



## Ultrasound Guided Popliteal Block for Below Knee Surgeries in High Risk Patients

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**Type of Publication:** Original Research Article

**Conflicts of Interest:** Nil

### Abstract

**Introduction:** To evaluate the safety and effectiveness of ultrasound-guided popliteal sciatic nerve block (PSNB) for pain control in endovascular treatment of below knee surgery. Peripheral nerve blocks are immensely popular among anesthesiologists as they provide excellent anesthesia and analgesia with minimal side effects and risk, making it an invaluable part of the practice of modern anesthesia. Until the advent of ultrasound, peripheral nerve blocks were performed based on the knowledge of anatomy, the use of small gauge high-quality needles, nerve stimulators, and the experience of the anesthesiologist.

### Aim

- To assess the onset of sensory and motor blockade and changes in hemodynamic parameters, if any.
- To assess duration of post-operative analgesia in high risk patients posted for below knee surgeries under ultrasound guided popliteal block as sole anaesthetic technique.

**Material and Method:** Study Place: This study will be conducted in the Department of Anaesthesiology and Critical care at Kempegowda Institute of Medical Sciences Hospital and Research Centre, Bangalore

Study duration: May 2023 to October 2023

Study design: Randomised clinical study

Sampling method: Simple random sampling

**Results:** A total of 23 patients with significant comorbidities scheduled for below-knee surgery were enrolled in this study. Out of total 23 patients, 17 were male and 6 were female. Mean age of patients was 56.86 ±13.67 Years. The mean duration for sensory and motor block onset time was 3.49±0.48 minutes and 4.95±0.65 minutes respectively. Haemodynamic parameters were maintained stable without gross fluctuation from baseline value throughout the procedure. Average duration of post-operative analgesia as assessed by NRS was 7.42 ±0.16 hours. Quality of motor block was assessed by Modified Lovett scaling, with 63.63% of patients graded scale 0, 36.36% of patients were graded scale 1 and 4.55% of patients were graded scale 2. There were no intra-operative complications recorded.

**Conclusion:** Ultrasound-guided popliteal sciatic block is an effective alternative anaesthetic technique for below-knee surgeries with better stability of haemodynamic parameters and pain management in high-risk patients.

**Keywords:** Sciatic Nerve, Systemic Disorders, Vasoconstrictor, Hemostatic Effect, Bupivacaine, Ultrasound

### Introduction

Peripheral nerve blockade is one of the components of comprehensive anaesthesia care because of its distinct advantages over central neuraxial blockade and general anaesthesia. Ultrasound guidance helps in better delineation of the anatomical structures making the block safer, hence avoiding complications. In high risk patients with significant cardiovascular and other systemic disorders, scheduled for below knee surgeries, administration of central neuraxial blockade or general anaesthesia is usually associated with adverse hemodynamic effects and high perioperative mortality.

With good anatomical knowledge of lower limbs and use of ultrasound for precise perineural deposition of local anaesthetics, there is an increase in the success rate with prolonged duration and decrease in the incidence of complication associated with peripheral nerve blocks.<sup>1</sup>

Distal sciatic nerve block (popliteal fossa block) is a very clinically valuable technique that results in anaesthesia of calf, tibia, fibula, ankle and foot. Bupivacaine is an amide local anaesthetic, four times more potent than lignocaine and longer duration of action but has delayed onset of action. Lignocaine, a commonly used local amino amide based anaesthetic, is a class 1b antidysrhythmic. Vasoconstrictor are used along with local anaesthetics to retard their systemic absorption.<sup>2</sup>

This enhances local anaesthetic effect by localising it to site of injection, decreases toxicity by retarding systemic absorption, has hemostatic effect, prolongs duration of anaesthesia and may decrease total dose of local anaesthetic drug required.

### Aims & Objectives

- To assess the onset of sensory and motor blockade and changes in hemodynamic parameters, if any.
- To assess duration of post-operative analgesia in high risk patients posted for below knee surgeries under ultrasound guided popliteal block as sole anaesthetic technique.

