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Health education

Ultrasound-guided ankle block: An attractive anaesthetic technique for foot surgery[☆]



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ABSTRACT

Foot innervation, defined as distal to the tibial and fibular malleoli, is provided by five nerves, namely the tibial, peroneal (deep and superficial), sural and saphenous nerves. Blockade of these nerves is referred to as ankle block. The main advantage of using this block in foot surgery over other regional techniques is the absence of motor blockade above the ankle, which allows faster mobility after surgery. The use of ultrasound for this block has been shown to be of higher clinical efficacy when compared to a landmark approach. The purpose of this continuing education article is not only to detail the anatomy and sonoanatomy of the five nerves innervating the foot, but the ultrasound technique as well. The ultrasound-guided ankle block can be used alone as anaesthetic technique or as adjuvant for analgesia in foot surgery.

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Bloqueo de tobillo guiado por ultrasonido: una técnica anestésica atractiva para cirugía de pie

R E S U M E N

La inervación del pie, definida como aquella distal a los maléolos tibial y peroneal es dada por cinco nervios: tibial, peroneal (superficial y profundo), sural y safeno. El bloqueo de estos nervios se conoce como el bloqueo de tobillo. Su principal ventaja en la cirugía de pie comparado con otras técnicas regionales es la ausencia de bloqueo motor por encima del tobillo, que permite una rápida movilización posterior a la cirugía. El uso del ultrasonido para este bloqueo ha mostrado mayor eficacia clínica cuando se compara con la técnica por

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reparos anatómicos. El objetivo de este artículo de educación continua no es sólo detallar la anatomía y sonoanatomía de estos cinco nervios sino también describir la técnica guiada por ultrasonido. El bloqueo de tobillo guiado por ultrasonido puede ser usado como una técnica anestésica única o como coadyuvante analgésica en la cirugía de pie.

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Introduction

Regional anaesthesia has become increasingly popular in ambulatory surgery because it has been shown to offer excellent pain control in the immediate postoperative period, with shorter length of stay in the post-anaesthetic care unit, and perioperative opioid sparing.¹⁻³

Ankle blockade consists of blocking the five nerves that provide sensory innervation to the region distal to the malleoli. It is used alone as anaesthetic technique in foot surgery provided no pneumatic tourniquet is used during the procedure, or it can also be used together with general or neuroaxial anaesthesia in order to provide adequate post-operative analgesia.⁴ Whenever a tourniquet is required, we propose its use at ankle level, with good tolerance when the ankle block is used as the only anaesthetic technique.^{5,6}

Its main advantage over the simultaneous sciatic and femoral nerve block is the absence of motor blockade above the ankle. This allows for rapid mobilization of the patient, which is important in the outpatient context or when bilateral procedures are required.⁷

Migues et al.⁸ conducted a prospective randomized study in 51 patients, comparing the quality of surgical anaesthesia, postoperative analgesia and postoperative complications of the sciatic nerve block at the popliteal level with the ankle block in foot surgery. In their study, they used the anatomic landmark technique for the ankle block, and the peripheral nerve stimulator for the popliteal sciatic block. The authors did not find a significant difference in terms of block efficacy and the quality of postoperative analgesia. No complications were reported in this study.

Although high rates of success have been reported with the anatomical landmark technique (89–100%),^{9,10} it has been perceived as technically challenging and not very reliable.¹¹

Regarding the ultrasound technique, Chin et al.¹² conducted a six-year retrospective cohort study comparing the ultrasound technique with the anatomical landmark technique for ankle blocks and found that the use of ultrasound increases clinical efficacy with improved surgical anaesthesia, a lower need for rescue systemic opioids, and smaller postoperative opioid doses.

The objective of this article is to review the relevant anatomy and sonoanatomy in ankle blocks and to provide anaesthetists with a tool for localization and successful blockade of the nerves involved.

Ankle innervation

Innervation distal to the malleoli comprises the tibial, superficial and deep peroneal, sural and saphenous nerves.

All of these nerves are branches of the sciatic nerve except for the saphenous, which is a branch of the femoral nerve. The deep peroneal, posterior tibial and sural nerves are accompanied by blood vessels, which are useful anatomical landmarks for the ultrasound approach. Fig. 1 shows the regions corresponding to the sensory innervation of each of the nerves of the foot.

Although it has been suggested that saphenous nerve block is only necessary in 3% of patients taken to foot surgery,¹³ a complete rather than a selective block is recommended regardless of the type of surgery, because nerve territories are often superimposed.⁴

Tibial nerve: A nerve with mixed characteristics (sensory and motor), it arises from the terminal branches of the sciatic nerve. As it crosses the popliteal fossa it receives the name of tibial nerve, and becomes superficial in the region that lies posterior to the medial malleolus. It is the largest of the group of five nerves innervating the foot and provides sensation to the sole and the heel. At the ankle, it divides into its medial, lateral and calcaneal branches.^{14,15} With the knee in flexion and the hip in external rotation, the transducer is placed cross-wise between the medial malleolus and the Achilles tendon (Fig. 2).

Blood vessels in this area are identified with the help of the sonanatomy, including the posterior tibial artery which runs posterior to the medial malleolus, and two accompanying veins. The tibial nerve appears as a hyperechoic structure adjacent to the posterior tibial artery (Fig. 3).

The tibial nerve is most often found posterior to the artery, although sometimes it may be anterior to it. It is recommended to perform this block proximal to the eminence of the medial malleolus to ensure blockade of the calcaneal branch.¹⁶ Finally, it is important to bear in mind the flexor

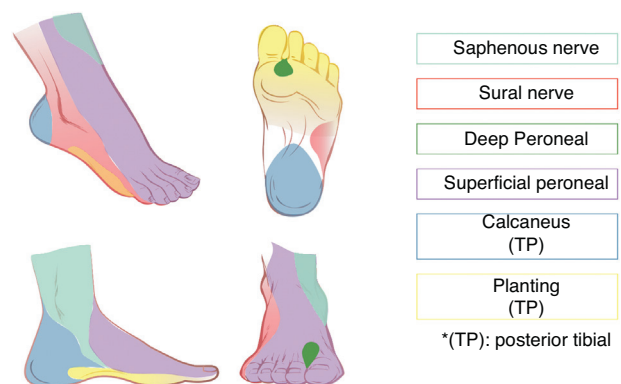


Fig. 1 – Sensory innervation of the foot and ankle.
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