CASE REPORT

Ultrasound-Assisted Sural Nerve Biopsy: Technical Note and Correlation of Ultrasound Imaging with Operative Findings

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The novel technique of ultrasound-assisted sural nerve biopsy is presented. Conventional sural nerve biopsy uses surgical landmarks to identify the sural nerve. However, the sural nerve location can vary. With the guidance of high-resolution ultrasound, the problem of nerve location variation is overcome, the skin incision is smaller, and tissue manipulation is minimized. The correlation of ultrasound imaging with operative findings is also presented. © 2013, Elsevier Taiwan LLC and the Chinese Taipei Society of Ultrasound in Medicine.

Introduction

Sural nerve biopsy has been a well-established procedure for the diagnostic investigation of peripheral neuropathies [1]. However, it should be reserved for cases that cannot be diagnosed by any other means and where identification of the neuropathy is likely to influence subsequent treatments [2]. A sural nerve biopsy is commonly required to establish the diagnosis of various diseases, such as vasculitis and amyloidosis [1]. Conventional sural nerve biopsy using anatomical landmark is well described in the literature, in which a 6-cm longitudinal skin incision is made equidistant between the fibula and the Achilles tendon [2]. The lesser saphenous vein is used as an anatomical landmark. However, there is variation of sural nerve location [3], and it is not impossible for surgeons to become disoriented when searching for the sural nerve. Peripheral nerves can be well evaluated by ultrasound [4]. In this study, we present the

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original method of ultrasound-assisted sural nerve biopsy. With real-time ultrasound imaging, the problem of sural nerve location variation is overcome, and skin incision is smaller. Tissue dissection and manipulation can be minimized. With less tissue manipulation, sural nerve structure can be better preserved, which will help in the histological diagnosis. This article is also the first report to demonstrate the correlation of ultrasound imaging with operative findings regarding the sural nerve.

Technical note

Ultrasound evaluation was performed with a Philips Envisor ultrasound machine (Philips, Bothell, WA, USA). A linear ultrasound probe with high frequency (12 MHz) is applied on the skin surface between the distal fibula and the Achilles tendon. The lesser saphenous vein is first identified. The sural nerve can be seen close to the lesser saphenous vein. Ultrasound shows the fascicles of the sural nerve in the cross-section view (Fig. 1). Each "black dot" corresponds to a fascicle. In this specific case, the location of the sural nerve is anterior to the lesser saphenous vein (Fig. 1) proximally and is found underneath the lesser saphenous vein (Fig. 2) distally. We prefer this part of the sural nerve to be located more superficially instead of being underneath the vein to avoid unnecessary tissue manipulation. The preferred part of the sural nerve is marked on the skin with a marking pen (Fig. 3). A local anesthetic is administered, which can be performed under ultrasound to avoid puncturing the sural nerve or the lesser saphenous vein. A longitudinal incision of about 2–3 cm is made at the marked area. The subcutaneous fat is gently dissected. The lesser saphenous vein is seen, and the sural nerve is identified close to the lesser saphenous vein (Fig. 4). The operative findings showed that the sural nerve location is anterior to the lesser saphenous vein proximally and is underneath the bifurcated lesser saphenous vein distally,

Fig. 1 Transverse view of the sural nerve (more proximal part). The sural nerve (arrow) was anterior to the lesser saphenous vein (arrowhead) in the more proximal part.

Fig. 2 Transverse view of the sural nerve (more distal part). The sural nerve (arrow) was found underneath the bifurcating lesser saphenous vein (arrowhead) in the more distal part.

Fig. 3 The location of the sural nerve to be biopsied was marked with a pen.
which is compatible with the ultrasound findings. The sural nerve is gently dissected free from nearby tissues. A 1.5-cm \((\text{length})\) segment is resected from the sural nerve.

Discussion

The sural nerve is superficial anatomically and is a pure sensory and autonomic nerve. Its sensory distribution is located on the dorsolateral aspect of the foot \[2\]. Hence, anesthesia in this area will not predispose a patient to plantar ulcer. These characteristics make the sural nerve the most commonly biopsied peripheral nerve. In conventional sural nerve biopsies, the lesser saphenous vein is used as the most reliable landmark \[2\]. However, in cases where there is variation of sural nerve location, it is possible that a surgeon can become disoriented during surgical exploration without seeing the sural nerve beforehand. Ultrasound helps a surgeon locate the sural nerve and avoid unnecessary exploration.

Conclusion

Ultrasound-assisted sural nerve biopsy appears to be a promising method to enhance the accuracy of sural nerve biopsy. It helps to minimize skin incision and avoid unnecessary tissue manipulation.

References