

Combining Ultrasound-Guided Popliteal Sciatic and Adductor Canal Block as a Lifesaver for High-Risk Patients Scheduled for Emergency Below Knee Surgery: A Case Series

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ABSTRACT

High risk patients with multiple comorbidities, sepsis, poor cardiopulmonary reserve when posted for emergency below knee surgeries definitely pose challenges in terms of Anaesthesia. In this case series we highlighted the important role of ultrasound guided popliteal sciatic combined with adductor canal block as a sole anaesthetic technique for safe outcome in high risk cases having significant and multiple comorbidities.

10 cases with ASA physical status III and IV, aged 50-70 years scheduled for below knee surgeries were enrolled. All the patients received ultrasound guided popliteal sciatic nerve block with 8 ml of 2% Lignocaine with Adrenaline and 8 ml of 0.5% of Bupivacaine and 4mg Dexamethasone (1ml) (total volume 17 ml) and Adductor canal block with 8 ml of 0.5% of Bupivacaine.

Adequate sensory and motor blockade required for surgery was achieved, with stable haemodynamic parameters throughout the procedure. No patient developed any serious complication in the perioperative period.

Combination of the popliteal sciatic nerve and adductor canal block provide sufficient sensory and motor block with good hemodynamic stability for below-knee surgeries. When used on high-risk patients with numerous comorbidities, this anesthetic technique has the potential to save lives.

Introduction

Subarachnoid block is anaesthesia of choice for lower limb surgeries, but in patients with significant cardiovascular and other systemic disorders, administration of Central Neuraxial Block (CNB) is usually associated with adverse haemodynamic effects and instability [1]. Patients with poor cardiorespiratory reserve also makes them high risk for general anaesthesia (GA) which may be associated with high perioperative mortality in terms of ventilator requirement and ICU stay [2-3].

Peripheral Nerve Block (PNB) is increasingly gaining popularity as it has various advantages like safety, good

intra and post-operative analgesia, reduced requirement of opioid analgesics perioperatively and increased patient satisfaction [4-5]. With availability of Ultrasonography (USG) machine, it is possible to precisely locate and deposit local anaesthetic drug around these peripheral nerves which decreases complications associated with landmark guided peripheral nerve blocks.

Considering all these factors, use of ultrasound guided peripheral nerve blocks is advocated especially in emergency lower limb surgeries where adequate time for optimization is not in hand. Among the USG guided lower limb blocks, popliteal sciatic nerve block gained popularity.

A large number of studies have confirmed that popliteal approach of sciatic nerve block and Adductor canal nerve

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block can be safely and effectively applied to patients undergoing foot and ankle surgery [2,6]. These regional anaesthesia techniques ultimately help in better recovery of the patient.

In this case series we highlighted the important role of USG guided popliteal sciatic combined with adductor canal block as a sole anaesthetic technique for safe outcome in high risk emergency below knee surgical procedures having significant and multiple comorbidities [7].

Case Report

This is the series of 10 cases which were posted for emergency below knee surgery, like debridement of wound over foot and ankle region. All these patients were ASA Grade III and IV, in the age group from 55-70 years. We prospectively collected data of such cases who underwent surgery in last 3 months duration (December 2023-February 2024).

Thorough Pre-anaesthetic Evaluation of all these patients was done. Routine investigations like complete blood count, coagulation profile, renal and hepatic function tests were obtained. As all patients were high risk ECG and bedside 2D ECHO was done. Prior to shifting the patient to Operation Theater (OT) counseling was done and written informed consent was obtained from the patient and relatives. After explaining the risk and benefits of procedure, permission to use data for research purpose and publication was taken. The availability of blood and blood products was also checked and patients were taken inside the Operation Theatre.

Anaesthesia Management

All patient were monitored intraoperatively with standard multiparameter monitors, which included recording baseline heart rate (HR), oxygen saturation (SPO2), electrocardiogram (ECG) and non-invasive blood pressure (NIBP). The patient were given supine position with their leg extended slightly outwards for an adductor canal block. Patient's mid-thigh was examined with a high-frequency linear ultrasound probe. After identifying the femur bone, the probe was moved medially until the femoral artery and the boat-shaped sartorius muscle were visible beneath it (Figure-1). A 22 gauge stimuplex needle was inserted in-plane under aseptic precaution and 8 ml of 0.5% Bupivacaine was deposited on either side of the femoral artery after negative aspiration.

