



Ultrasound Guided Localization of Inferior Gluteal Artery for Identification of Sciatic Nerve: A Case Report

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nerve blocks technique challenging. Numerous techniques for sciatic nerve block have been described, ranging from various landmark-based approaches to ultrasound-guided methods, which can be confusing for novice practitioners. In 1920 Victor Pauchet first described the landmark technique to block that was popularized as the Labat technique by Gaston Labat in 1923. In 1975 Alon Winnie modified the Labat approach. In 1963 George Beck described anterior approach and in 1975 Prithvi Raj described lithotomy approach to block the sciatic nerve in the supine position. The landmark parasacral approach was first described by Mansour in 1993.¹

Sciatic nerve is a flat and thick nerve with branching starting proximally. These proximal branches supply the posterior-superior aspect of thigh. These branches have to be blocked

Abstract

Various approaches to sciatic nerve blocks at different levels have been described. In the nineteenth century, landmark techniques were employed for the nerve block, while nowadays, ultrasound-guided nerve blocks are gaining popularity. Despite the array of techniques available, challenges arise due to factors like the intricate gluteal anatomy, challenging sonoanatomy, patient positioning issues, and the learning curve associated with ultrasound and nerve locators. Among these landmarks, the inferior gluteal artery stands out as an easily identifiable feature with ultrasound assistance.

We report a case where we used ultrasound to locate the inferior gluteal artery that guides in the identification of the sciatic nerve. In this technique, we can identify the nerve immediately as it emerges from the greater sciatic notch. At this level, we can block the nerve to achieve adequate surgical anesthesia and analgesia for tourniquet pain.

Introduction

The sciatic nerve is the mixed nerve and its course from the sciatic plexus to the popliteal region provides different levels to block the nerve along its pathway. Complexity of gluteal anatomy, level of expertise of the anesthesiologist and the unavailability of devices like the ultrasound, the nerve stimulators make the sciatic

along with femoral and lateral cutaneous nerve of the thigh to achieve anesthesia for tourniquet application.

In this report, we used ultrasound long with the nerve stimulator in localization of the sciatic nerve. Inferior gluteal artery is adjacent to the nerve and might serve as a novel ultrasound landmark for proximal sciatic nerve blocks. We performed femoral and lateral cutaneous nerve block to achieve surgical anesthesia and analgesia for tourniquet application in a covid positive patient posted for right foot surgery.

Case presentation

A 26-year-old gentleman, ASA PS I, who suffered a road traffic

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accident where he had crush injury of the right foot with second, third and fourth metatarsal fractures. He had multiple laceration injuries in face, low back area and posterior aspect below the knee. The orthopedic surgeon planned emergency debridement of the right foot, and k-wire fixation of the metatarsal fractures. The surgery required tourniquet application in thigh.

On evaluation, the patient had a history of fever and cough since 5 days and was taking over the counter medications. There were no other comorbidities. As per our hospital protocol, the trauma series imaging, pre-operative panel, and RT-PCR for COVID-19 were done. The imagings of the other systems and pre-operative panels were within normal limits. However, the RT-PCR reported positive.

The central neuraxial technique was contraindicated as there was laceration at the L1-L5 area. General anesthesia can generate airborne particles of COVID, hence we opted for peripheral nerve blocks for performing surgery. We explained the risks and benefits of the technique and we obtained informed consent. Affirming adequate nil per oral tatus, we shifted the patient to the operating room.

ASA standard monitoring device was attached. First we performed the right sciatic nerve block by positioning the patient on the left lateral position with the right lower limb on the non-dependent side. Slight flexion of the lower limb was done .

