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IS MEDIAL ELBOW PAIN CORRELATED WITH CUBITAL TUNNEL SYNDROME? AN ELECTRODIAGNOSTIC STUDY

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Abstract

Introduction—Medial elbow pain is often considered to be a symptom associated with ulnar neuropathy at the elbow (UNE). We examined the relationship between medial elbow pain and a positive electrodiagnostic (EDx) test result for UNE.

Methods—We performed a retrospective review of 884 patients referred for EDx evaluation of UNE. Regression models were used to determine the odds ratios between clinical findings and a positive EDx result for UNE.

Results—Patients reported medial elbow pain in 44.3% of cases. Clinical factors that correlated with a positive EDx study result for UNE included male gender, small and ring finger numbness, ulnar intrinsic weakness, and age. Medial elbow pain was negatively correlated with a positive EDx result.

Conclusions—This study demonstrates a negative correlation between medial elbow pain and a positive EDx result for UNE. Medial elbow pain should not be considered a clear diagnostic symptom of UNE.

Keywords

cubital tunnel syndrome; electrodiagnostic study; medial elbow pain; ulnar neuropathy at the elbow; tardy ulnar palsy

Medial elbow pain is a non-specific complaint that may be associated with various causes, including medial epicondylitis, elbow osteoarthritis, and ulnar collateral ligament injury. When medial elbow pain is a prominent complaint, the clinician may be well advised to consider these alternate diagnoses, although frequently the patient's presentation may be less clear, and it may include some combination of ulnar symptoms in addition to medial elbow pain. In this context, it may therefore be helpful to understand whether medial elbow pain should be considered a symptom of ulnar neuropathy at the elbow (UNE). The relationship between medial elbow pain and cubital tunnel syndrome (CuTS) has yet to be evaluated formally in the literature.

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In this study we sought to characterize the relationship between medial elbow pain and a diagnosis of UNE by electrodiagnostic (EDx) studies. Clinical findings of UNE were also evaluated and correlated with EDx examination. We hypothesized that medial elbow pain is not associated with a positive EDx study for UNE.

METHODS

Approval was obtained from our institutional review board for a retrospective study of patients who underwent clinical evaluation and EDx testing for UNE. The study population was a database of EDx examinations performed between 2003 and 2010 by a single physiatrist with certification in EDx medicine (D.S.).

The entire database was reviewed, and patient reports were selected based on orthopedic referral for evaluation of clinically suspected UNE. Patients were referred for EDx evaluation if they presented with some combination of medial elbow pain, small and ring finger numbness, ulnar intrinsic muscle weakness, and/or a Tinel sign over the ulnar nerve at the elbow. Study exclusion criteria included history of previous elbow trauma (fracture or open injury to the ulnar nerve), history of UNE, history of ulnar nerve surgery, or history of known or newly diagnosed cervical radiculopathy. No patient in the cohort had known polyarthritis or generalized multi-joint arthritis.

A total of 884 EDx studies satisfied the inclusion criteria. The EDx reports were evaluated for: (1) a report of medial elbow pain or pain over the medial elbow on physical examination; (2) reported or objective small and ring finger sensory symptoms; (3) reported or objective ulnar intrinsic muscle weakness; (4) presence of a Tinel sign over the ulnar nerve at the elbow; and (5) a positive or normal EDx result for UNE. EDx studies for each patient were performed and interpreted by a single physician (D.S.). The diagnosis of UNE was made according to the guidelines and standards found in the American Association of Neuromuscular and Electrodiagnostic Medicine (AANEM) practice parameter.[1] The data obtained for all study patients included: ulnar antidromic sensory nerve action potentials (SNAPs) recorded from the small finger; ulnar compound muscle action potentials (CMAPs) recorded from either the abductor digiti minimi (ADM) or first dorsal interosseous (FDI) muscles with stimulation at the wrist and above and below the elbow; and ulnar F wave. Arm position was carefully maintained with the same degree of elbow flexion in all studies. The dorsal ulnar cutaneous nerve (DUC) and ulnar short segment studies (“inching” technique) were employed in patients when UNE was not clearly diagnosed using routine studies. All patients, at a minimum, were evaluated with needle electromyographic (EMG) examination of ulnar-innervated muscles. If a patient had signs or symptoms of radiculopathy or had an abnormal examination of ulnar-innervated muscles, additional needle examination was performed to evaluate for brachial plexopathy or cervical radiculopathy. Any additional EDx findings, such as median neuropathy or cervical radiculopathy, were documented. Patient demographics, including gender and age, were evaluated.

Statistical analyses were performed using R version 3.0.2 software (© 2004–2013 The R Foundation for Statistical Computing, Mac OS platform). Normative data were obtained

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from the AANEM practice parameter and the technique described by Buschbacher.[2] Before a definitive integrative model was fitted, a series of univariate tests were conducted; t-tests and Mann–Whitney–Wilcoxon tests were used for patient age, and the Pearson chi-square test was used for the remaining categorical variables. A univariate logistic regression model was then fitted to describe the relationship between medial elbow pain and UNE in isolation. The results of this study and the design were over-seen by a qualified department statistician.

