

## A Comparison of Injection of 0.375% Ropivacaine before and after the Bifurcation of Sciatic Nerve for Ultrasound Guided Popliteal Block

Jayanth M.N.<sup>1</sup>, G. Anand Isaac<sup>2</sup>, Penchalaiah<sup>3</sup>, Krishna Chaithanya<sup>4</sup>, Narsimha Reddy<sup>5</sup>, Bhoopal Naik<sup>6</sup>

<sup>1,2,6</sup>Assistant Professor <sup>3</sup>Post Graduate <sup>4,5</sup>Professor, Dept. of Aneesthesiology, Narayana Medical College, Nellore, Andhra Pradesh 524003, India.

### Abstract

*Introduction:* Lower limb surgeries were performed under popliteal block. Over the years Sciatic nerve has been blocked pre bifurcation by using peripheral nerve stimulator and blind techniques. But thanks to the Ultrasound which allowed us to visualize the branches of Sciatic nerve post bifurcation like tibial and common peroneal nerves in the popliteal fossa. *Aims and Objectives:* To compare onset of action of sensory and motor blockade between pre bifurcation sciatic nerve block with post bifurcation common peroneal nerve and tibial nerve block. *Materials and Methods:* This prospective randomized observational double blind study was conducted in 102 ASA I and II patients scheduled for surgeries on ankle and foot who were randomized into two groups A and B. Group A received 20ml 0.375% ropivacaine for tibial nerve and 10ml of 0.375% for common peroneal nerve post bifurcation whereas in Group B 30 ml of 0.375% ropivacaine was given pre bifurcation. Grade of Sensory and motor blockade were assessed every 5 minutes till complete surgical blockade and Block onset time were measured. *Results:* The Mean Onset of Block in group A was 18.5±4.1 min whereas in group B was 21.5 ±2.7 min (p <0.0001) which was statistically significant. Rate of complete sensory and motor block was also faster in group A compared to group B. *Conclusion:* Sciatic nerve block post bifurcation provides rapid onset of block and faster complete sensory and motor block compared to blocking the sciatic nerve before bifurcation.

**Keywords:** Sciatic Nerve Block; Tibial Nerve; Common Peroneal Nerve; Ropivacaine.

### Introduction

Popliteal block is commonly used regional anesthesia for foot and ankle surgeries. It helps in not only mitigating postoperative pain but also reduces the requirement of rescue medication like opioids [1]. Sciatic nerve block requires a long time of up to 30 min to 45 min to achieve complete block [2]. With the advent of ultrasound, sciatic nerve along with its bifurcation can be visualized at the popliteal fossa. Various studies have been done to compare the effect of pre bifurcation sciatic nerve block with its branches tibial and common peroneal nerves post bifurcation at the popliteal fossa. Various local anesthetics have been used to compare the block [3,4,5]. Ropivacaine [6,7,8] is a new amino

amide local anesthetic whose properties are concentration dependent and at lower concentrations, ropivacaine shows a distinct sensory, motor separation which makes it suitable for treating postoperative pain and also provides early motor recovery facilitating early ambulation. Our study was conducted to compare the properties of Sciatic nerve block before and after the division.

### Materials and Methods

This prospective randomized observational double blind study was conducted on 102 patients undergoing ankle and foot surgeries under ultrasound guided popliteal block at Narayana

**Corresponding Author:** G. Anand Isaac, Assistant Professor, Dept. of Aneesthesiology, Narayana Medical College, Nellore, Andhra Pradesh 524003, India.  
E-mail: [anandisaac@gmail.com](mailto:anandisaac@gmail.com)