Electrode of the nerve stimulator was attached to the limb and the current setting was adjusted. Under all aseptic preparation, the Curvilinear probe (2-5Hz, Acuson P500, Siemens) as placed at a transverse position just inferior to the posterior superior iliac spine (PSIS) which was identified by palpation and skin dent. The ultrasound showed a hyperechoic image which is the posterior border of ilium (PBI). Then the probe was moved caudally and discontinuation in the ilium was visualized which is the sciatic notch. With slight caudal tilt of the probe, a pulsating image - Inferior gluteal artery was seen along with a hyperechoic image - Sciatic nerve was visualized lateral to inferior gluteal artery. The echogenic needle 10 cm (sonoplex, Pajunk), connected to the nerve stimulator was inserted from the lateral side. When the needle approximated the nerve, the plantar flexion was noticed. Adjustment in the current amplitude was done. 20 ml of 0.5% Bupivacaine was injected.

After completion of the sciatic nerve block, the patient was repositioned to supine for the right femoral nerve block. Under all aseptic preparation, Linear ultrasound probe (5-13 Hz, Acuson P500, Siemens) was placed transversally just beneath the inguinal crease. Femoral nerve is visualized as hyperechoic structure just lateral to the artery and femoral nerve block was done by inserting the sonoplex needle from the lateral side. Contraction of the quadriceps muscle was visualized by adjusting the current settings in the nerve stimulator. 10 ml of 0.5% Bupivacaine was injected. After completion of femoral nerve block, The linear probe was

moved laterally and the lateral femoral cutaneous nerve was identified in a fat filled cavity between sartorius and tensor fascia latae muscles and 3mls of bupivacaine was injected.

Within 20 minutes surgical anesthesia was achieved and the surgery was completed uneventfully. Adverse effects were not observed while we followed up on the first postoperative day.

Discussion

This case illustrates an ultrasound-guided Sciatic Nerve block for lower limb surgery in an unusual situation where spinal anesthesia was contraindicated and GA needs to be better avoided due to Covid 19 positive status. In the situation of covid 19, the regional anesthesia practice avoids the need for General Anesthesia. Ultrasound technology has become an indispensable tool in operation theatres, ICUs, and pain clinics, owing to its versatility and non-invasive nature. In the operation theatre, ultrasound is commonly employed for real-time imaging during procedures, like central venous catheter placement and arterial line insertion and in nerve blocks, guiding needle placements with precision. In the ICU, ultrasound serves as a valuable diagnostic and monitoring tool, allowing physician to assess lung and cardiac function, inferior venacava diameter and diaphragm excursion measurement. Additionally, ultrasound plays a crucial role in pain clinics by enabling physicians to precisely identify anatomical structures, assess joint and soft tissue abnormalities, and guide interventions like nerve blocks and injections, contributing to improved accuracy and efficacy in pain management.

Greater sciatic foramen (GSF) is visualized as a gap between the posterior border of ilium laterally and scarum medially. The piriformis muscle divides GSF into superior and inferior halves. The superior gluteal artery and nerve arises from superior GSF and the sciatic nerve along with nerve to quadratus muscle, the inferior gluteal vein and artery and the inferior gluteal nerve; and posterior femoral cutaneous nerves; the internal pudendal artery and veins, and the nerves to the internal obturator and quadratus femoris muscles emerges from inferior GSF. In the view of complexity anatomy, ultrasound view of the gluteal region to identify the sciatic nerve is cumbersome.

The sciatic nerve is formed from the L4 to S3 root of the Lumbosacral plexus and emerges from the pelvis through the greater sciatic foramen (GSF) under the piriformis muscle and runs between the ischial tuberosity and greater trochanter.

Inferior gluteal artery arises from the anterior division of the internal iliac artery and descends through the lower portion of greater sciatic foramen.

The sciatic nerve lies lateral to the inferior gluteal artery in inferior GSF. It is the most proximal part of the sciatic, visible by the ultrasound in the gluteal region.

