EDITOR'S CHOICE

Electrodiagnostic Grade and Carpal Tunnel Release Outcomes: A Prospective Analysis

Michael Rivlin, MD,* Amir R. Kachooei, MD,† Mark L. Wang, MD, PhD,* Asif M. Ilyas, MD*

Purpose The value of electrodiagnostic (EDX) study grades as a prognostic indicator of clinical results after carpal tunnel release (CTR) remains controversial. In this study, we tested the primary null hypothesis that symptom relief after CTR would not differ based on EDX grade. Secondarily, we evaluated the degree of symptomatic and functional postoperative improvement relative to preoperative EDX grade.

Methods We prospectively evaluated 199 consecutive patients with 256 hands after CTR confirmed with EDX. Data were collected before surgery and patients were observed at 2 weeks and 3 months after surgery. There were 20 hands with mild, 126 with moderate, and 110 with severe involvement in the preoperative EDX. Demographic, EDX grade (mild, moderate, or severe); surgical parameters; *Quick*—Disabilities of the Arm, Shoulder, and Hand questionnaire; symptom severity scale, functional status scale, pain catastrophizing scale, and visual analog scale data were collected and analyzed.

Results There was significant improvement in *Quick*—Disabilities of the Arm, Shoulder, and Hand, symptom severity scale, and functional status scale scores from the preoperative to 2-week and 3-month postoperative visits in all categories of EDX grade. There was no significant difference in the extent of recovery by the 2-week and 3-month visits relative to EDX grade. Catastrophic thinking did not have a significant effect on any of the 3 groups. Pain decreased dramatically at 2 weeks after surgery but there was no additional significant difference in visual analog scale scores between the 2-week and 3-month postoperative visits. Postoperative pain improvement occurred regardless of EDX grade. There were no major complications or reoperations in any group.

Conclusions Carpal tunnel release demonstrated consistently significant improvement in outcomes regardless of EDX grade at initial and final follow-up. The extent of postoperative improvement after CTR overall was also not statistically different between groups with differing EDX severity. Older patients with severe CTS achieved more modest gains. *(J Hand Surg Am. 2017;■(■):■–■. Copyright © 2017 by the American Society for Surgery of the Hand. All rights reserved.)*

Type of study/level of evidence Prognostic II.

Key words Carpal tunnel release, carpal tunnel syndrome, electrodiagnostic study, endoscopic.

*From the *Department of Hand and Orthopaedic Surgery, Rothman Institute, Thomas Jefferson University, Philadelphia; and the †Department of Hand and Wrist Surgery, Rothman Institute, Bryn Mawr, PA.*

Received for publication December 4, 2016; accepted in revised form December 4, 2017.

No benefits in any form have been received or will be received related directly or indirectly to the subject of this article.

Corresponding author: Michael Rivlin, MD, Department of Hand and Orthopaedic Surgery, Rothman Institute, Thomas Jefferson University, 925 Chestnut Street, 5th Floor, Philadelphia, PA 19107; e-mail: michael.rivlin@rothmaninstitute.com.

0363-5023/17/■ ■-0001$36.00/0
https://doi.org/10.1016/j.jhsa.2017.12.002

Despite the common use of electrodiagnostic (EDX) testing to corroborate the clinical impression of carpal tunnel syndrome (CTS), its importance as an essential diagnostic component of the preoperative workup continues to be disputed. Supplemental EDX testing has been reported to add minimal benefit to increasing the probability of diagnosis of CTS.[1] As a result, some providers have proposed that the routine ordering of EDX for clinically diagnosed CTS is unnecessary, and suggest that it is an extraneous study that accomplishes little to alter surgical treatment strategy.[2,3] More recently, the American Academy of Orthopaedic Surgeon's Clinical Practice Guidelines have indicated that EDX may be helpful but not required to establish the diagnosis of CTS.[4]

Although the diagnostic value of EDX in CTS has been widely debated, the importance of EDX severity grade as a prognostic indicator of clinical results after carpal tunnel release (CTR) also remains controversial.[5–8] Furthermore, the impact of CTR on disease modification in patients with an EDX grade of severe has yet to be clearly elucidated,[9] because our current understanding is largely limited to retrospective reviews.[2,5,7] In this study, we tested the primary null hypothesis that symptom relief after CTR would not differ based on EDX grade. Secondarily, we prospectively evaluated the degree of symptomatic and functional postoperative improvement relative to preoperative EDX grade.

TABLE 1. Demographic Characteristics of Patients Undergoing CTR (n = 256)

Characteristics	n (%)
Age, mean (SD)	62 (14)
Sex	
Male	108 (42)
Female	148 (58)
Side	
Right	147 (57)
Left	107 (42)
Both	2 (1)
Electromyograph	
Mild	20 (8.0)
Moderate	126 (49)
Severe	110 (43)
Symptom duration, y*	
<1	79 (31)
1–3	76 (30)
3–5	37 (15)
5–10	38 (15)
≥10	23 (9.0)
CTR technique*	
Open	166 (65)
Endoscopic	84 (33)

*Missing data are not presented.

MATERIALS AND METHODS

After receiving institutional review board approval, we solicited all consecutive patients indicated for CTR surgery by any of 8 hand surgery fellowship-trained orthopedic surgeons to enroll. We prospectively included 199 patients with 256 hands with a diagnosis of CTR confirmed upon EDX. An inclusion criterion was to have EDX-verified CTS before CTR surgery. All EDX were performed by a fellowship-trained electromyographer and were graded as electrophysiologically mild, moderate, or severe according to criteria established by Werner and Andary.[3] We excluded patients with concomitant procedures (ie, concomitant trigger finger release), prior CTR on the ipsilateral side, inpatient surgery, age less than 18 years, acute CTS, or emergent CTR performed for a traumatic etiology. There were 20 hands with mild, 126 with moderate, and 110 with severe involvement on the preoperative EDX. Patients and surgeons were asked to fill out a paper questionnaire including demographic data, surgical technique, insurance, Levine–Katz CTS symptom severity scale, functional status scale,[10] insomnia severity index scale,[11] *Quick*—Disability of the Arm, Shoulder, and Hand (*Quick*DASH) questionnaire,[12] and pain catastrophizing scale[13] before surgery, as well as at 2 weeks and 3 months after surgery. Demographic data were collected at the initial visit, along with the *Quick*DASH questionnaire. At each visit, symptom severity scale (SSS), functional status scale (FSS), and visual analog scale data were also collected (Table 1).

The CTR surgical technique (open vs endoscopic) was not controlled for and was indicated based on the preference of the patient and surgeon. The open technique was performed through a 1.5- to 2-cm incision placed at the base of the volar hand in line with the third web space. The superficial palmar fascia was cut in line with the skin incision. The transverse carpal ligament was then released longitudinally with direct visualization until complete decompression of the median nerve was confirmed. The endoscopic technique consisted of making a 1-cm transverse incision about 0.5 cm proximal to the volar wrist crease and tangential to the level of the hamate at the wrist level. This was followed by soft tissue dissection to the flexor retinaculum. A distally