

Ultrasound in the Diagnosis of Ulnar Neuropathy at the Cubital Tunnel

Ethan R. Wiesler, MD, George D. Chloros, MD,
Michael S. Cartwright, MD, Hae W. Shin, BS, Francis O. Walker, MD

From the Departments of Orthopaedic Surgery and Neurology, Wake Forest University School of Medicine, Winston-Salem, NC.

Purpose: Ulnar neuropathy at the cubital tunnel (UCT) is diagnosed on the basis of history, physical examination, and nerve conduction studies (NCSs); however, the wide spectrum of findings often makes the diagnosis difficult. The purpose of this study was to document the ultrasonographic differences in ulnar nerve size between patients with UCT and control subjects, and to correlate those differences with clinical examination findings and NCS abnormalities, thereby testing the validity of ultrasound (US) as an additional adjunct diagnostic modality for UCT.

Methods: Fifteen elbows in 14 patients with symptoms, clinical examination, and NCS findings consistent with UCT had US of the ulnar nerve. Patients were excluded if they had a history of polyneuropathy, acute trauma involving the upper extremity, previous trauma in the region of the elbow (including previous surgery), or brachial plexus injury. The control group consisted of 60 elbows from 30 normal volunteers that also had US. Maximal cross-sectional areas (CSAs) were measured and compared for the 2 groups and a correlation analysis was performed between nerve size and NCS findings.

Results: The average CSA of the ulnar nerve was 0.065 cm² in the control group, whereas in the UCT group it was 0.19 cm², indicating a significant statistical difference in ulnar nerve size between the 2 groups. The Pearson correlation coefficient between motor nerve conduction velocity of the ulnar nerve and the CSA was 0.80.

Conclusions: High-resolution US is a noninvasive, safe, and reliable modality for imaging the ulnar nerve at the elbow and it may provide a valuable adjunct to NCS in the diagnosis of UCT. (J Hand Surg 2006;31A:1088–1093. Copyright © 2006 by the American Society for Surgery of the Hand.)

Type of study/level of evidence: Diagnostic III.

Key words: Ulnar nerve, ulnar neuropathy, cubital tunnel, ultrasound, entrapment neuropathy.

Ulnar neuropathy at the cubital tunnel (UCT) is the second most common nerve entrapment neuropathy^{1,2} and is traditionally diagnosed by a thorough history, physical examination, and nerve conduction studies (NCSs)^{3–5}; however, UCT encompasses a spectrum of clinical findings, making it difficult to diagnose solely on clinical grounds. Furthermore, NCSs may have limitations in the diagnosis of UCT.^{3,4}

Studies have shown that enlargement of the ulnar nerve is an important component of UCT,^{6–9} thus the ability to assess this finding by ultrasound (US) measurement may prove helpful as an adjunct to NCSs in detecting patients with UCT.

There have been a limited number of ultrasound studies,^{2–4,7,8,10} most coming from a single center,^{3,4,10} that have investigated the ulnar nerve. Some of these studies had improper inclusion^{7,8} or exclusion criteria,^{2,7,8} others performed no correlation between US and NCSs,^{7,8} and others lacked control groups.^{2,4,7,8} Therefore, further data are necessary to confirm the diagnostic value of US in UCT.

The purpose of this study was to document the ultrasonographic differences in ulnar nerve size between patients with UCT and controls and to correlate these findings with clinical examination findings and NCS abnormalities, thereby testing the validity of US as an adjunct to NCSs for diagnosing UCT.

