

Ultrasound-Guided Peripheral Nerve Procedures



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KEYWORDS

- Injection • Intervention • Neurological • Neuroma • Neuropathy • Perineural
- Sonography • Ultrasound

KEY POINTS

- Detailed preprocedural scanning should always be performed before an ultrasound-guided peripheral nerve procedure to determine the ideal approach.
- Ultrasound image optimization is necessary for reliably identifying peripheral nerves and appropriately performing procedures.
- Having all necessary equipment and planning done in advance will facilitate an effective and safe ultrasound-guided peripheral nerve procedure.

INTRODUCTION

Ultrasound guidance allows real-time visualization of the needle in peripheral nerve procedures with improved accuracy and safety. The visualization of the vulnerable target of the peripheral nerve as well as the surrounding anatomy can provide valuable information for both diagnostic purposes and procedure enhancement. Detailed knowledge of the anatomy and appropriate prescanning and equipment preparation can facilitate effective use of ultrasound for peripheral nerve procedures.

Success with peripheral nerve procedures requires knowledge of nerve structure and anatomy, technical skills, and unique challenges associated with peripheral nerves. A thorough knowledge of anatomy, including the peripheral nerve course, function, and surrounding tissue is needed.

Appropriate use of depth, frequency, focal zones, and gray-scale mapping will provide the clearest view of the target region around the peripheral nerve. The depth should be set so the target area takes up the largest portion of the screen. The image

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should be centered to allow adequate visualization of the approach of the needle to the target. Generally, the highest frequency available that still provides adequate penetration to the tissue desired will create the clearest image of the peripheral nerve.¹ The focal zone should be placed at the desired target for the clearest image (Fig. 1). The gray-scale mapping is chosen to provide the greatest contrast between the nerve and surrounding tissue. Most peripheral nerve injections are performed with a short-axis view of the nerve and an in-plane view of the needle. This allows the best view of the outline of the nerve and visualization of the approach of the needle. In some situations, it is advantageous to rotate between short-axis and long-axis views of the nerve to establish both vantage points.

The patient should be positioned between the clinician and the ultrasound screen to allow easy visualization of both the needle at the target site and the ultrasound image. The necessary equipment for the injection should be reviewed before the procedure and placed easily within reach. Detailed preprocedural scanning should be performed before the procedure to plan the approach and investigate the surrounding anatomy, including potential anatomic variants.²

Peripheral nerves provide unique challenges as an injection target, including borders that can be somewhat indistinct relative to surrounding tissue. Nerves also are relatively mobile and have the potential to move from the initial target site with tissue movement as well as infiltrating injectate. Nerves are also vulnerable targets with considerable potential for injury. Some investigators argue that intraneural injections are relatively safe if the needle does not penetrate the fascicles.³⁻⁵ Despite this, caution is recommended for all injections because of limits of resolution and variability of the pattern of fascicular architecture in some nerves.⁶ Creating a halo around the nerve with injectate can increase the conspicuity of nerve borders (Fig. 2).⁷ Use of blunt needles can also help facilitate safe injections very close to the peripheral nerve borders.

GENERAL PROCEDURAL CONSIDERATIONS

A detailed discussion of all peripheral nerve procedures is beyond the scope of this article. The more commonly performed procedures are discussed. There are often

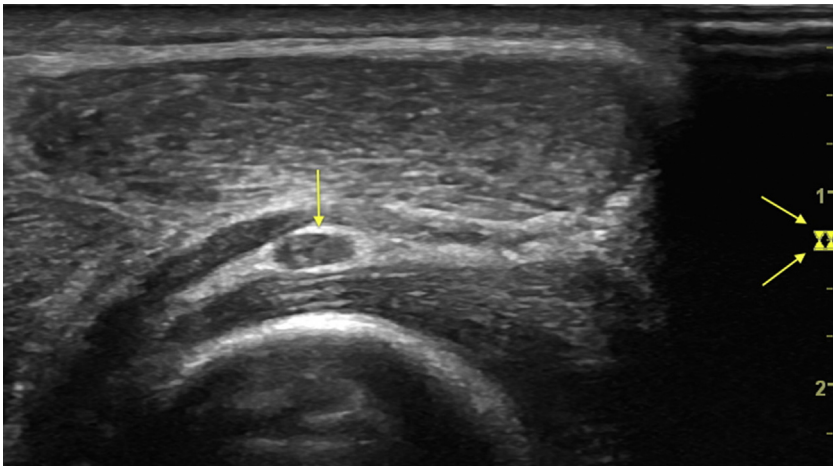


Fig. 1. Sonogram demonstrating a short-axis view of an abnormally enlarged deep branch of the radial nerve (*single arrow*) at the level of the supinator. The focal zone (*double arrows*) is set at the appropriate level for optimization of the image.

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