We followed these steps to identify the sciatic nerve reliably (multimedia link for the steps). <https://youtu.be/zO-iVTP5ZcI>

1. Palpate the PSIS and place the probe just below it, transversely.
2. We can get the image of PBI as the hyperechoic shadow. (Fig: 1)
3. Slide the probe inferiorly, we can visualize GSN.(Fig: 2)
4. At this point, we will visualize the inferior gluteal artery as a pulsatile structure. (Fig: 2)
5. We tilt the probe caudally, we can visualize the sciatic nerve as triangular hyperechoic shadow. (Fig: 3)



Fig 1: Ultrasound image of Transverse section of gluteal area

PBI posterior border of ilium

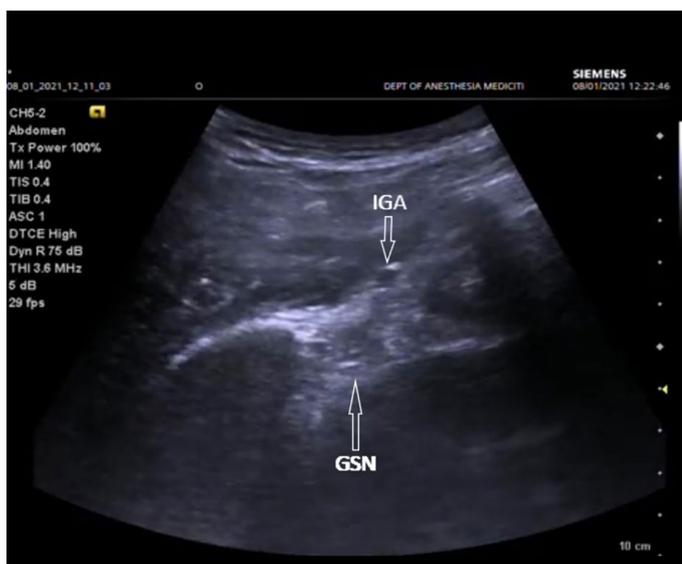


Fig 2: Ultrasound image of Transverse section of gluteal area

(IGA: Inferior Gluteal Artery SN: Sciatic Nerve GSF: Greater Sciatic Foramen)

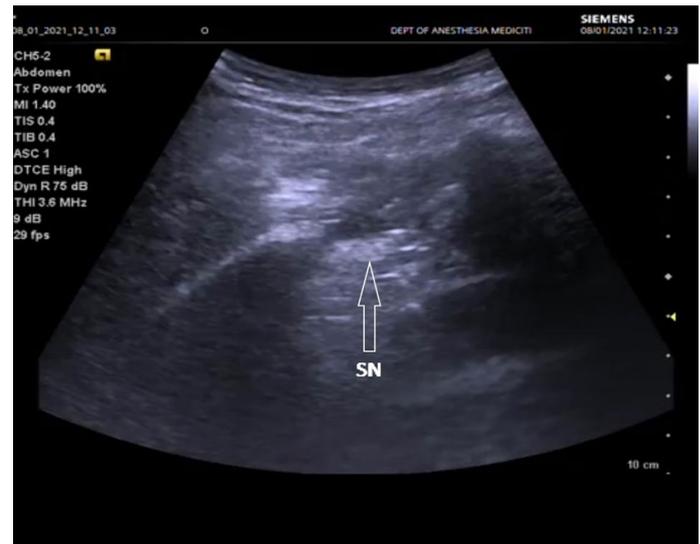


Fig 3: Ultrasound image of Transverse section of gluteal area

SN: Sciatic Nerve

The success rate is high if we are able to block the nerve proximally. Elsharkawy et al conducted a retrospective study on Ultrasound Detection of ArteriaComitans to locate the sciatic nerve. They found arteriacomitans accompany the sciatic nerve for a short distance and then penetrate the nerve and run to the lower part of the thigh². Similarly, Dillow et al found a 100% success rate of Ultrasound-guided parasacral approach to the sciatic nerve block in children where they were able to localize inferior gluteal artery³.

Ultrasound (US) has a pivotal role for performing regional anesthesia. US aids to identify the structures of interest, avoid vascular injury, visualization of the tip of the block needle, and appropriate deposition of local anesthetics. The use of the nerve stimulators adds safety margins during nerve blocks.

Conclusion

The understanding of the surface landmarks, regional and sonoanatomy are key to the successful nerve blocks. Identification of inferior gluteal artery can help proximal localization of the sciatic nerve, as soon as both the nerve and the artery emerge in inferior GSF.

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