

The Benefit of Carpal Tunnel Release in Patients With Electrophysiologically Moderate and Severe Disease

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Purpose To compare change in numbness and pain after carpal tunnel release in patients with electrophysiologically moderate and severe disease.

Methods We tested the primary null hypothesis that there is no difference in the total Carpal Tunnel Symptoms Scale score 3 months after surgery between patients with moderate and those with severe disease. Ninety-five patients (47 in the moderate cohort, and 48 in the severe cohort) who had miniopen carpal tunnel release between November 2011 and November 2013 were identified from our prospectively collected database. For each patient, the total Carpal Tunnel Symptoms Scale score, as well the numbness and pain subscale scores, at the preoperative and postoperative (2-wk, 1-mo, 2-mo, 3-mo, \geq 1-y) visits were documented. The data were analyzed with repeated-measures analysis of variance.

Results Three months after surgery, patients with moderate carpal tunnel syndrome (CTS) reported, on average, no symptoms, and patients with severe disease had reduced but unresolved symptoms. Although symptoms diminished in both groups from the preoperative assessment to the 2-week postoperative assessment, patients with severe CTS had comparatively more severe symptoms at all time points with the exception of pain at 2 weeks and 1 year or longer after surgery, at which times there was no significant difference. At 1 year or longer after surgery, 1 (2%) patient with moderate CTS and 9 (19%) patients with severe CTS reported continued symptoms. Preoperative electrodiagnostic severity was the factor most predictive of symptom scores.

Conclusions Patients with severe CTS experience considerable reduction in symptoms after surgery but should be informed that recovery may be more prolonged and, in some cases, incomplete 1 year after carpal tunnel release, particularly with regard to numbness. (*J Hand Surg Am.* 2015;40(3):438–444. Copyright © 2015 by the American Society for Surgery of the Hand. All rights reserved.)

Type of study/level of evidence Prognostic III.

Key words Carpal tunnel, electrodiagnostic, severe, moderate, release, benefit.



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CARPAL TUNNEL SYNDROME (CTS) is the most commonly diagnosed^{1–3} and treated⁴ idiopathic peripheral mononeuropathy in the upper extremity. Operative treatment is the only known disease-modifying treatment.^{5–12} Preoperative electrodiagnostic testing is commonplace and most patients undergoing surgery have either moderate or severe disease.¹³ Electrophysiological tests do not always return to normal after surgery, particularly for

TABLE 1. Baseline Characteristics of the Study Population Stratified by CTS Severity

Parameter	All Patients (n = 95)	CTS Severity		P
		Moderate (n = 47)	Severe (n = 48)	
Age* (y)	60 ± 12 (25–87)	57 ± 11 (36–81)	63 ± 12 (25–87)	.013
Sex [†]				
Female	51 (54)	23 (48)	28 (60)	.26
Male	44 (46)	25 (52)	25 (52)	
Diabetes [†]	13 (14)	1 (2.1)	12 (25)	.001
Side affected [†]				
Left	39 (41)	22 (47)	17 (35)	.26
Right	56 (59)	25 (53)	31 (65)	

*The values are given as the mean and SD, with the range in parentheses.

†The values are given as the number of patients, with the percentage in parentheses.

patients with more advanced pathology.^{14–18} As a result, hand surgeons debate whether carpal tunnel release is effective in resolving symptoms among patients with severe disease.^{19–23} A few case series document satisfaction with treatment in spite of incomplete symptom improvement in patients with advanced disease including thenar atrophy, weakness, and static numbness.^{19,20,24–26}

This retrospective review of prospectively collected data compared symptom (numbness and pain) reduction in patients with electrophysiologically moderate or severe CTS. The primary null hypothesis was that there is no difference in the total Carpal Tunnel Symptoms Scale (CTSS)²⁷ score 3 months after carpal tunnel release between patients with moderate and those with severe CTS on electrodiagnostic testing. Secondly, we addressed the null hypothesis that there is no difference in the pain and numbness subscale scores of the CTSS and the total CTSS score at any time point after carpal tunnel release between patients with moderate and those with severe CTS and that there is no change in CTSS scores more than 2 weeks after surgery. Finally, we studied the factors associated with CTSS (total and subscale) scores 3 months after carpal tunnel release.

MATERIALS AND METHODS

Study design

Following institutional review board approval, we identified all patients who had miniopen carpal tunnel release (Current Procedural Terminology code 64721) performed under local anesthesia, with or without conscious sedation, between November 2011 and November 2013 performed by a single hand

surgeon. Patients underwent electrodiagnostic testing (electromyography and nerve conduction velocity) prior to consideration of surgery. The disease was graded as moderate or severe according to the American Association of Electrodiagnostic Medicine modified criteria for diagnosis of CTS in those who were offered surgical treatment.²⁸ Moderate disease was defined as abnormal median sensory distal latency and prolonged (relative or absolute) median motor distal latency. Severe disease was defined as prolonged median motor and sensory distal latencies, with either an absent sensory nerve action potential or mixed nerve action potential or low amplitude or absent thenar compound muscle action potential.²⁸ The electrodiagnostic testing was performed in a single office by 1 of 2 board-certified physical medicine and rehabilitation physicians with advanced training in electrodiagnostic testing using a consistent technique. All patients with advanced CTS were offered surgery.

There were no patients younger than 18 years old or with untreated endocrinopathies. We excluded patients with concomitant hand surgery procedures (n = 141); revision carpal tunnel surgery (n = 2); other nerve entrapments (eg, cubital tunnel syndrome) or neurological diagnoses (eg, cervical radiculopathy, idiopathic peripheral neuropathy) (n = 72); incomplete preoperative or postoperative clinical records (n = 37); electrodiagnostic testing performed by another physician (n = 12), or an active workers' compensation claim (n = 11). The final study cohort consisted of 95 patients: 47 with moderate CTS and 48 with severe CTS.

We collected data on age, sex, side affected, and history of diabetes. Our standard of practice was to

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