### Material and Methods

**Study Place:** This study will be conducted in the Department of Anaesthesiology and Critical care at Kempegowda Institute of Medical Sciences Hospital and Research Centre, Bangalore

**Study Duration:** May 2023 to October 2023

**Study Design:** Randomised clinical study

**Sampling Method:** Simple random sampling

**Sample size:** 23 patients of either sex of age > 18 years posted for below knee surgeries.

- Based on previous study
- Sample Size Calculation is

$$n = \frac{z^2 \frac{\sigma}{2} \sigma^2}{d^2}$$

where

n = sample size

$z^{\alpha/2}$  = standard table value for 95% CI

$\sigma$  = standard deviation

d = precision

**Input data:** duration of sensory block onset in study population was 3.35 +/- 0.49 minutes. (reference- Arjun BK, Prijith RS, Sreeraghu GM, Narendrababu MC. Ultrasound-guided popliteal sciatic and adductor canal block for below-knee surgeries in high-risk patients. Indian J Anaesth. 2019)

#### Inclusion Criteria

- ASA 2,3,4 patients posted for below knee surgeries (debridement, fasciotomy, toe amputation, Reye's amputation)
- Age > 18 years
- Either Sex

#### Exclusion Criteria

- Patient not willing to give informed consent
- Known hypersensitivity to local anaesthetics
- Pregnancy
- Sepsis, edema at site of injection
- Any neurological deficits of lower limb.

#### Methods and Procedure

After obtaining written informed consent, patients with ASA physical status III-IV (diabetes, hypertension, hepatorenal disease, ischemic heart disease), aged > 18

years, scheduled for below knee surgeries are enrolled in this study.

Routine investigations, coagulation profile, renal and hepatic function tests are done.

Once patient is on the operation table, all monitors are to be connected and baseline readings of HR, BP, ECG, Respiratory Rate and Pulse Oximetry (SPO2) will be recorded.

All sterile aseptic precautions are taken and the ultrasound machine is placed on the opposite side of the limb that has to be blocked. Patient will lie lateral with the operative limb up. A 25G Quincke needle will be inserted with in-plane technique after identifying the junction of sciatic nerve just dividing into tibial and common peroneal nerve.

Predetermined volume of 10ml 0.5% bupivacaine and 10ml 2% lignocaine + adrenaline will be given perineurally and spread of drug is observed in perineural hydrodissection under ultrasound guidance.

After the drug injection, assessment for onset, duration of sensory motor blockade, post-operative analgesia and any side effects of the drugs of complication of technique will be done.

Patient will be assessed for

Duration of sensory block – by pin prick

Duration of motor block- by modified Lovett's score

Post-operative pain severity will be assessed by visual analogue score

Sensory block will be assessed by pin prick method once every 5 mins for initial 30 mins and then after every 30 minutes to assess duration of sensory block.

Quality of motor block will be assessed at the same intervals and graded according to Modified Lovett's Scoring

Post operative pain severity will be assessed by visual analogue score(VAS 0-no pain,VAS 10-worst pain)

Time for rescue analgesia will be recorded, which is when patient first complains of pain or discomfort, and is given 50mg Tramadol IV for pain relief.

- 23 cases in total
- 16 cases were debridement cases
- 2 cases were tarsometatarsal amputation
- 5 cases were great toe amputation

**Result**

Table 1: Patients characteristics

Mean age	56.86 ±13.67 Years
Male : Female	17 :6
ASA (3:4)	16:7
BMI (kg/m <sup>2</sup> )	28.09±5.12

Table 2: Block characteristics

Sensory block onset	3.49±0.48 minutes
Motor block onset	4.95±0.65 minutes
Duration of analgesia	7.42 ±0.16 hours
Quality of motor block (modified lovetts scoring) (0:1:2)	14(63.63%):8(36.36%):1(4.55%)

Table 3: VAS score

0 hours	0.3±0.32
2 hours	0.3±0.43
4 hours	0.4±0.51
6 hours	1.2±0.44
12 hours	2.3±0.43
24 hours	3.7±0.51

A total of 23 patients with significant comorbidities scheduled for below-knee surgery were enrolled in this

study. Out of total 23 patients 17 were male and 6 were female. Mean age of patients was 56.86 ±13.67 Years. The mean duration for sensory and motor block onset time was 3.49±0.48 minutes and 4.95±0.65 minutes respectively. Haemodynamic parameters were maintained stable without gross fluctuation from baseline value throughout the procedure. Average duration of post-operative analgesia as assessed by NRS was 7.42 ±0.16 hours. Quality of motor block assessed by modified lovetts scoring, with 63.63% of patients were graded as per modified lovetts scale 0, 36.36% of patients were graded as per modified lovetts scale 1 and 4.55% of patients were graded as per modified lovetts scale 2. There were no intra-operative complications recorded.