Following that, all the patients were positioned lateral with the affected limb in upper position and slightly flexed for the Popliteal Sciatic Nerve Block. A cushion was positioned to provide support between both the knees. The area of the popliteal fossa of the affected leg was aseptically prepped and draped for block. The popliteal fossa was transversely scanned with a high frequency linear probe (5–12 MHz, Sonosite USG Machine). Along with the tibial nerve and common

peroneal nerve, the popliteal vein and artery were located. Tibial Nerve was traced proximally till it merges with peroneal component to form the sciatic nerve (Figure 2). 100 mm of 22 G sononeedle was inserted in plane under vision after infiltrating skin and subcutaneous tissue with 2-3 ml of Lignocaine 2% with Adrenaline. Sononeedle was also connected to Peripheral Nerve Stimulator (PNS) to confirm the motor response. Needle tip was adjusted till adequate motor response on PNS noted, followed by slow injection of Local Anaesthetic (LA) drug mixture of 8 ml of 2% Lignocaine with Adrenaline and 8 ml of 0.5% Bupivacaine with 4 mg of Inj Dexamethasone (Total volume- 17 ml). Circumferential spread of LA around sciatic nerve was observed making peroneal and tibial component more prominent [8-9] (Figure-3). After a 15 to 20 minute wait and confirmation of appropriate sensory (with pin prick) and motor blockade, the patient was handed over to the surgeon. All blocks were given by experienced anesthesiologist.

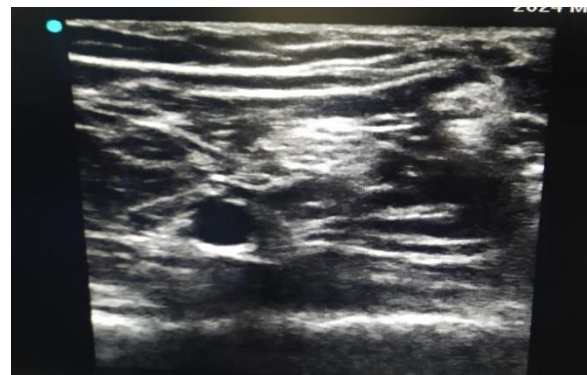


Figure 1- Sciatic nerve seen in ultrasound image

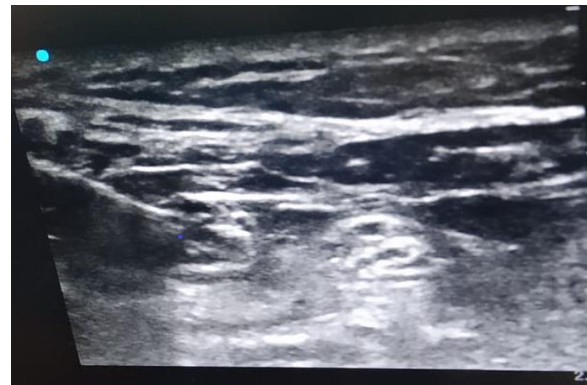


Figure 2- Common peroneal and tibial components seen separately

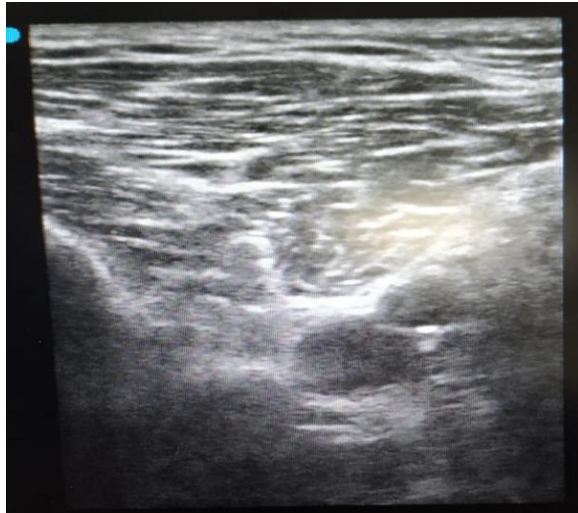


Figure 3- Saphenous nerve seen in adductor canal

All patients were supplemented with oxygen using face mask during the surgery. None of the cases involved the use of tourniquets. Sedation was administered to agitated patients and an intravenous infusion of 1 gm of Paracetamol was used to augment analgesia based on their needs. Vitals were monitored continuously at regular interval every 5 minutes intra-operatively and post-operatively every 10 minutes. Patients were observed in Post Anaesthesia Care Unit (PACU) for 2 hours after surgery.