Materials and Methods

We conducted a database search based on International Classification of Diseases-9 codes to identify all patients diagnosed with UCT in the diagnostic neurology laboratory at our institution from 2003 to 2005. This yielded 80 patients. From this group, the individuals who had an US examination of the ulnar nerve were reviewed and only those with symptoms, clinical signs, and NCS results consistent with UCT were included in the study. Clinical symptoms consisted of weakness or clumsiness of the ulnar nerve-innervated muscles, numbness and paresthesias of the fourth and fifth digits of the hand, and medial elbow pain. Furthermore, patients were excluded if any of the following were found: (1) history of polyneuropathy; (2) acute trauma involving the upper extremity, previous trauma in the region of the elbow (including previous surgery); or (3) brachial plexus injury. These criteria identified a total of 14 patients (15 elbows) who were eligible for participation in the study. There were 9 males and 5 females, with a mean age of 45 years (range, 16–68y) (Table 1). In all patients, the NCSs and US had been performed and interpreted by an experienced neurologist and there was no strict order followed in performing the 2 examinations.

Clinical Evaluation

All patients were clinically assessed and the following were evaluated: pinprick sensation in the area

innervated by the ulnar nerve, muscle strength using the Medical Research Council rating scale of the first dorsal interosseous and abductor digiti minimi muscles, and the presence or absence of medial elbow pain.

Nerve Conduction Studies

The temperature of the limb was maintained at 32°C or higher and NCSs were performed with standard surface/ring electrodes, stimulation techniques, recording techniques, and filter settings as described by Kimura.¹¹ Surface stimulation was performed with the cathode placed at the proximal wrist crease, 4 cm distal to the medial epicondyle and 4 to 6 cm above the elbow. Ulnar neuropathy at the cubital tunnel was diagnosed based on the American Association of Electrodiagnostic Medicine criteria,¹² which included the presence of 1 of the following abnormalities: absolute nerve conduction velocity slowing above the elbow, decrease of nerve conduction velocity of more than 10 m/s across the elbow, decrease in amplitude of more than 20%, absent ulnar sensory responses, or signs of denervation in muscles innervated by the ulnar nerve on electromyography.

Normal Controls

The control group consisted of 30 healthy volunteers (60 elbows; 19 females, 11 males; mean age, 30 y; range, 24–50 y) who had US of the ulnar nerve. The volunteers were included in the study only if they did not complain of symptoms referable to the peripheral nervous system.

Ulnar Nerve Ultrasound

Ultrasound of the ulnar nerve was performed using a scanner with a 12/5 MHz linear-array transducer (Philips HDI 5000; Philips Medical Systems, Bothell, WA). Both groups (controls and patients) were examined in the supine position with the arm abducted.

In the normal controls, a systematic scan to follow the nerve in transverse planes was performed and 3 measurements were taken: (1) 2 cm proximal to the medial epicondyle, (2) at the epicondyle, and (3) 2 cm distal to the epicondyle. These measurements were taken for the purpose of establishing reference values (Cartwright MS, unpublished data). The maximum cross-sectional area (CSA) of the ulnar nerve found throughout the scan was recorded and used for correlation purposes.

In the patient group, the ulnar nerve, from 4 cm above to 4 cm below the elbow, was scanned and the CSA at the point of maximal swelling was recorded.

Table 1. Data for Patients With Ulnar Neuropathy at the Elbow

Elbow	Age, y	Gender	Side	Duration of Symptoms, mo	CSA, cm ²
1	58	F	R	4	0.25
2	41	M	L	2	0.12
3	49	F	L	1	0.13
4	52	M	L	1	0.37
5	58	F	L	6	0.12
6	47	M	R	N/A	0.16
7	60	M	L	8–12	0.17
8	51	M	L	7	0.16
9	51	M	R	N/A	0.14
10	16	M	L	N/A	0.09
11	38	M	L	19	0.23
13	42	F	L	4	0.16
14	68	F	L	N/A	0.27
15	50	M	L	18	0.12
Mean	45				0.19 (SD, 0.08)

A total of 14 patients (15 symptomatic elbows) were included. N/A, not applicable.

Download English Version:

<https://daneshyari.com/en/article/4071178>

Download Persian Version:

<https://daneshyari.com/article/4071178>

[Daneshyari.com](https://daneshyari.com)