Once a correlation between medial elbow pain and UNE was established, a full model was constructed to allow 3-way interaction of terms. Backward stepwise regression was used to select the optimum analysis, which returned a logistic regression model. The Hosmer–Lemeshow test was used to verify suitability of fit.

RESULTS

Of the 884 patients referred for EDx evaluation for UNE, 323 (36.5%) had a positive EDx test result for the neuropathy. The mean patient age was 46 years (range 14–93 years). There were 507%) women and 377 (42.6%) men included in the study.

Univariate testing of categorical variables using the Pearson chi-square independent test revealed statistically significant relationships for all predictive variables as they compared with a positive EDx result for UNE, except for Tinel sign (Table 1). Univariate testing of the only continuous variable, patient age, was performed using both the t-test and Mann–Whitney–Wilcoxon test and revealed a statistically significant relationship with EDx outcome.

A univariate logistic regression of medial elbow pain revealed a negative correlation with EDx study outcome, with an odds ratio of 0.5439 (95% confidence interval 0.4101–0.7213), which suggests the presence of medial elbow pain actually predicted a negative EDx study result for UNE ($P < 0.0001$). Multivariate regression modeling results are shown in Table 2.

DISCUSSION

In this study we have established that medial elbow pain may not be a clear and diagnostic symptom of UNE. It may be negatively correlated with UNE, as determined by EDx evaluation. In addition, the analysis indicates that the likelihood of a positive study for UNE is related to the clinical signs and symptoms of UNE in each patient. Ulnar-innervated muscle weakness or abnormal sensation in the ulnar nerve distribution suggests a very high likelihood ratio for a positive EDx study. Conversely, medial elbow pain without significant signs of UNE, such as a positive Tinel sign at the elbow or intermittent paresthesias in the ulnar distribution, did not correlate with a positive EDx study.

There are several limitations to our study. First, this was a retrospective chart review. Multiple surgeons within our network examined and referred the patients for EDx studies with the suspected diagnosis of CuTS. The clinical examination before the EDx studies was not standardized among the referring physicians. However, all patients were assayed for medial elbow pain as part of their evaluation in addition to evaluation for other standard perceived predictors of UNE. This notwithstanding, EDx studies investigating UNE have a

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wide range of sensitivity,[1,3–5] and it is possible that the patients in our study who presented with medial elbow pain and symptoms of UNE had mild neuropathy below the threshold of the EDx examination. Of the patients referred for EDx testing for suspected UNE, 36.5% had a positive EDx test result, which was at the low end of earlier reports.[3,4] Many of the patients referred for EDx evaluation had medial elbow pain as their primary symptom, with ulnar symptoms as a secondary indication. This may explain why our cohort had a lower incidence of a positive EDx result, as this test may have a higher sensitivity for detecting patients referred for primary UNE symptoms.[4] In addition, Campbell et al. suggested that the standard practice of measuring conduction velocities at the elbow over a minimum distance of 10 cm may further limit the sensitivity of EDx testing for UNE.[6]

In conclusion, the outcome of an EDx study in a patient with predominant medial elbow pain, even with symptoms of UNE, is likely to be normal. Future research should address the fundamental challenge of the study of UNE, with the goal of improving EDx studies as the tool for diagnosis.

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Abbreviations

AANEM	American Association of Neuromuscular and Electrodiagnostic Medicine
ADM	abductor digiti minimi
CMAP	compound muscle action potential
CuTS	cubital tunnel syndrome
DUC	dorsal ulnar cutaneous nerve
EDx	electrodiagnosis
FDI	first dorsal interosseous
SNAP	sensory nerve action potential
UNE	ulnar neuropathy at the elbow

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Table 1

Summary of categorical variables.

	UNE-negative CuTS	UNE-positive CuTS	Total	P-value
Medial elbow pain				
Absent	282	210	492	<0.0001
Present	279	113	392	
Gender				
Women	357	150	507	<0.0001
Men	204	173	377	
Tinel sign				
Absent	332	176	508	0.1978
Present	229	147	376	
Small and ring finger numbness				
Absent	169	37	206	<0.0001
Present	392	286	678	
Ulnar intrinsic weakness				
Absent	482	220	702	<0.000
Present	79	103	182	

UNE, ulnar neuropathy at the elbow; CuTS, cubital tunnel syndrome.

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Table 2

Multivariate regression model.

	P-value	OR	CI 2.5%	CI 97.5%
Medial elbow pain	0.0149*	0.6838	0.5036	0.9284
Male gender	<0.0001*	2.0472	1.5151	2.7662
Tinel sign	0.1385	1.2593	0.9282	1.7085
Small and ring finger numbness	<0.0001*	2.8930	1.9177	4.3643
Ulnar intrinsic weakness	<0.0001*	2.1231	1.4826	3.0403
Age	<0.0001*	1.0359	1.0245	1.0473

OR, odds ratio; CI, confidence interval.