Prevalence of Carpal Tunnel Syndrome in a Hand Surgeon's Practice

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Abstract

Purpose Additional methods of diagnosing carpal tunnel syndrome (CTS) are increasingly being investigated, such as ultrasound or diagnostic tools such as carpal tunnel syndrome 6 (CTS-6), and the sensitivity and specificity of these tests are determined by the pretest probability and thereby the prevalence of a condition. It is critical that the prevalence used in these calculations accurately reflects the population undergoing these tests for a true assessment of their quality. Orthopaedic surgeons and, specifically, upper extremity specialists are most often studying these diagnostic methods, and given referral patterns, these physicians likely have a greater prevalence of CTS in their clinics than previously published for only the general population (5%). The purpose of this study is to define the prevalence of CTS in a hand surgery practice consisting of three fellowship-trained orthopaedic hand surgeons for use in future assessing the accuracy of diagnostic tests for CTS among patients presenting to a hand surgeon for evaluation.

Methods All the adult patients (≥ 18 years) who had a face-to-face encounter with an orthopaedic surgeon in this practice between January 1 and December 31, 2014 were identified. The ICD-9 code 354.0 was used to identify all patients diagnosed with CTS. The medical records of all patients with ICD-9 code were reviewed and the results of electrodiagnostic testing (EDX) documented.

Results A total 56,641 patients were evaluated by the orthopaedic department from January 1 to December 31, 2014. Of these patients, 812 (1.4%) had EDX-confirmed CTS. The prevalence of EDX-confirmed CTS was 0.2% for nonhand orthopaedic specialists and 10.7% for hand specialists. Of those seen by the hand subspecialists, 66% were female, 34% were male with the right hand affected in 42%, left in 26%, and bilateral upper extremities in 32%.

Conclusion Current literature demonstrates a prevalence of CTS among the general population of 5%. The authors have demonstrated a prevalence of CTS in an orthopaedic surgical practice to be 1.4% with a prevalence of only 0.2% noted among nonupper extremity orthopaedic specialists. They have determined the prevalence of EDX confirmed CTS in a tertiary referral hand practice to be 10.7%, much higher than the prevalence in the general population. Accurate identification of the prevalence of CTS within these patient groups is critical for statistical analysis of new diagnostic tools being developed to assess for CTS.

Level of Evidence Level IV, cross-sectional, prognostic.

Keywords

- carpal tunnel syndrome
- prevalence
- specialty practice

Introduction

Carpal tunnel syndrome (CTS) is the most common compression neuropathy of the upper extremity.¹ Though the

prevalence of CTS in the general population and of patients presenting to a European general orthopaedic practice has been previously documented,² the prevalence of CTS in a hand surgery practice is unclear. Intuitively, the prevalence

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of CTS would be higher in this setting. Higher prevalence can have important effects on the pretest probability and predictive values of common confirmatory tests such as electrodiagnostic testing (EDX) and ultrasound. Given that a hand surgery practice is likely where confirmatory tests are assessed on patients, accurate understanding of the prevalence of CTS within a hand surgery practice is important for evaluation of new confirmatory tests.

Most CTS prevalence studies have involved mailing surveys to a specific population and inviting a sample of respondents to return for a clinical examination and additional testing. Atroshi et al² found numbness and tingling in the median nerve distribution present in 14% of respondents. However, in a small subset of these patients who were examined by a physician, only 3.8% patients had clinical evidence of CTS and nerve conduction studies were positive in 4.9% of patients. Nerve conduction studies were positive in 18% of asymptomatic patients in this study, calling into question their utility. Papanicolaou et al³ used Katz hand diagrams and a CTS survey to estimate a prevalence of 3.7% CTS in the general population. de Krom et al.⁴ found that the prevalence of electrodiagnostically confirmed CTS was 5.8% in adult women and 0.6% in adult men. Dale et al⁵ found a prevalence of 7.8% in a working US population.

The current literature lacks an accurate prevalence of CTS among hand and upper extremity specialist practices. This is vital for assessment of confirmatory tests for CTS such as ultrasounds or other diagnostic tools, as most confirmatory tests are evaluated on patients within a hand and upper extremity specialist practice. The purpose of this study is to define the prevalence of CTS in a hand and upper extremity practice consisting of three fellowship-trained hand surgeons.

Methods

A cross-sectional study was designed to investigate the prevalence of CTS of the department of orthopaedics at a university tertiary referral center and compare this to the prevalence for the hand specialists within this group. This study was conducted with the approval of the institutional review board (#PRO 15070038). All adult patients evaluated by an orthopaedic surgeon between January 1 and December 31, 2014 were identified by searching billing databases for ICD-9 code 354.0. Duplicate patients were removed to determine the number of unique patients evaluated over the study period. The prevalence of CTS within the entire orthopaedic practice as well as among each of the subspecialties was calculated. The medical records of each patient with a diagnosis code consistent with a diagnosis of CTS were reviewed to determine if EDX had been performed, laterality, sex, and age of each patient.

Results

A total of 56,641 unique adult patients were evaluated by the orthopaedic department over the study period. The total number of unique patients clinically diagnosed with CTS was 1,171 (2.1%) by ICD-9 code. Total 912 patients underwent EDX studies with confirmed CTS in 812 (1.4% of the total patients

evaluated in total, 69.3% patients clinically diagnosed with CTS). Of the remaining 359 patients, 100 had negative EDX studies, 71 had EDX studies ordered but not performed, and 171 were not recommended EDX studies.