(Table 1) shows the demographic parameters along with specific comorbidities of total of 10 patients

Table 1- Patient characteristics

Sr no.	Age/sex	Surgery	ASA Grade	Comorbidities	Medications	IV Sedation/analgesia
1	70/M	Debridement of non-healing ulcer over amputated right great toe	IV	Uncontrolled DM, recent IHD, Sepsis. Bilateral crepts, on O2 4l 2D echo- EF-45%, RWMA Deranged coagulation PT/INR – 45/1.8	HAI as per BSL, Tab Stiloz 100 mg, Tab Ecosprin 150 mg,	No sedation, Inj Paracetamol 1 gm
2	76/M	Debridement of right diabetic foot	III	DM, hypertension, h/o stroke, Bilateral crepts, INR- 1.4	Tab Aml+ Telma+ Hydrochlorothiazide Tab Atorvastatin + Clopidogrel	Inj PCM 1gm, Inj Midazolam 0.5 mg, Inj Fentanyl 30 mcg
3	57/M	Debridement of right diabetic foot	IV	DM, IHD, h/o CABG 2d echo- EF 30-35%, left ventricular hypokinesia, mild MR, TR, moderate PAH (54) INR 1.53, K 5.6, Na 125	Tab Ivabradine, Bisoprolol, Trental, Ecosprin, Rosuvastatin, OHA, Duolin and Budecort nebulization	Not required

scheduled for emergency surgery over below knee. Patients were of ASA classification III or IV. The approximate duration of surgery ranged from 60 to 90 minutes.

All the patients obtained an adequate sensory and motor blockade required for the surgery and the operative procedure was successfully performed under ultrasound-guided popliteal sciatic and adductor canal block. Two patients were apprehensive even after 15 min of block, so received minimal sedation in the form of Injection Midazolam 0.5 mg and fentanyl 20-30 mcg intravenously (IV) and additional analgesic Injection Paracetamol 1 gm IV.

Haemodynamics of all patients didn't show gross fluctuations from baseline throughout the procedure. There were no intraoperative complications recorded. Patients were observed for 2 hours in the recovery room. No significant adverse events in the immediate post-op period.

(MI-Myocardial Ischemia, RWMA- regional wall motion abnormality, BSL- Blood Sugar Level, HAI-Human Actrapid Insulin, IHD- Ischemic Heart Disease, DM- Diabetes Mellitus, HTN- Hypertension, AKI- Acute Kidney Injury, RFT- Renal Function Test, CKD- Chronic Kidney Disease, CAG- Coronary Angiography, Tab- Tablet.)

Patient remained pain free in first 8 to 10 hrs after blockade. None of the patients developed block related adverse events such as nerve damage, localised haematoma or Local Anaesthetic Systemic Toxicity (LAST).

4	60/M	Left foot wound debridement	III	DM, HTN, recent MI 2D echo-EF 40%, Moderate PAH, PT/INR- 18.1/1.53, Fever, sepsis	Tab Ecosprin and Clopidogrel, Telmisartan HAI as per BSL	Not required
5	69/M	Wound debridement and amputation of 4th and 5th toe	IV	DM and HTN Difficult airway, AKI, Sepsis TLC-23100, BSL- 352, Hb 7.8 gm%, hyponatremia	Tab Telmisartan, Rosuvastatin, Cilacar, HAI	Not required
6	55/M	Right, external fixation of right lateral malleolus fracture and wound debridement	IV	DM , dilated cardiomyopathy, 2d echo-EF 20%, global hypokinesia moderate TR, PAH	Tab Metoprolol, Clopidogrel, Atorvastatin, Torsemide, Spironolactone, Lantus	Not required
7	73/M	Right foot trans-metatarsal amputation	III	DM, expiratory rhonchi	Tab Pentoxifylline, Cilostazole	Inj PCM 1gm, Inj Fentanyl 50 mcg , Inj Midazolam 1 mg
8	65/M	Wound debridement of right diabetic foot	IV	DM, HTN, CKD on Dialysis, IHD, sepsis, high BP-160/100, B1 crepts Deranged RFT, anaemia	Tab Clonidine, Nicardia, Trental, OHA, Lasix Clopidogrel, Ecosprin, Cardivas, Arkamine	Not required
9	62/M	Wound debridement of left diabetic foot	III	Uncontrolled DM, HTN, BSL-316, deranged coagulation 11.2/1.67,	Tab Amlodipine, Telmisartan,	Inj Midazolam 1 mg iv
10	67/M	Right foot wound debridement	IV	DM, IHD, CVA Critical CAD, dilated cardiomyopathy, severe LV dysfunction, PT/INR 22.7/1.7	Tab Met xl, Ecosprin AV, Inj Lasix, UFH, HAI	Inj PCM 1 gm

(MI-Myocardial Ischemia, RWMA- regional wall motion abnormality, BSL- Blood Sugar Level, HAI-Human Actrapid Insulin, IHD- Ischemic Heart Disease, DM- Diabetes Mellitus, HTN- Hypertension, AKI- Acute Kidney Injury, RFT- Renal Function Test, CKD- Chronic Kidney Disease, CAG- Coronary Angiography, Tab- Tablet.)

