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Diagnostic Ultrasound for Traumatic Radial Neuropathy

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The radial nerve is the most commonly injured nerve in cases of long-bone fracture.¹ Traditionally, radial neuropathy following trauma is evaluated through a combination of history, examination, electrodiagnostic studies, and, in some cases, surgical exploration.² Recent studies suggest that high-resolution ultrasound may be valuable in the pre-operative assessment of traumatic neuropathies.³⁻⁵ However, the benefit of dynamic ultrasound imaging (with movement of the arm in several positions) for traumatic radial nerve injury has not been described. We present a case in which dynamic high-resolution ultrasonography assisted in the diagnosis and treatment decision-making in an individual with a traumatic radial neuropathy.

A 36 year-old man was shot in the right arm with a .45 caliber pistol, which shattered the humerus (Fig.1). He immediately had numbness over the dorsal forearm and hand and weakness in the forearm, wrist, and fingers. His wound was cleaned, no surgical exploration was performed, and he was discharged with a splint. Two months later he continued to have neither wrist nor finger extension. Electrodiagnostic studies were consistent with severe axonal injury to the radial nerve in the mid-arm, and nerve transection could not be excluded.

A Philips iU22 high-resolution ultrasound instrument (Philips Medical Instruments, Bothell, WA) with a 12 MHz linear array transducer was used to examine the area of injury. The proximal portion of the radial nerve was followed distally as it wrapped around the humerus, but at the site of the fracture there was a 1 cm region over which the nerve was difficult to visualize. The radial nerve segments proximal and distal to the region that was difficult to visualize were aligned. Video of the nerve, both in cross-section and longitudinal view, is provided (Video). The arm was repeatedly flexed and extended at the elbow and ultrasound was used to visualize the proximal and distal nerve segments at the site of the fracture. These segments moved in unison and remained perfectly aligned during the full range of motion. These dynamic images provided strong evidence the nerve was anatomically intact. In addition, the radial nerve was hypoechoic and enlarged at the proximal and distal sites around the fracture, with a maximal cross-sectional area of 27 mm².

Since high-resolution ultrasound suggested the radial nerve was anatomically intact, conservative management was pursued rather than surgical intervention. Three months after

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the ultrasound he was seen in follow-up and had regained the ability to extend the fingers. He was still unable to extend the wrist, but given his improvement, conservative management was continued.

Supplementary Material

Refer to Web version on PubMed Central for supplementary material.

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Figure 1.

A plain x-ray of the right humerus is shown (left), and the compound fracture is easily seen with the bullet still in the soft tissue. A cross-sectional ultrasound image at the level fracture is shown (right). The radial nerve (dotted line) is seen between the bone fragments of the fractured humerus (arrows). The cross-sectional area of the nerve is enlarged to 27mm² at this level. Although the bullet (apparent on the x-ray lateral to the fracture) is not shown in this ultrasound image, it was readily identified by ultrasound just below the skin overlying the triceps (T).