ISSN (P) : 2589-9120 / (O) : 2589-9139
PubMed-National Library of Medicine - ID: 101773527

International Journal of Medical Science and Applied Research (IJMSAR)

Available Online at: https://www.ijmsar.com

Volume – 6, Issue – 1, February – 2023, Page No. : 20 – 28

Comparison of Ropivacaine vs. Levobupivacaine for Sciatic Nerve Block in Lower Limb Surgeries

[1]Dr. Barre Avinash, [2]Dr. Shaik Yeramala Dasthagiri Basha, [3]Dr. K. Nagendra Prasad

[1]Postgraduate, Dept. of Anaesthesia, NRI Institute of Medical Sciences, Chinakakani, Andhra Pradesh, India

[2]PG Scholar, Dept. of Paediatrics, Fathima Institute of Medical Sciences, kadapa, Andhra Pradesh, India

[3]HOD Department of Paediatrics, Fathima Institute of Medical Sciences, Kadapa, Andhra Pradesh, India

Citation of this Article: Dr. Barre Avinash, Dr. Shaik Yeramala Dasthagiri Basha, Dr. K. Nagendra Prasad, "Comparison of Ropivacaine vs. Levobupivacaine for Sciatic Nerve Block in Lower Limb Surgeries,'' IJMSAR – February – 2023, Vol. – 6, Issue - 1, Page No. 20-28.

Corresponding Author: Dr. Barre Avinash, Postgraduate, Dept. of Anaesthesia, NRI Institute of Medical Sciences, Chinakakani, Andhra Pradesh, India

Type of Publication: Original Research Article

Conflicts of Interest: Nil

ABSTRACT

Introduction

Regional anaesthesia, particularly using peripheral nerve blocks allows for targeted anaesthesia. This is used for surgical anaesthesia, and as an adjunct to general anaesthesia for postoperative (PO) pain relief. Local anaesthetics like levobupivacaine and ropivacaine are commonly used for sciatic nerve block. The aim of the study is to compare the clinical effects of 0.5% ropivacaine with 0.5% levobupivacaine.

Methods

The current study was done at a tertiary care centre named NRI Institute of medical sciences, Mangalagiri, Patients were divided randomly into two groups having 100 patients each. Patients of Group L received 0.5% levobupivacaine and group R patients received 0.5% ropivacaine. Age, gender, ASA grade, duration of surgery, onset of sensory and motor blocks, duration of sensory and motor blocks and duration of analgesia were assessed and compared between both groups.

Results

There is no significant difference in the mean age, gender, ASA grade and mean duration of surgery between the two groups. The quick onset of sensory block was seen in the ropivacaine group. There is no significant difference in the mean onset of motor block between two groups. More mean duration of sensory and motor blocks, and analgesia were seen in

patients of the levobupivacaine group. There were no major side effects in both groups.

Conclusion

Based on the study results, we recommend using 0.5% levobupivacaine for patients scheduled for lower limb surgeries under sciatic nerve block.

Keywords

Peripheral nerve block, Ropivacaine, Levobupivacaine, Sciatic nerve block, Postoperative pain relief.

INTRODUCTION

Regional anaesthesia, particularly using peripheral nerve blocks allows for targeted anaesthesia. This is used for surgical anaesthesia, and as an adjunct to general anaesthesia for postoperative (PO) pain relief. By focusing on a specific location, systemic adverse effects can be avoided or reduced to a greater extent. It improves the quality of postoperative analgesia and patient outcome and reduces complications, especially in elderly patients.[1-2]Performing a targeted peripheral nerve block (PNB) is a vital part of the multimodal analgesic approach to decrease opioid usage. To perform a PNB, the provider must have the proper equipment, which includes peripheral nerve needles, local anaesthetics, ultrasound, etc. and a targeted nerve structure. Surgical duration should be taken considered while selecting a local anaesthetic for the surgical block. One of the most vital factors is the mass or total dosage of the local anaesthetic. Various adjuncts can be used in combination with local anaesthetics to reduce the time of onset, increase duration, and increase the quality of the block.[3]Bupivacaine was commonly used previously for this purpose; but due to its cardiotoxicity after intravascular (IV) administration. Later Ropivacaine and levobupivacaine, the novel long-acting local anaesthetics were found to be safer.[4]Previous studies of PNBs with levobupivacaine identified that the duration of analgesia of levobupivacaine is more than that of an equivalent dose of levobupivacaine or ropivacaine.[5-8]In the current study, we compared the duration and quality of PO analgesia for lower limb surgeries produced by levobupivacaine and ropivacaine in combined sciatic and femoral nerve blocks.

The aim of the study is to compare the clinical effects of 0.5% ropivacaine with 0.5% levobupivacaine.

MATERIALS AND METHODS

Study site: NRI Institute of Medical Sciences

This interventional study was conducted for 12 months from January 2022 to January 2023 in the department of anesthesia on 200 patients who were scheduled for lower limb surgeries.

