Unexpected Iching Explained by an Ulnar Nerve Anatomic Variant Documented by Sonography

Ulnar neuropathy at the elbow is the most common upper limb entrapment neuropathy after carpal tunnel syndrome, and its diagnosis is usually straightforward. The inching technique may help document the site of ulnar nerve entrapment and help decide the site of surgical release.1

A 69-year-old man with paresthesia involving the fourth and fifth fingers and clumsiness of the right hand was sent for suspected ulnar neuropathy. An examination showed mild hypoesthesia in the fourth and fifth fingers and slight weakness of the ulnar and innervated intrinsic hand muscles on the right side. His clinical history was unremarkable except for mild hypertension. An ulnar nerve electrodiagnostic study, which was performed according to current guidelines,1 documented a reduced sensory nerve action potential amplitude, a reduced motor nerve conduction velocity from above to below the elbow (37.5 m/s; below the elbow to wrist: 52 m/s), and a 40% decrease in the compound muscle action potential amplitude from below to above the elbow. An ulnar nerve inching study1 documented a 49% reduction and a further 54% decrease in the compound muscle action potential amplitude across the distal and proximal segments of the cubital tunnel, respectively (Figure 1A). A surprising 241% increase in the ulnar compound muscle action potential amplitude in comparison to the above-the-elbow value was found in the distal arm (Figure 1A). The presence of Martin-Gruber anastomosis or other anomalous median-ulnar communications was ruled-out.2

The patient underwent sonography imaging,3 which showed that when the elbow was extended, the right ulnar nerve, instead of coursing in the cubital tunnel between the olecranon and the medial epicondyle, was located anterior to the medial epicondyle, and its cross-sectional area was increased (29.4 mm²; normal values4: 8.0 ± 3.2 mm²; Figure 1B and Video 1). No changes in the ulnar nerve position were found with the elbow flexed. On the opposite side, sonography showed a normal course of the left ulnar nerve, with a cross-sectional area (12.8 mm²) in the normal range. The inching study was repeated, taking into account the abnormal course of the right ulnar nerve, and nerve entrapment was found in the area corresponding to the site of ulnar nerve enlargement (Figure 1C). The left upper limb was asymptomatic, and a left ulnar nerve electrodiagnostic study yielded normal values.

Figure 1. Ulnar nerve entrapment in a 69-year-old man. A, The inching study showed 49% and 54% decreases in the compound muscle action potential amplitude across the distal and proximal segments of the cubital tunnel, respectively, suggesting right ulnar nerve entrapment in the cubital tunnel (asterisk). A surprising 241% ulnar compound muscle action potential amplitude increase in comparison to the above-the-elbow value was found in the distal arm. B, Sonography showed a normal course of the left ulnar in the cubital tunnel between the olecranon and the medial epicondyle and a normal cross-sectional area. Note that the ulnar nerve is normally hypoechoic in the cubital tunnel. The right ulnar nerve could not be found in the cubital tunnel because it coursed anterior to the medial epicondyle when the elbow was extended, and its cross-sectional area (29.4 mm²) was substantially enlarged. Sonography with the elbow flexed did not show any change in the ulnar nerve course. Arrowheads and arrows indicate the hyperechoic profiles of the medial epicondyle and olecranon, respectively, with their posterior hypoechoic acoustic shadowing. ? marks the position where the right ulnar nerve was expected to be located, and ellipses indicate the right and left ulnar nerves. • marks the medial epicondyle (continued).
In this case, the abnormal course of the right ulnar nerve resulted in submaximal stimulation at the sites above the elbow at the time of first inching study and caused the apparently surprising finding in the inching study. We may be quite confident that this case showed an anatomic variant and not ulnar nerve instability because the nerve was anterior to the medial epicondyle in the extended elbow position, and its course did not change with the elbow flexed.

To the best of our knowledge, reports of an ulnar nerve located anterior to the medial epicondyle are very rare. It has been suggested that ulnar nerve subluxation or a previous fracture might be a predisposing factor for this abnormal nerve location, but that seemed not the case in our patient because of neither previous traumas of the elbow nor nerve subluxation on the opposite side.

Anterior transposition of the ulnar nerve into the ante-cubital fossa is a surgical treatment for ulnar neuropathy at the elbow. On the basis of the finding of an enlarged ulnar nerve in patients who had failed anterior transposition, we may speculate that the position adjacent to the medial epicondyle might predispose the nerve to recurrent trauma. Alternatively, the sharp bending of the ulnar nerve when it reached its normal course after the elbow might have represented a predisposing factor for stretch nerve damage. Anatomic ulnar nerve variations might make the diagnosis of ulnar neuropathy at the elbow difficult and might result in inappropriate surgical nerve exploration in the wrong spot. The use of sonography, which is becoming more popular in the field of electrodiagnostic medicine, might help avoid such pitfalls.

Figure 1. (continued) C. The inching study was repeated, taking into account the abnormal course of the right ulnar nerve, and it showed entrapment in the area that corresponded to the site of the ulnar nerve enlargement on sonography. • marks the medial epicondyle in C.

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References