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## Comparison between 0.5% ropivacaine with dexmedetomidine versus 0.5% levobupivacaine with dexmedetomidine for ultrasound guided popliteal nerve block

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### Abstract

**Background:** Popliteal nerve block used for below knee surgery in old age group people who are more vulnerable for hemodynamic disturbances, is beneficial with reduced morbidity and mortality. Rapid post operative mobilization and lack of post dural puncture headache are mainly useful in day care operations.

**Objectives:** To compare the sensory and motor blockade onset of 0.5% Levobupivacaine and 0.5% Ropivacaine.

To compare the post-operative analgesia duration of 0.5% Levobupivacaine with 0.5% Ropivacaine.

**Methods:** After institutional ethical committee clearance and informed consent from the patients, 60 patients of either sex, aged 18-70 years, belonging to ASA 1 and 2 were enrolled in the study. Subsequently the patients were allocated into the group (L) or the group (R) in a random manner by sealed envelope method with 30 patients in each group (n=30).

Under aseptic precautions, ultrasound guided popliteal nerve block was performed with 20 ml of either 0.5% Levobupivacaine with Dexmedetomidine or 0.5% Ropivacaine with Dexmedetomidine.

**Group L:** Received 19.5 ml of 0.5% Levobupivacaine + 0.5 ml (25mcg) of Inj. Dexmedetomidine making total volume of 20ml.

**Group R:** Received 19.5 ml of 0.5% Ropivacaine + 0.5 ml (25 mcg) of Inj. Dexmedetomidine making total volume of 20ml.

**Results:** No statistical significant difference in view of action onset, block duration and block quality in the two groups. No adverse effects or hemodynamic disturbances in any of the groups. 0.5% Levobupivacaine and 0.5% Ropivacaine both had satisfactory and comparable sensory and motor block in our study.

**Conclusion:** As there was adequate post operative pain relief and steady hemodynamic parameters perceived in this present study, it can be determined that Popliteal nerve block can be the best alternate anesthetic practice for below knee surgeries and both the drugs can be used for significant block.

**Keywords:** Popliteal nerve block, ropivacaine, levobupivacaine, dexmedetomidine

### Introduction

Peripheral nerve blocks is becoming important in modern anaesthesia practice due to role in postoperative analgesia, shortens patients stay in hospital & avoids complications of General anesthesia. Thus, peripheral nerve blocks are used for comprehensive anesthetic care.

The efficacy of anesthesia procedures has a vital role in increasing ambulating patients with orthopedic surgeries [1]. Regional anesthesia practices are used regularly as alternative to general anesthesia for these procedures [2]. Foot and ankle surgeries will have pain in the initial days post surgery [3], opioids containing post operative pain management leads to adequate analgesia but have caused many side effects. A popliteal nerve block is a very advantageous method for ankle and foot surgeries, mainly in patients who were inappropriate for the subarachnoid block. It will avoid risks in old age patients who are mainly susceptible to hemodynamic disturbances causing more disability and mortality. Other advantage is by avoiding postdural puncture headache, hence it is an ideal technique for day care surgeries. It can also be given in head injury wherever the subarachnoid blockade is comparatively contraindicated. Ultrasound allow to directly visualise the nerves and for properly depositing local anesthetic and improve the successful nerve blockade [4].

In 2015, three patients were treated with liposomal bupivacaine for popliteal nerve blocks seen in limited case study. Because liposomal bupivacaine can last up to 72 hours, the goal was to deliver long-acting regional anaesthetic without the hazards of utilising a perineural catheter<sup>5</sup>. Popliteal nerve blocks have a low risk of complications, with a reported rate of 0-10 percent. Incomplete anaesthesia, infection, and neuropraxia are the most prevalent consequences.

This study aims to compare the sensory and motor blockade onset and the duration of postoperative pain relief between 20ml of 0.5% Ropivacaine with 25mcg of Dexmedetomidine and 20ml of 0.5% Levobupivacaine with 25mcg of Dexmedetomidine for ultrasound guided popliteal nerve block.

