Ultrasound-guided Approaches to Sciatic Nerve Block

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ABSTRACT
Along with the femoral nerve block, the sciatic nerve block is one of the most commonly performed peripheral nerve blocks of the lower limb block. It provides innervation to the hip joint, the knee joint and the ankle joint, it is blockade is utilised to provide analgesia for all such joint surgeries.

Keywords: Anaesthesia, Ultrasound, Sciatic, Nerve, Poplitea.

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INTRODUCTION
Along with the femoral nerve block, the sciatic nerve block is one of the most commonly performed peripheral nerve blocks of the lower limb block.1,2 It provides innervation to the hip joint, the knee joint and the ankle joint, it is blockade is utilised to provide analgesia for all such joint surgeries. In the last few years, the use of ultrasound has revolutionized the field of regional anaesthesia. Ultrasound has improved the reliability of peripheral nerve blocks, increasing the success rate while reducing performance times.3,4 Ultrasound has also helped to overcome variable anatomy, that were the bane of the landmark guided techniques; allowing its use to become the standard worldwide.5

ANATOMY OF THE SCIATIC NERVE
The sciatic nerve is the main branch of the sacral plexus.6 The sacral plexus is derived from the lumbosacral trunk (anterior rami of L4,L5) and the sacral nerves (anterior rami of the S1-S3).7 Its main branch, the sciatic nerve is formed in the pelvis anterior to the piriformis muscle (and posterior to the iliac vessels), and exits the pelvis via the greater sciatic foramen. In the upper part of its course, the nerve is accompanied by the posterior femoral cutaneous nerve and the inferior gluteal artery, under the cover of the gluteus maximus. It enters the thigh lying between the greater trochanter of the femur and the ischial tuberosity, under the gluteal muscles. It is crossed obliquely by the long head of the biceps femoris (Fig. 1).8 At lower third of the thigh it divides into two large branches, the tibial and common peroneal nerves. This division is variable and may take place at any point between the sacral plexus and the lower third of the thigh.5

INDICATIONS OF THE SCIATIC NERVE BLOCK
Sciatic nerve is employed to provide analgesia for the following procedures:
• Analgesia for hip arthroplasty and hip arthroscopy
• Analgesia for knee arthroplasty
• Analgesia for ankle arthrodesis
• Analgesia for tibial nailing
• Analgesia for forefoot surgery.

CONTRAINDICATIONS OF THE SCIATIC NERVE BLOCK
These include:
• Patient refusal
• Coagulopathy
• Pre-existing neurological deficit of the sciatic nerve.

APPROACHES TO SCIATIC NERVE BLOCKADE
There are four approaches to ultrasound guided nerve block. These are:
• The gluteal approach
• The subgluteal approach
• The anterior mid-thigh approach
• The popliteal approach

These approaches are described in brief below:
• Gluteal approaches9: In this approach, the sciatic nerve is blocked as it emerges from the greater sciatic foramen under the piriformis muscle. Here, it lies deep (anterior) to the gluteus maximus muscle and is superficial (posterior) to the inner muscle layers. The sciatic nerve passes lateral to the ischial spine to descend downwards. The pudendal vessels lie medial to the sciatic nerve and

Fig. 1: The course of the sciatic nerve in the lower limb
help in its identification on the ultrasound by using colour Doppler mode.

• **Technique:** The patient is given Sim’s position (with the hip and knee flexed and the operative side uppermost). The posterior superior iliac spine, the sacral hiatus and the greater trochanter are palpated and marked. A low frequency (2-5 MHz) curvilinear transducer is used to scan the sciatic nerve at this region as the nerve is fairly deep. The nerve is scanned in its short axis by placing the probe transversely at the midpoint of the line joining the sacral hiatus and the greater trochanter. After optimizing the image, the ischial bone is identified as it appears as a continuous linear hyperechoic structure. A caudal scan reveals the ischial spine, which is seen as a curved hyperechoic line, with the pudendal vessels visualized above it. The curved hyperechoic hip joint is visualized laterally. The sciatic nerve can be seen as a flattened or triangular hyperechoic bundle under the gluteus maximus (Figs 2A and B). A 80 to 100 mm short bevel regional block needle is brought in plane (usually from lateral to medial direction) or out of plane, to inject 20 to 30 ml 0.25% bupivacaine (or similar local anaesthetic) to achieve an analgesic block of the sciatic nerve.