Received on 10.04.2018, Accepted on 23.04.2018

Medical college Hospital, Nellore between March 2016 to March 2017. After obtaining written informed consent, 102 patients aged 20–60 years with American Society of Anesthesiologists (ASA) Physical Status class I-II were divided into two groups of 51 patients each. Group A: received injection of 0.375% ropivacaine after the bifurcation of sciatic nerve, 20 ml to tibial nerve and 10ml to common peroneal nerve. Group B: received 30 ml 0.375% ropivacaine injection before the bifurcation of sciatic nerve. Exclusion criteria includes uncooperative patients, patient’s refusal, infection at the site of injection, history of allergy or hypersensitivity to local anesthetics, bleeding tendencies or patient’s on anticoagulants, patient with peripheral neuropathy. All the patients received tab.alprazolam 0.5mg as premedication on the previous night. Standard fasting guidelines were followed. On the day of surgery in the operation theatre, after securing wide bore i.v cannula, patients were preloaded with 15ml/kg of ringers lactate solution. Toxic dose of local anesthetic was calculated according to the body weight. Ultrasound guided popliteal block was performed in lateral position with all the basic monitors in situ. Hemodynamic monitoring was continued during the surgery.

**Block Technique**

The block was performed under aseptic precautions with the patient in lateral position. Transducer was placed in the transverse position at the popliteal crease; the popliteal artery was identified using colour Doppler at a depth of approximately 3 to 4 cm. The popliteal vein accompanies the popliteal artery. Superficial (towards the skin surface) and lateral to the artery is tibial nerve (seen as hyperechoic, oval, round structure with a stippled honey comb appearance). Once the tibial nerve is identified, an attempt is made to visualize common peroneal nerve which is located even more superficial and lateral to the tibial nerve. Now the transducer is moved proximally until tibial and common peroneal nerves are visualized coming together from the sciatic nerve. The junction usually occurs at a distance between 5-10 cm from the popliteal crease.

Complications such as vascular puncture, persistent weakness and persistent numbness after 24 hours were looked for. Onset of block, rate of complete sensory and motor blockade was measured. Sensory block was assessed every 5min till 30 min using ice cubes in areas of common peroneal nerve and tibial nerve distribution and is graded as follows:

- 0- Normal sensation to cold ,
- 1- Diminished sensation to cold
- 2- No sensation to cold.

Block onset time is defined as the time taken to attain a sensory score of 2. Motor blockade was assessed by assessing dorsiflexion (deep peroneal nerve), plantar flexion (tibial nerve) at ankle and is graded as follows:

- 0: Normal force
- 1: Reduced force
- 2: Total immobility

Rate of complete sensory block at 30 min, rate of motor block at 30min, block onset time, procedure related complications and use of supplementary analgesia were recorded. In patients where block was not achieved within 30mins were excluded from study.

**Statistical Analysis**

The data has been entered into MS-Excel and statistical analysis has been done by using IBM SPSS Version 20.0. (IBM SPSS, USA). For categorical variables, the data values are represented as number and percentages. To test the association between the two groups, Chi-square test and to test mean scores between the two groups, Mann-Whitney U test has been used. For continuous variables, the data values are represented as mean and standard deviation. To test mean difference between the two groups, student’s t-test has been used. A ‘p’ value of less than 0.05 was considered significant.

**Results**

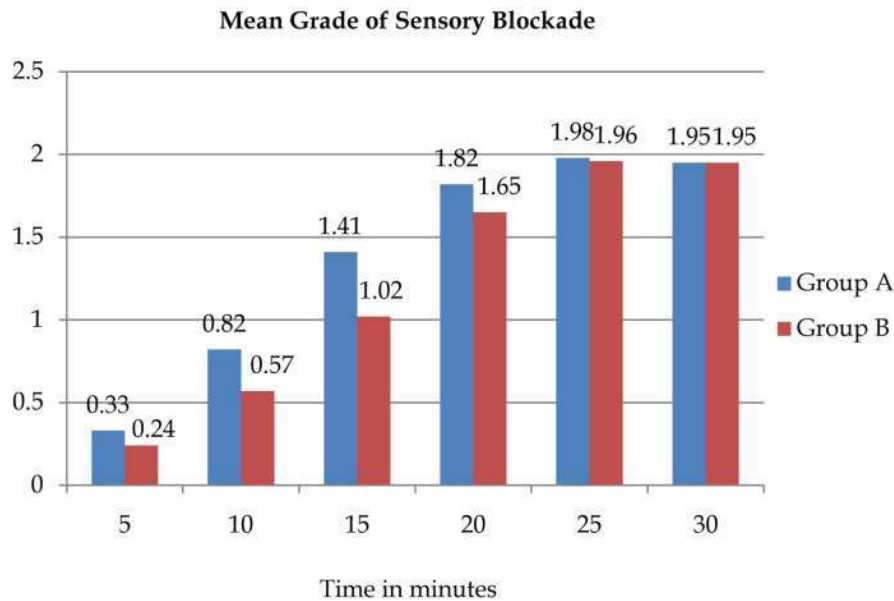
The patients in the two groups were statistically comparable with respect to age, weight, sex and height.