Inclusion Criteria

- Patients aged 18 to 60 years, scheduled for elective lower limb surgeries.
- Patients with ASA grade I and II
- Patients who provided informed consent to participate in the study.

Exclusion Criteria

- Pregnant and lactating women
- Patients with a known history of allergy to the drug used in the study.
- Patients with infection at injection site
- Patients with bleeding disorders
- Patients with peripheral neuropathy
- Patients with BMI more than 30kg/m^2

Sample size calculation: According to Casati A[9] et al, considering the standard deviation as 25 min, at 85% confidence intervals and with 5% error, the sample size came to 208. But the data was incomplete for 8 patients. So, we included 200 patients in our study.

Parameters assessed:

- Age
- Gender
- ASA Grade
- Duration of surgery
- Onset of sensory block
- Onset of motor block
- Duration of motor block
- Duration of sensory block
- Duration of analgesia
- Postoperative pain

Groups: Patients were divided randomly into two groups having 100 patients each. Group L patients received 0.5% levobupivacaine and Group R patients received 0.5% ropivacaine.

METHODOLOGY

Intravenous access was secured usingan 18-gauge cannula and crystalloid solution was initiated. All patients received midazolam 10 min beforeto block. Sciatic and femoral performed by an experienced anaesthesiologist with using nerve stimulator. After appropriate skin preparation, 20 mL of 0.5% ropivacaine was used for femoral nerve block among all subjects.Landmarks for Labat approach for sciatic nerve block was done as perLabet G approach.[10] Progression of sensory block was measured with the help ofa 22-gauge needle.

The visual analogue scale (VAS) score was used to assess postoperative pain after surgery.[11]The duration of analgesia was considered from the time of completion of local anaesthetic injection to need for1st rescue analgesia.

STATISTICAL ANALYSIS

Data analysis was done using Epi Info software version 7.2.5. Numerical parameters between the two groups were compared using the student's -test. Z test for proportions was used for comparing percentages between two groups. P value < 0.05 was considered significant.

ETHICAL CONSIDERATIONS

Ethical committee approval was taken before conducting the study. The informed consent form was taken from every patient who participated in the study.

RESULTS

Demographic features: There is no significant difference in mean age, gender and ASA grade between two groups of patients. Hence the comparison is justifiable.

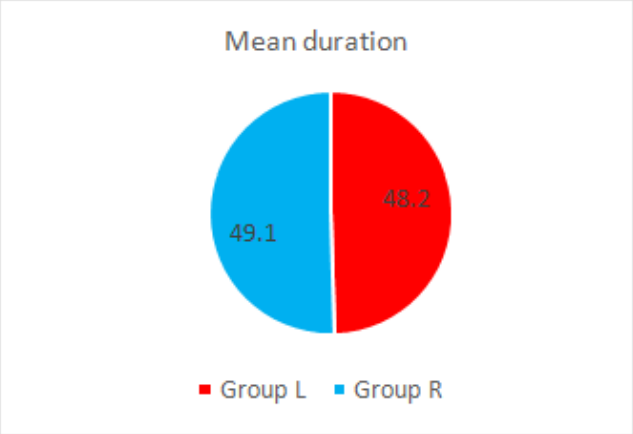
Table 1: Demographic parameter comparison

Parameters	Group L	Group R	P Value
Mean age	56.2±8.1	55.4±7.2	0.46
Gender(males)	54%	52%	0.77
ASA Grade(I)	72%	66%	0.91

Duration of Surgery

There is no signficiant difference in the mean duration of surgery between two groups(p=0.45).

Graph 1: Mean duration of surgery



Onset of Sensory Block

There is faster onset of sensory block with levobupivacaine. (p=0.0002).

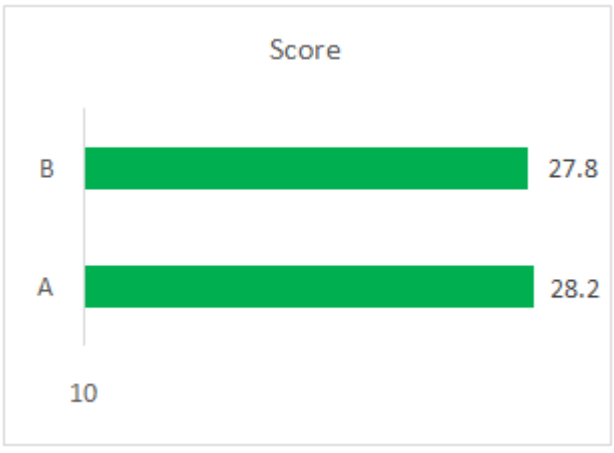
Table 2: Onset of sensory block

Parameter	Group L	Group R
Onset of sensory block	14.2±6.8	18.3±8.2

Onset of motor block

There is no significant difference in the onset of the motor block between two groups, as per the T-test (0.49).