• **Subgluteal approach**\(^{10}\). At the subgluteal region, the sciatic nerve passes midway between the ischial tuberosity and the greater trochanter. Here, the nerve lies between the fascial planes of the gluteus maximus and the quadratus femoris. The patient is given prone position and ischial tuberosity and greater trochanter are palpated. A line is drawn joining them.

*Technique:* A low frequency (2-5 MHz) curvilinear transducer is placed transversely at the midpoint of the line joining the ischial tuberosity and greater trochanter. After image optimization, ischial tuberosity and greater trochanter are seen as hyperechoic curved lines on either sides. The sciatic nerve can be identified as seen as a triangular hyperechoic bundle under the gluteus maximus but above the quadriceps femoris (Fig. 3). A slight cephalad angulation may be needed to overcome the anisotropy of the sciatic nerve at this level. A 50 to 80 mm short bevel regional block needle is brought in plane (usually from lateral to medial direction) or out of plane, to inject 20 to 30 ml 0.25% bupivacaine (or similar local anaesthetic) to achieve an analgesic block of the sciatic nerve.

• **Anterior approach**\(^{9,11}\): The sciatic nerve can be accessed using an anterior approach, just distally to the inguinal crease. Here, the sciatic nerve crosses posteriorly to the lesser trochanter. The patient is given a supine position, maintaining the lower limb flexed slightly at the knee, and externally rotated. This moves the lesser trochanter laterally, and makes approaching the sciatic nerve easier.

*Technique:* A low frequency (2-5 MHz) curvilinear transducer is placed transversely 5 to 10 cm distal to the inguinal crease. The lesser trochanter deep to the femoral vessels is identified, and the adductor muscles are identified more medially. The sciatic nerve is seen here as a hyperechoic triangular structure, medial to the lesser trochanter, deep to the adductor muscles, but above the gluteus maximus (Fig. 4). A 100 mm short bevel regional block needle is brought in plane (usually from medial to lateral direction) or out of plane, to inject 20 to 30 ml 0.25% bupivacaine (or similar local anaesthetic) to achieve an analgesic block of the sciatic nerve.

• **Popliteal approach**\(^{12,13}\): At the popliteal region, the sciatic nerve divides into its two branches, the tibial nerve medially, and the common peroneal nerve laterally. The popliteal artery and vein lie deep to the nerve, and helps to locate the sciatic nerve at this level. The patient may be given a prone, supine or lateral position, though this block is best performed with prone positioning.

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**Fig. 2:** Ultrasound image of sciatic nerve at gluteal level

**Fig. 3:** Ultrasound image of sciatic nerve at subgluteal level
Technique: A high frequency (6-13 MHz) linear transducer is used to scan the sciatic nerve in its short axis. At first, the popliteal vessels are identified by placing the probe at the popliteal crease as they are fairly superficial. On scanning more proximally, the tibial nerve and the common peroneal nerve can be seen superficial to the vessels. Here they are separated from each other, coming closer on more proximal scanning till just at the point of bifurcation of the sciatic nerve. Finally they are seen merging together to form the sciatic nerve. The point of bifurcation represents the best place to block both components of the sciatic nerve. After image optimization, the two branches of the sciatic nerve are scanned at their point of bifurcation. A slight caudal tilt to the probe is required to obtain the best view of the nerves here (Fig. 5). A 50 to 80 mm short bevel regional block needle is brought in plane (usually from lateral to medial direction) or out of plane, to inject 20 to 30 ml 0.25% bupivacaine (or similar local anaesthetic) to achieve an analgesic block of the sciatic nerve at the popliteal fossa.

REFERENCES


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