**Table 1:** Demographic profile

	Group A (Mean ± SD)	Group B (Mean ± SD)	P value
Age	52.31 ± 15.71	52.92 ± 12.17	0.828
Weight	67.98±8.65	67.89±8.65	1
Sex (Male, Female)	M( 45) F(5)	M(41)F(10)	0.16
Height	162±5.8	167±5.4	0.73

**Table 2:** Grade of sensory Blockade

Time in mins	Group A	Group B	p Value
5	0.33 ± 0.48	0.24 ± 0.42	0.2769
10	0.82 ± 0.48	0.57 ± 0.50	0.2120
15	1.41 ± 0.54	1.02 ± 0.32	< 0.0001
20	1.82 ± 0.39	1.65 ± 0.48	0.0439
25	1.98 ± 0.16	1.96 ± 0.2	0.6822
30	1.95 ± 0.22	1.95 ± 0.23	0.9664

**Fig. 1:**

The mean grade of sensory blockade in Group A was found to have faster rate of complete sensory block at 15 and 20 minutes compared to group B with 'p' value of <0.0001 and 0.0439 respectively which is statistically significant (Table 2) and (Figure 1)

Grade of complete motor blockade is found to be higher in group A at 20 min and 25min in comparison to group B with 'p' value of <0.0001 and 0.0247 respectively which is statistically significant. (Table 3) and (Figure 2).

**Table 3:** Mean Grade of Motor Blockade

Time in mins	Group A	Group B	p Value
5	0	0	0
10	0.47 ± 0.5	0.06 ± 0.24	0.2010
15	0.9 ± 0.3	0.55 ± 0.5	0.3210
20	1.27 ± 0.49	0.92 ± 0.27	<0.0001
25	1.49 ± 0.51	1.25 ± 0.44	0.0247
30	1.79 ± 0.42	1.66 ± 0.48	0.3146

**Table 4:** Demographic Profile

Block onset time (minute)	Group A	Group B
Mean	18.5	21.5
SD	4.1	2.7
'p'	<0.0001 Significant	

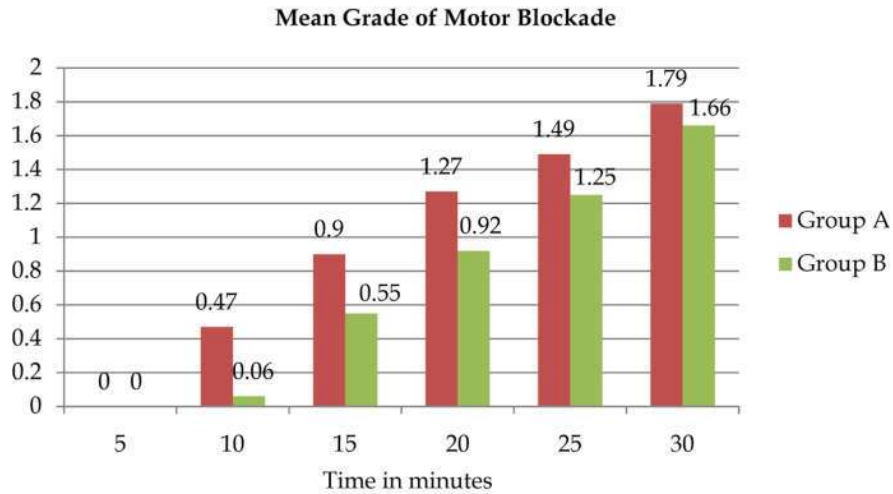


Fig. 2:

