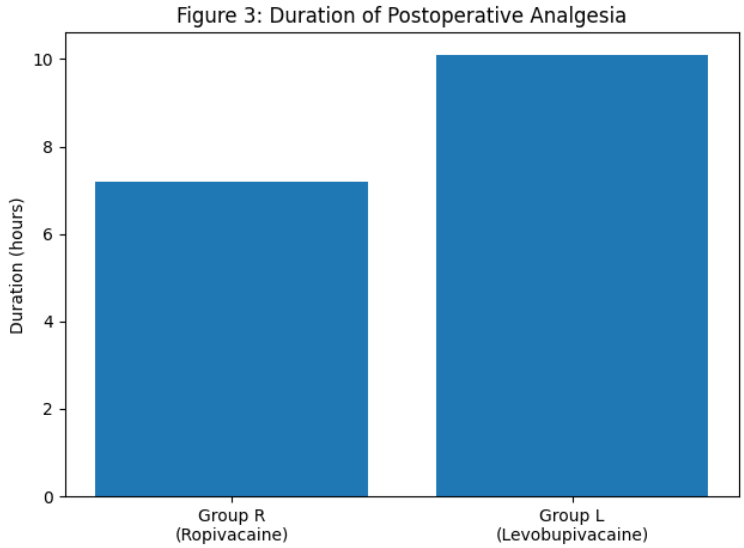

Figure 3: Comparison of duration of postoperative analgesia between Group R and Group L

Discussion

The present study demonstrates that both ropivacaine and levobupivacaine are effective and safe for brachial plexus block. However, levobupivacaine provided a significantly longer duration of sensory block, motor block, and postoperative analgesia.

Comparable onset times observed in both groups are consistent with previous studies by Casati et al. and McLeod et al., who reported similar pharmacodynamic onset between the two agents [11,12]. The prolonged duration of analgesia with levobupivacaine may be attributed to its higher protein-binding capacity and intrinsic potency [13,14].

Ropivacaine, while offering a favorable safety profile and faster recovery, demonstrated shorter duration of motor block, which may be advantageous for ambulatory surgeries [15]. Levobupivacaine, on the other hand, is better suited for prolonged surgical procedures requiring extended postoperative analgesia [16–18].

The absence of significant adverse effects in both groups reinforces the improved safety profiles of these S-enantiomer local anesthetics compared to racemic bupivacaine [19–21]. Findings from this study align with existing literature suggesting levobupivacaine as a reliable alternative when prolonged analgesia is desired [22–25].

Conclusion

Levobupivacaine provides longer sensory and motor blockade and prolonged postoperative analgesia compared to ropivacaine in brachial plexus block, without increasing adverse effects. Ropivacaine remains a suitable option where early motor recovery is preferred.

References

1. Brown DL. Atlas of regional anesthesia. Philadelphia: Elsevier Saunders; 2019.
2. Neal JM, Barrington MJ, Brull R, Hadzic A, Hebl JR, Horlocker TT, et al. The second ASRA practice advisory on neurologic complications associated with regional anesthesia and pain medicine. Reg Anesth Pain Med. 2018;43(2):113–123.
3. McClure JH. Ropivacaine. Br J Anaesth. 1996;76(2):300–307.
4. Morrison SG, Dominguez JJ, Frascarolo P, Reiz S. A comparison of the electrocardiographic cardiotoxic effects of racemic bupivacaine, levobupivacaine, and ropivacaine in anesthetized swine. Anesth Analg. 2000;90(6):1308–1314.
5. Casati A, Fanelli G, Magistris L, Beccaria P, Cappelleri G, Aldegheri G. Minimum local anesthetic volume blocking the brachial plexus with ultrasound guidance. Anesth Analg. 2001;92(6):1370–1373.
6. Cox CR, Checketts MR, Mackenzie N, Scott NB, Bannister J. Comparison of S(-)-bupivacaine with racemic (RS)-bupivacaine in supraclavicular brachial plexus block. Br J Anaesth. 1998;80(5):594–598.
7. Bardsley H, Gristwood R, Baker H, Watson N, Nimmo W. A comparison of the cardiovascular effects of levobupivacaine and racemic bupivacaine following intravenous administration to healthy volunteers. Br J Anaesth. 1998;80(4):497–502.
8. Liisanantti O, Luukkonen J, Rosenberg PH. High-dose bupivacaine, levobupivacaine, and ropivacaine in axillary brachial plexus block. Acta Anaesthesiol Scand. 2004;48(5):601–606.
9. Klein SM, Evans H, Nielsen KC, Tucker MS, Warner DS, Steele SM. Peripheral nerve block