**Discussion**

Ultrasound-guided peripheral nerve blocks remains a safe alternative for such patients.<sup>3-5</sup> There are few case reports based on lower limb surgeries performed under peripheral nerve blocks. Baddoo et al. published a case series of ten patients posted for above-knee amputation surgery, landmark technique of three-in-one block and Labat's approach of sciatic block were administered and reported as a partial block in the three cases.<sup>6</sup> However, the use of ultrasound ensures adequate block and facilitates rapid block onset and prolonged duration with a decrease in drug dosage and systemic complications. Shamim et al. studied combined femoral and sciatic nerve block under ultrasound guidance and reported it a safe and satisfactory anaesthetic technique for above- and below-knee amputation surgeries in high-risk patients.<sup>7</sup> But, the lateral cutaneous nerve of the thigh from lumbar plexus and the posterior cutaneous nerve of the thigh from sacral plexus should be blocked to

achieve the complete anaesthesia for above-knee surgeries.<sup>8</sup>

Proper anatomical knowledge is the key point for the success of peripheral nerve blocks. The two branches of the sciatic nerve: common peroneal and tibial nerve supply the leg and foot along with a sensory terminal branch of femoral nerve i.e., saphenous nerve, which provides sensory innervation to the medial part of leg and foot. Thus popliteal sciatic and adductor canal block provide adequate anaesthesia for below-knee surgeries. Yun Suk Choi et al. reported below-knee surgery successfully performed in two patients with severe cardiac dysfunction under ultrasound-guided femoral and popliteal sciatic nerve block with the stable intra-operative haemodynamic parameters.<sup>9</sup> But, presently there are no published literature on ultrasound-guided combined popliteal sciatic and adductor canal block for below-knee surgeries. The present case series affirms successful below-knee surgeries under combined ultrasound-guided popliteal sciatic and adductor canal block as sole anaesthetic technique, with rapid sensory and motor block onset, decrease the dosage of local anaesthetic agent, better stability of haemodynamic parameters, good post-operative analgesia and no adverse complications.

The most important independent predictor of persistent pain is the degree of pain relief in the immediate post-operative period. An adequate post-operative pain management has been reported to prevent the development of chronic pain.<sup>10</sup> Peripheral nerve block has an additional advantage of adequate post-operative pain management and in our study, the average duration of post-operative analgesia was  $7.42 \pm 0.16$  hours.

## Conclusion

Ultrasound-guided popliteal sciatic block is an effective alternative anaesthetic technique for below-knee surgeries with better stability of haemodynamic parameters and pain management in high-risk patients.

## Ethical Aspects/Issues

- Written informed consent will be taken from the patient
- Supervision of each case will be done by senior staff
- Previous similar studies in humans showed the safety profile of the drug.
- The cost of the study drug will be borne by the investigator
- The adverse effects of the drug/procedure, if any, will be dealt with immediately and the cost will be borne by the investigator.

## References

1. Arjun BK, Prijith RS, Sreeraghu GM, Narendrababu MC. Ultrasound-guided popliteal sciatic and adductor canal block for below-knee surgeries in high-risk patients. *Indian J Anaesth.* 2019 Aug;63(8):635-639. doi: 10.4103/ija.IJA\_296\_19. PMID: 31462809; PMCID: PMC6691641.
2. Chauhan D, Bhamri S, Shah N, Syed AN. A peripheral nerve stimulator guided popliteal sciatic nerve block combined with adductor canal block in lower leg surgery- A sole anesthetic technique. *Indian J Clin Anaesth* 2023;10(1):53-57
3. Yazigi A, Madi-Gebara S, Haddad F, Hayeck G, Tabet G. Intra-operative myocardial ischemia in peripheral vascular surgery: General anesthesia vs. combined sciatic and femoral nerve blocks. *J Clin Anesth.* 2005;17:499–503.
4. Bergmann I, Heetfeld M, Crozier TA. Peripheral nerve blocks give greater hemodynamic stability

- than general anaesthesia for ASA III patients undergoing outpatient knee arthroscopy. *Cent Eur J Med.* 2013;8:436–42.
5. Baddoo H. A preliminary report on use of peripheral nerve blocks for lower limb amputations. *Ghana Med J.* 2009;43:24–8.
  6. Shamim F, Hameed M, Siddiqui N, Abbasi S. Ultrasound-guided peripheral nerve blocks in high-risk patients, requiring lower limb (Above and below knee) amputation. *Int J Crit Illn Inj Sci.* 2018;8:100–3.
  7. Enneking FK, Chan V, Greger J, Hadzić A, Lang SA, Horlocker TT, et al. Lower-extremity peripheral nerve blockade: Essentials of our current understanding. *Reg Anesth Pain Med.* 2005;30:4–35.
  8. Choi YS, Shin HJ, Park JY, Kim HJ, Yun SH. Ultrasound-guided femoral and popliteal sciatic nerve blocks for below knee surgery in patients with severe cardiac disease. *Korean J Anesthesiol.* 2015;68:513–5.
  9. MJE Neil. Pain after amputation. *Br J Anaesth.* 2016;3:107–12.