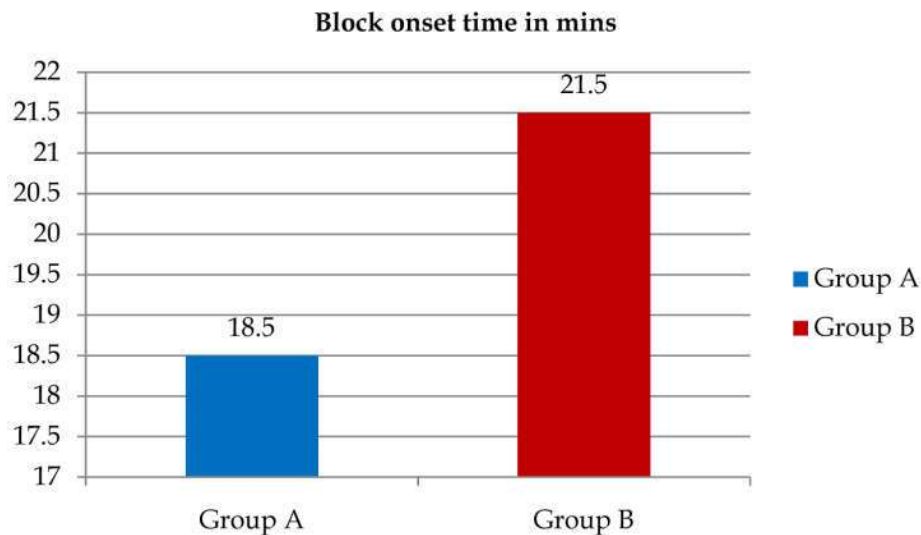


Fig. 3:

Block onset time in group A was 18.5±4.1 mins and block onset time in group B was 21.5±2.7 mins. This Difference Is Found To Be Statistically Significant. ( $p < 0.0001$ ) (Table 4)(Figure 3).

None of the Patients Developed Procedure Related Complications like vascular punctures, persistent numbness and weakness after 24 hours. None of the patients required supplementary analgesia. Hemodynamics were stable during the entire procedure.

### Discussion

Traditionally, ankle and foot surgeries were performed under spinal anesthesia. However, peripheral nerve blocks [9,10,11] have provided

better cardiovascular stability compared to spinal anesthesia. Previously, peripheral nerve stimulator has been used to perform popliteal block. As there is high variability in the site of division in sciatic nerve and blind nature of stimulating technique at popliteal fossa, it is not possible to know with certainty if the selected needle insertion site lies proximally or distally to sciatic nerve bifurcation. In the last few years, ultrasound guidance (USG) for performing peripheral nerve blocks has increased dramatically.

The potential benefits of USG for continuous peripheral nerve and neuroplexus blocks include the ability to directly visualize the neural and perineural anatomy. Sciatic nerve block is often associated with a slow onset time, of usually 30 to 60 mins. Various studies have shown post

bifurcation block of tibial and common peroneal nerve separately has faster onset of block than pre bifurcation. In this study, we demonstrated that using ultrasound guidance to block the tibial and common peroneal nerves separately distal to the point of bifurcation of the sciatic nerve in the popliteal fossa has a significantly faster onset time compared to pre bifurcation sciatic block.

Ropivacaine [7,8] is a new amino amide local anaesthetic. Ropivacaine is known to have lower lipid solubility and lower affinity for the myocardial sodium channels. These properties contribute to low systemic toxicity of ropivacaine which makes it a popular choice for nerve blocks.