### Objectives

- To compare the sensory and motor blockade onset of 0.5% Levobupivacaine and 0.5% Ropivacaine.
- To compare the postoperative analgesia duration of 0.5% Levobupivacaine with 0.5% Ropivacaine.
- To evaluate and compare haemodynamic parameters.
- To evaluate and compare side effects like vomiting, hypotension in the intraoperative and postoperative periods.

### Methodology

After attaining ethics committee clearance from the institution and informed consent was taken, sixty patients aged 18 to 70 years of either of the sex, who belongs to ASA PS 1 and 2 and were posted to elective below knee surgeries were taken into the study. Subsequently the patients were allocated into the group (L) or the group (R) in a random manner by sealed envelope technique with thirty patients in each group (n=thirty).

**Group L:** Received 19.5 ml of 0.5% Levobupivacaine + 0.5 ml (25mcg) of Inj. Dexmedetomidine making total volume of 20ml.

**Group R:** Received 19.5 ml of 0.5% Ropivacaine + 0.5 ml (25 mcg) of Inj. Dexmedetomidine making total volume of 20ml.

Each ml of Dexmedetomidine contains 100mcg and diluted to 2 ml by adding 1ml of distilled water. Then each 0.5 ml contains 25mcg of Dexmedetomidine.

### Inclusion Criteria

- Patients with age between 18-70 years.
- ASA PS I and II
- Patients posted for below knee surgeries

### Exclusion Criteria

- Patients with history of hypersensitivity reactions
- Patients with difficulty in placing position
- Patient refusal
- Failure of block
- Surgeries over medial aspect of the ankle and foot (saphenous nerve distribution)
- Pregnant woman
- Patient with coagulopathy and contraindications to regional anaesthesia
- Patients with history of neurological, psychiatric or

neurovascular problems

Detailed pre anaesthesia checkup was done on day prior to the surgery. The required blood investigations and necessary investigations were advised.

Patient in prone position, knee slightly flexed and the foot should lie freely on the bed. The Popliteal triangle was identified which was formed by the semitendinosus and semimembranosus muscles medially, by the biceps femoris muscle laterally, and by the popliteal crease as the base. A linear high frequency probe was placed transversely parallel to popliteal crease. Based on the place where sciatic nerve divides into tibial and peroneal components, one or two small round hyperechoic areas were seen usually 1 cm lateral to midline of the popliteal fossa and 7-8 cm above the popliteal crease<sup>[6]</sup>. If popliteal artery was seen, nerve lies lateral to the artery. In plane or out of plane approach can be used. As in plane technique will allow whole needle to be visualised, it is ideal method. Probe was in line to popliteal crease and at a level above division of the nerve, needle was inserted at the lateral end to probe and advanced it towards the nerve. After piercing sciatic sheath, 20 mL of local anesthetic in a circumferential manner<sup>[7]</sup> was given. Repositioning the needle was useful to completely cover the nerve<sup>[8]</sup>.

### Parameters Assessed

After giving the block, patients were assessed for onset of sensory block for each minute using pin prick method on both the behind and front surface of foot and response will be graded based on Visual analogue scale (VAS)<sup>[9]</sup> as

- 0 - No Pain
- 2 - Annoying
- 4 - Uncomfortable
- 6 - Dreadful
- 8 - Horrible
- 10 - Agonizing

Assessment of motor block was done for every minute by asking the patient to do plantar or dorsiflexion at the level of ankle joint and was divided as<sup>[10]</sup>

- 0 = power is normal
- 1 = power is decreased
- 2 = full motor block

By completion of one hour, if the patient did not get sensory and motor blockade, the block was considered as insufficient and they were given Spinal Anaesthesia. For the statistical purpose those patients were removed from study. 3 patients in Group L and 2 patients in Group R did not get sensory and motor block and were given Spinal Anaesthesia and hence were excluded from the study. So, to complete sample size, another three patients in Group L and two patients in Group R with successful complete block were added to complete the sample size.