Discussion

All the patients were high risk cases with either uncontrolled Diabetes Mellitus, hypertension amongst them few were on anticoagulants such as Tab Clopidogrel with deranged coagulation profile, which was not stopped prior to surgery. Some patients also had history of recent myocardial ischemia or stroke for whom stopping of anticoagulants could be dangerous. Four patients were known case of poor left ventricular function with EF less than 40% making them susceptible to haemodynamic instabilities. Also compromised respiratory status making them high risk for general anaesthesia. Few of them also showed sepsis to some extent with increased leucocyte count and on off fever episodes with Acute Kidney Injury.

Central neuraxial block can be catastrophic as it may worsen haemodynamic instability in such patients, which

may also be contraindicated considering coagulopathies. General anaesthesia may also be of high morbidity with notable hypotension, cardiac depression and mechanical ventilation related complications [2-3]. All these factors serve a dilemma in choosing the correct anaesthetic plan and hence further serve a challenge to perioperative anaesthetic management.

For such situations, USG guided PNB was found to be a reliable substitute. L.E. Martins et al in their case series on USG guided peripheral nerve blocks in anticoagulated patients mentioned that peripheral nerve blocks can be considered in anticoagulated patients for superficial blockage with ease of compression site and must be guided by ultrasound [10]. Therefore, we made an effort to assess this technique's utility as a substitute for subarachnoid block and general anaesthesia particularly in high-risk emergency surgeries.

Sciatic nerve block results in both sensory and motor Anaesthesia of below knee, except medial leg and foot,

which is the supplied by saphenous nerve (a branch of femoral nerve), Therefore we considered administration of combination of adductor canal and popliteal sciatic nerve block. The sciatic nerve divides into the tibial and common peroneal nerves at a variable distance from the popliteal crease. Hence use of ultrasound increases accuracy of nerve block. It also allows administration of drug under vision with rapid onset, decreased requirement and less block related complications. Our hybrid technique of using Peripheral Nerve Stimulator (PNS) guidance for confirming location of sciatic nerve along with USG made block more effective. Combined popliteal sciatic nerve block along with the adductor canal nerve block produced complete anaesthesia of lower limb below knee joint.

Arjun B K et al and Ara Sheikh et al found that a combination popliteal sciatic and adductor canal block was a useful substitute anesthetic method for below-knee procedures in patients at high risk [1, 6]. Hyun Jun Jeon et al studied potential efficacy of Popliteal Nerve Block as an anaesthetic technique for hallux valgus surgery when compared with spinal anaesthesia [11]. Study by Umut Oguslu et al also observe PSNB as a safe and effective method of pain control during endovascular treatment for critical limb ischemia with low adverse events rates and high patient and operator satisfaction, making PSNB was reasonable alternative for high risk patients [12].

In addition to above it was also observed by Yanan li et al and Rania Maher Husseni that Popliteal Sciatic Nerve Block (PSNB) also gives additional advantage of postoperative analgesia hence reduced requirement of large doses of analgesics especially opioids preventing side effects like nausea, vomiting, respiratory depression [5, 9].

Therefore, by giving Peripheral Nerve Blocks we could limit the side effects of general anaesthesia such as cardiovascular instabilities. It also reduced several side effects of central neuraxial blockade related complications in anticoagulated patients like epidural or spinal haematoma, neurologic damage. Hence surgery could be carried out without much haemodynamic fluctuations [13].

The current case series confirms that combined popliteal sciatic nerve and adductor canal block is a safe and effective anesthetic technique for below-knee surgeries. It offers adequate sensory and motor block, hemodynamic stability, effective post-operative analgesia, and no unfavorable complications [11]. Further studies are required on large number of subjects with detailed evaluation of block characteristics and post operative analgesia, long term benefits in terms of ICU and hospital stay.

Conclusion

Combination of the popliteal sciatic nerve and adductor canal block provides sufficient sensory and motor blockade with good hemodynamic stability for below-knee surgeries. When used on high-risk patients with numerous comorbidities, this anesthetic technique has the potential to save lives and safe outcome.

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