It has been concluded by Casati A et al. [6] that 0.75% ropivacaine is the most suitable choice of local anesthetic for combined sciatic femoral nerve block, providing an onset similar to mepivacaine and prolonged postoperative analgesia.

Germain et al. [5] used 25 mL of ropivacaine 0.75% around the sciatic nerve cephalad to the peroneal-tibial division in group A (n= 51) and caudad to the division in group B (n= 51). The sensory and motor blocks were evaluated in every 5 minutes up to 30 minutes. Rates of complete sensory block and surgical anesthesia were superior in group B (p<0.0001).

Prasad et al. [4] used 30 ml of a standardized local anesthetic solution of equal volumes of 2% lidocaine and 0.5% bupivacaine with 1:200,000 epinephrine injected 5 cm proximal (group P) or 3 cm distal (group D) to its bifurcation in the popliteal fossa. They concluded that popliteal SNB distal to the bifurcation has a shorter onset time than SNB proximal to its bifurcation, and therefore, it may be a good option when fast onset for a surgical block is required.

In our study we have used 0.375% of Ropivacaine for ultrasound guided popliteal nerve block. The grade of complete sensory blockade and motor blockade were significantly higher in group A compared to group B. Block onset time was also faster in group A compared to group B.

## Conclusion

Ultrasound guided popliteal block after division of sciatic nerve hastens the onset of sensory and motor blockade compared to before division of sciatic nerve.

## References

1. Bonica JJ. The management of pain. Vol 1. 2nd ed. Philadelphia: Lea & Febiger, 1990.pp.461-80.
2. Perlas A, Brull R, Chan VWS, McCartney CJL, Nuica A, Abbas S. Ultrasound guidance improves the success of sciatic nerve block at the popliteal fossa. *Reg Anesth Pain Med.* 2008;33:259Y26.
3. Buys MJ, Arndt CD, Vagh F, Hoard A, Gerstein N. Ultrasound-guided sciatic nerve block in the popliteal fossa using a lateral approach: onset time comparing separate tibial and common peroneal nerve injections versus injecting proximal to the bifurcation. *Anesth Analg* 2010;110:635-7.
4. Prasad A, Perlas A, Ramlogan R, Brull R, Chan VW. Ultrasound guided popliteal block distal to sciatic nerve bifurcation shortens onset time. *Reg Anesth Pain Med* 2010;35:267-71.
5. Germain et al. A comparison of an injection cephalad or caudad to the division of the sciatic nerve for USG guided popliteal block. *Anaesth Analg* 2012; 114:230-5.
6. Casati A, Fanelli G, Borghi B, Torri G. Ropivacaine or 2% mepivacaine for lower limb peripheral nerve blocks. *Anesthesiology* 1999;90:1047-52.
7. Salonen MHA, Haasio J, Bachmann M, Xu M, Rosenberg PH. Evaluation of efficacy and plasma concentrations of ropivacaine in continuous axillary brachial plexus block: high dose for surgical anesthesia and low dose for postoperative analgesia. *Reg Anesth Pain Med.* 2000;25:47-51.
8. Mulroy MF, Burgess FW, Emanuelsson BM. Ropivacaine 0.25% and 0.5%, but not 0.125%, provide effective wound infiltration analgesia after outpatient hernia repair, but with sustained plasma drug levels. *Reg Anesth Pain Med.* 1999;24:136-41.
9. Myerson MS, Ruland CM, Allon SM. Regional anesthesia for foot and ankle surgery. *Foot Ankle.* 1992;13:282-88.
10. Auroy Y, Narchi P, Messiah A, Litt L, Rouvier B, Samii K. Serious complications related to regional anesthesia: results of a prospective survey in France. *Anesthesiology.* 1997;87:479-86.
11. Yazigi A, Madi-Gebara S, Haddad F, Hayeck G, Tabet G. Intraoperative myocardial ischemia in peripheral vascular surgery: general anesthesia vs combined sciatic and femoral nerve blocks. *J Clin Anesth.* 2005; 17:499-03.