During post operative period the time of motor blockade resolution and the analgesia duration were noted. Satisfaction of patient with this method was noted by enquiring patient and surgeon to qualify the block as: very good, good, medium or poor<sup>[11]</sup>.

During post operative period, assessment of pain was done using visual analogue score and when score was five, medication like Inj. Diclofenac 75mg was given and we

concluded study at that point.

Surgeon satisfaction [12] was sought by three point score

- 1 = fully fulfilled. I need similar anaesthesia technique to do further procedures
- 2 = partly fulfilled. The anaesthetic technique is adequate and require perfection
- 3 =very poor. I need another anaesthesia technique for further surgeries

Both the descriptive and inferential statistics were employed for analysing the data. Required statistical calculations were done by using SPSS for Windows (version 20.0).

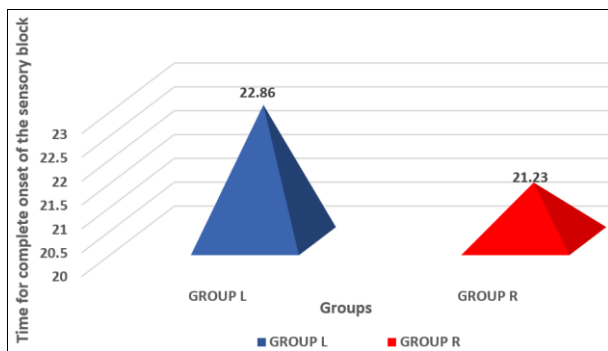
**Results**

There was no difference in patients regular parameters in any of groups based on age, gender distribution and body mass index.

**Sensory Block**

**Table 1:** Sensory block onset

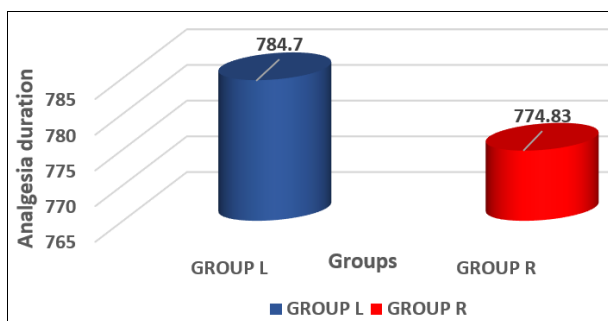
Sensory block	Group L	Group R	P Value
Pinprick as dull	18.20±8.34	17.53±6.44	0.730
Complete sensory onset time	23.00±9.00	21.00±7.00	0.416



**Graph 1:** Time for full onset of the sensory block

**Table 2:** Analgesia duration

Analgesia duration (mean ±SD)	Group L	Group R	P Value
	784.70±250.68	774.83±212.72	0.870

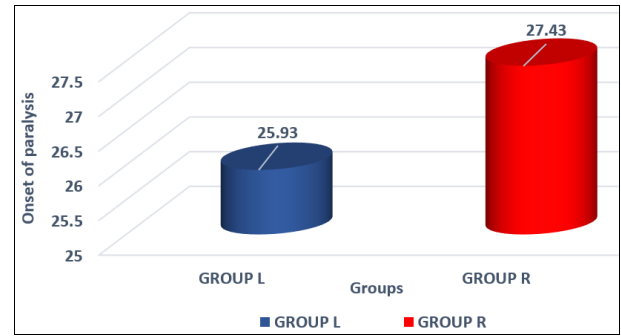


**Graph 2:** Analgesia duration in both the study groups

**Motor Block**

**Table 3:** Motor block onset

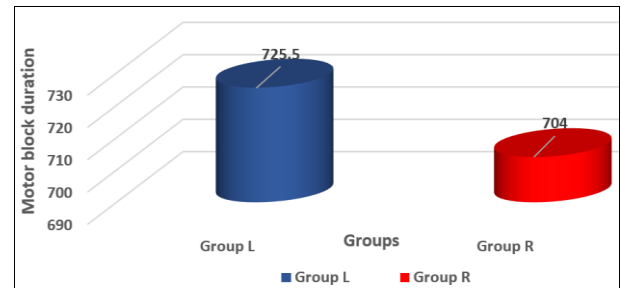
	Group L	Group R	P value
Paresis (in minutes)	14.26±5.58	15.80±6.12	0.315
Paralysis (in minutes)	25.93±5.82	27.43±4.95	0.287