Graph 2: Onset of motor block



Duration of sensory block

There is significantly more duration of sensory block in Levobupivacaine group patients. (p=0.0001).

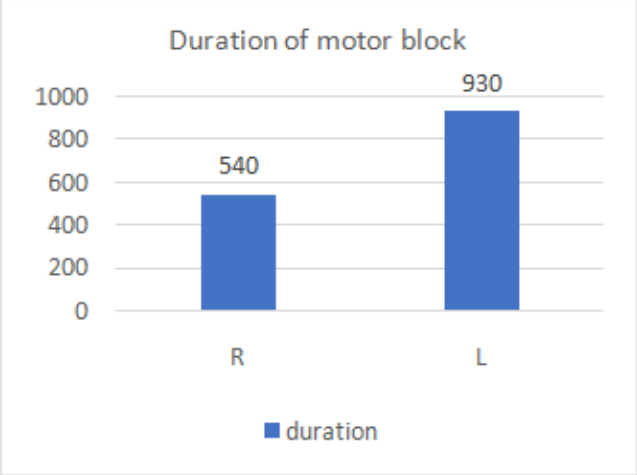
Table 3: Duration of sensory block

Parameter	Group L	Group R
Duration of sensory block	964.4±33.5	832.2±23.2

Duration of Motor Block

Duration of motor block was significantly more in Levobupivacaine group compared to ropivacaine group, (p=0.0001).

Graph 3: Duration of motor block



Duration of Analgesia

Duration of analgesia was significantly more in levobupivacaine group compared to ropivacaine group,

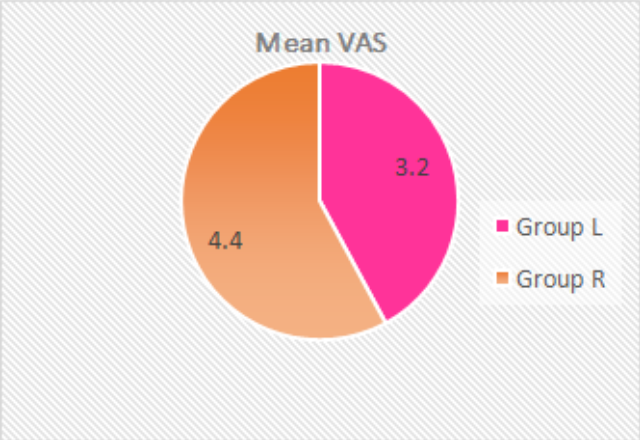
Table 4: Duration of analgesia

Parameter	Group L	Group R
Duration of analgesia	1241±32.1	1064.4±45.1

VAS Score

Mean VAS score was significantly less in levobupivacaine group patients compared to ropivacaine group patients. (p=0.001)

Graph 4: Mean VAS scores during postoperative period.



SIDE EFFECTS

There were no major side effects among both group patients.

DISCUSSION

The current interventional randomisedstudy was conducted to provide data on the efficacy and safety of 0.5% levobupivacaine and 0.5% ropivacaine for sciatic nerve block using the Labat approach for lower limb surgeries. It was found that levobupivacaine provided more duration of sensory and motor block with more postoperative pain relief compared to ropivacaine.

Ropivacaine is around 40% less potent compared to racemic bupivacaine, but levobupivacaine has the same potency as that of bupivacaine.[12]Levobupivacaine was less toxic compared to bupivacaine.[13-15]Hence, we used levobupivacaine in our study.

Our study results were similar to the study done by Malav K et al.[16] on 100 patients scheduled for ankle and foot surgeries under sciatic nerve block using levobupivacaine and ropivacaine.

The study done by Cline et al.[17]on 0.5% levobupivacaine with 0.5% ropivacaine inbrachial plexus block reported significantly more mean duration of analgesia with levobupivacaine compared to ropivacaine, similar to our study results.

Borghi et al[18]reported that 0.25% levobupivacaine produce same quality of anaesthesiaas that of0.4% concentration of ropivacaine, but better anaesthesiacompared to 0,25% of ropivacaine.‘

Dyhre H et al.[19] showed that onset and duration of nerve block induced by 2 equimolar doses of local anaesthetic agents to be similar on isolated nerves.

It was suggested previously that the duration of sensory and motor blocks to be related to the protein-bound level, and more highly protein-bound medications cause longer duration of effect.[20]Plasma protein binding was 94% for ropivacaine and 95% for

levobupivacaine[21], which might be the reason for long duration of block.

CONCLUSION

There was a faster onset of the sensory block with levobupivacaine. There was no significantvariation in the onset of the motor block between two groups. Duration of sensory and motor blocks were more in the levobupivacaine group compared to the ropivacaine group. The pain was significantly less for patients in the levobupivacaine group. Thus, from our study results, we recommend using 0.5% levobupivacaine for patients scheduled for lower limb surgeries under sciatic and femoral blocks.

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