techniques for ambulatory surgery. Anesth Analg. 2002;94(5):1238–1245.
10. Kuthiala G, Chaudhary G. Ropivacaine: A review of its pharmacology and clinical use. J Anaesthesiol Clin Pharmacol. 2011;27(4):463–471.
11. Casati A, Vinciguerra F, Santorsola R, Aldegheri G, Putzu M, Fanelli G. Levobupivacaine versus ropivacaine for peripheral nerve blocks. Br J Anaesth. 2004;92(6):850–852.
12. McLeod GA, Burke D. Levobupivacaine. Anaesthesia. 2001;56(4):331–341.
13. Leone S, Di Cianni S, Casati A, Fanelli G. Pharmacology, toxicology, and clinical use of new long-acting local anesthetics, ropivacaine and levobupivacaine. Curr Drug Saf. 2008;3(2):115–123.
14. Foster RH, Markham A. Levobupivacaine: A review of its pharmacology and use as a local anesthetic. Drugs. 2000;59(3):551–579.
15. Simpson D, Curran MP, Oldfield V, Keating GM. Ropivacaine: A review of its use in regional anesthesia and acute pain management. Drugs. 2005;65(18):2675–2717.
16. Kopacz DJ, Allen HW. Comparison of ropivacaine and bupivacaine for axillary brachial plexus block. Reg Anesth Pain Med. 2000;25(4):423–428.
17. Vainionpää VA, Haavisto ET, Huha TM, Korhonen AM, Pälve HK, Nuutinen LS. A comparison of ropivacaine and bupivacaine for axillary brachial plexus block. Br J Anaesth. 1995;75(3):359–363.
18. Mazoit JX, Decaux A, Bouaziz H, Edouard A. Comparative pharmacokinetics of ropivacaine and bupivacaine in humans. Anesthesiology. 2000;93(4):867–872.
19. Albright GA. Cardiac arrest following regional anesthesia with etidocaine or bupivacaine. Anesthesiology. 1979;51(4):285–287.
20. Burlacu CL, Buggy DJ. Update on local anesthetics: Focus on levobupivacaine. Drugs. 2008;68(13):1763–1777.
21. Knudsen K, Beckman Suurküla M, Blomberg S, Sjövall J, Edvardsson N. Central nervous and cardiovascular effects of intravenous infusions of ropivacaine, bupivacaine, and placebo in volunteers. Br J Anaesth. 1997;78(5):507–514.
22. Cox B, Durieux ME. Local anesthetic toxicity. Curr Opin Anaesthesiol. 2002;15(4):441–445.
23. De Negri P, Ivani G, Tirri T, Del Piano AC. New local anesthetics for peripheral blocks: Levobupivacaine and ropivacaine. Minerva Anestesiol. 2001;67(9):597–605.
24. Hansen TG. Ropivacaine: A pharmacological review. Pediatr Anesth. 2004;14(2):120–127.
25. Kaur A, Singh RB, Tripathi RK, Choubey S. Comparisons between ropivacaine and levobupivacaine in supraclavicular brachial plexus block. J Clin Diagn Res. 2015;9(9):UC01–UC04.