**Graph 3:** Onset of paralysis

**Table 4:** Motor block duration

Motor block duration	Group L	Group R	P Value
	725.50±223.11	704.00±229.21	0.714



**Graph 4:** Motor block duration

**Discussion**

Lower limb peripheral nerve blocks are not as much as prevalent when compared with upper limb blocks owing to easy acceptability, safe and accuracy of subarachnoid block. But the popularity of lower limb blocks is being increased now a days because of longer action of pain relief and short stay in hospital which are the main goals of anaesthesia practice in this modern era.

**More uses of lower limb nerve blocks are**

1. More hemodynamically stable because of no sympathetic blockade, mainly useful in reduced ejection fraction patients
2. These nerve blocks do not interfere with pulmonary parameters and will let respiratory failure patients being in sitting position in post operative phase with decreased danger of syncopal attacks
3. It can be given in head injury as well as trauma patient, so as to allow assessing the level of consciousness while surgery
4. These peripheral nerve blocks can be a safe substitute to subarachnoid block in phase of slight degrees of coagulation abnormalities.

Popliteal block is the best anaesthesia technique for foot and ankle surgeries. When used as the independent anesthetic technique, it provides excellent analgesia and will overcome the systemic and local complications as seen with general, spinal and epidural anaesthesia.

Ultrasound provides better visualization and reduces the volume of the drug to be injected.

**Hypothesis made before doing the study:** As it was known that Ropivacaine is lesser efficacious than Levobupivacaine owing to less lipid solubility, we thought

that Ropivacaine will give lesser quality motor block and shorter mean analgesia duration when compared with Levobupivacaine.

### Onset of block

Sensory block onset in this study was approximately 23± 9 minutes in Levobupivacaine group and 21±7 minutes in the Ropivacaine group. There was no statistically significant difference in onset times between the two drugs (p value=0.416).

Motor block onset in this study was approximately 25.93±5.82 minutes in group L and 27.43±4.95 minutes in the group Ropivacaine. There existed no statistically significant difference between the two drug groups (p value =0.287).

This study correlates with studies by Fournier *et al* [13] and Charles *et al* [14], where they observed average onset times is 15 minutes and had no statistically significant difference between the two drugs in onset times.

### Analgesia duration

Analgesia duration in this study was 784.70±250.68 minutes in Levobupivacaine group and 774.83±212.72 minutes in the Ropivacaine group and had no statistically significant difference in between the two drugs in duration of analgesia (p value=0.870) which correlates with Pujol *et al* [15] study.

### Motor block duration

Motor block duration was 725.50±223.11 minutes in Levobupivacaine group and 704.00±229.21 minutes in the Ropivacaine group and had no statistically significant difference between the two groups (p value=0.714) and correlates with Casati *et al* study [16].

### Satisfaction of the patient

Patients were asked orally about the experience with the block as very good, good, medium and poor. Patients were satisfied with the intensity of the block in the two groups.

### Surgeon satisfaction

93.33% of the surgeons in the group L and 90% surgeons in the group R were completely satisfied with the block.

### Adverse events

There were no adverse events noted in either of the groups.

### Conclusion

As there was adequate post operative pain relief and steady hemodynamic parameters perceived in this present study, it can be determined that Popliteal nerve block can be the best alternate anesthetic practice for below knee surgeries and both of the drugs can be used for significant block.

**Acknowledgements:** Not applicable

### Author's contribution

Dr. Vadlapudi Saikrupa had performed Popliteal block in 30 patients.

Dr. Ajay Rakesh Varma had performed Popliteal block in 30 patients.

Both the authors read and approved final manuscript.

**Conflicts of Interest:** Nil.

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