The fellowship-trained hand surgeons evaluated 7,145 of the total 56,641 patients seen within the department and 1,083 were clinically diagnosed with CTS (16.3%) by ICD-9 code. Of the hand surgeon practice, 858 of the 1,083 patients clinically diagnosed with CTS underwent EDX, with 92 negative tests (8.49%) and 766 positive tests (70.73%). Tests were ordered in 62 (5.72%) patients but not performed, and 163 (15.05%) patients were not recommended additional testing.

The non-upper extremity specialists within this orthopaedic practice evaluated a total of 49,496 patients and clinically diagnosed 88 of them with CTS (0.18%). Of the 88 clinically diagnosed with CTS, 54 underwent diagnostic testing with 46 (52.3%) positive EDX, 8 (9.1%) negative EDX, 9 (10.2%) recommended testing, and 25 (28.4%) not recommended any additional testing.

The prevalence of EDX-confirmed CTS was 1.4% for the entire orthopaedic practice and 10.7% for hand specialists. Of those seen by the hand subspecialists, 66% were female, 34% were male with the right hand affected in 42%, left in 26%, and bilateral upper extremities in 32%. ►Table 1 describes the distribution of patients by age.

Discussion

This study has found the prevalence of EDX confirmed CTS to be 1.4% in an academic orthopaedic practice and 10.7% in the practice of fellowship-trained hand surgeons. The prevalence in this general orthopaedic practice is similar to that reported in previous studies.²⁻⁴ The prevalence in the fellowship-trained hand surgeon practice is much higher than previously reported, and it likely reflects referral patterns and filtering of patients by the scheduling department.

Identification of the prevalence of CTS within an upper extremity specialist group is important in evaluating the quality of new methods of confirming CTS. Alternative methods of assessment, including ultrasound or diagnostic tools such as carpal tunnel syndrome 6 (CTS-6), are gaining interest as they offer a less expensive and expedited ability to confirm

Table 1 Patients with CTS seen by hand subspecialists

Age range (y)	Number of patients (%)
< 20	2 (0.3)
20–29	21 (3)
30–39	81 (11)
40–49	98 (13)
50–59	248 (32)
60–69	154 (20)
70–79	100 (13)
80–89	52 (7)
> 90	10 (1)

Abbreviation: CTS, carpal tunnel syndrome.

CTS; however, accuracy of these tests need to be evaluated. Sensitivity and specificity of these tests are determined by the pretest probability and thereby the prevalence of a condition. It is critical that the prevalence used in these calculations accurately reflects the population undergoing these tests for a true assessment of their quality. The prevalence of a condition may greatly affect the accuracy of diagnostic testing. For example, if the prevalence of CTS is high, the diagnostic accuracy of EDX will be artificially improved. Therefore, the patient population and practice type in a given study should be considered when applying this study results to one's own practice. Fowler et al reported sensitivity and specificity exceeding 80% when using ultrasound and EDX to confirm a clinical diagnosis of CTS.⁶ It should be noted that this study was performed in a hand specialty center with a high prevalence of CTS, likely similar to that found in the current study. A general orthopaedic surgeon with a lower prevalence of CTS in his/her practice should expect a lower sensitivity and specificity of both tests. This is a serious hurdle when trying to apply research performed in specialty centers to general practice. Specialty centers attract the surgeon expertise and patient numbers to perform the study; however, by increasing the prevalence of the disease state, it may make the findings less applicable in lower prevalence populations.

The difference in prevalence between EDX-confirmed CTS and ICD-9 CTS should be noted. Both hand specialists and general orthopedists had negative EDX rates around 10%. Given that the rates are similar, intuitively that means it is an issue with the test and not the diagnosis. The reason for the number of negative EDX is unclear but likely multifactorial. It is possible that some patients were given a clinical diagnosis of CTS but had negative EDX. In these instances, it is unclear whether the EDX is a false negative or if the clinical diagnosis was incorrect. Witt et al reported a false-negative rate of 25% for EDX in patients with a clinical diagnosis of CTS.⁷ However, in the current study, the clinical diagnosis of CTS was made by numerous orthopaedic surgeons using a variety of clinical criteria and varied clinical experience. The true prevalence likely falls somewhere between the EDX-confirmed prevalence and ICD-9 code prevalence.

A limitation of the study is the reliance on the use of an ICD-9 code. This introduces selection bias as it is possible that in some cases a patient may have had CTS, but was seeing a subspecialist for an unrelated complaint and the subspecialist only documented the ICD-9 code for only the chief complaint for the office visit. It is also possible that nonhand subspecialists identified patients with CTS and referred these patients to the fellowship-trained hand surgeons, deferring the diagnosis

of CTS pending their evaluation. It is also possible that some patients were erroneously diagnosed with CTS; however, these patients would still be counted as having CTS in this study design. Additionally, there was no standard protocol for the clinical diagnosis of CTS. Some surgeons may have made the diagnosis based on clinical findings alone and others may have based the diagnosis on a combination of clinical findings and EDX. The authors have attempted to minimize this limitation by presenting prevalence both by ICD-9 and EDX confirmation.

This study has found the prevalence of EDX-confirmed CTS to be 1.4% in an academic orthopaedic practice and 10.7% in the practice of fellowship-trained hand surgeons. These data will be important for determining the accuracy of confirmatory tests for CTS as the prevalence of 10.7% reflects the patient population in which confirmatory tests or diagnostic tools for CTS are most often assessed (by a hand surgery practice). This is a notable difference from prior studies that failed to assess prevalence specifically within the patient population most often used for analysis diagnostic tests for CTS.

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Conflict of Interest

None.

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