SCIENTIFIC ARTICLE

Prospective Pilot Study Comparing Pre- and Postsurgical CTSAQ and Neuro-QoL Questionnaire with Median Nerve High-Resolution Ultrasound Cross-Sectional Areas

Tuan A. Tran, MD, MBA,* Lisa M. Williams, MD,† Donna Bui, BA,* Colleen Anthonisen, BA,† Eduard Poltavskiy, MS,‡ Robert M. Szabo, MD, MPH*

Purpose The aims of this study were (1) to assess the utility of the Quality of Life in Neurological Disorder (Neuro-QoL) questionnaire in patients with carpal tunnel syndrome by comparing the validated patient-reported outcome (PRO) measure Neuro-QoL to the validated Carpal Tunnel Syndrome Assessment Questionnaire (CTSAQ) before and following carpal tunnel release, (2) to compare the measurements of the median nerve cross-sectional area (CSA) using high-resolution ultrasound (HRUS) before and after surgery, and (3) to determine a correlation between HRUS and PRO.

Methods Individuals diagnosed with carpal tunnel syndrome were evaluated using the CTSAQ, Neuro-QoL, and HRUS before surgery and at 3 months after surgery.

Results Twenty patients completed the study. Overwhelmingly, there was an improvement in symptoms and function assessed by patients on both the Neuro-QoL and the CTSAQ at 3 months after surgery. The Neuro-QoL Physical Function and Upper Extremity scores had strong correlation with the CTSAQ activity score but had low to moderate correlation with the CTSAQ symptoms score, before and after surgery. The HRUS measurements of the median nerve at the carpal tunnel inlet demonstrated a decrease in CSA whereas no noticeable changes were observed at mid tunnel and at the outlet (hook of hamate). The correlations between the ultrasound findings and PRO measures ranged from weak to strong.

Conclusions Patients had resolution of symptoms and higher physical function following carpal tunnel release measured by both the CTSAQ and the Neuro-QoL scores. The Neuro-QoL self-assessment questionnaire, a measurement of quality of life, correlated well with the CTSAQ. Therefore, it could be used as a self-assessment outcomes tool in patients undergoing carpal tunnel release. At 3 months after surgery, HRUS measurements of the median nerve CSA showed a noticeable decrease of CSA only at the inlet of carpal tunnel. This objective improvement correlated with the improvement in CTSAQ and Neuro-QoL scores. *(J Hand Surg Am. 2017;■(■):1.e1-e9.*

Type of study/level of evidence Diagnosis II.

Key words Carpal tunnel, Neuro-QoL, CTSAQ, ultrasound.

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*From the *Department of Orthopedics, †Department of Physical Medicine and Rehabilitation, and ‡Graduate Group of Epidemiology, University of California at Davis, Sacramento, CA.*

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Corresponding author: Robert M. Szabo, MD, MPH, Department of Orthopedics, UC Davis, 4860 Y St., Suite 3800, Sacramento, CA 95817; e-mail: rmszabo@ucdavis.edu.

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Carpal tunnel syndrome (CTS) is caused by compression of the median nerve at the wrist and is the most frequently occurring peripheral nerve compression disorder.[1,2] The diagnosis is mainly clinical and based on a classic triad of symptoms of night pain, paresthesia in the median nerve distribution, and thenar weakness.[3,4] After failing a trial of nonsurgical treatment, surgery is indicated.

Current concepts regarding the pathophysiology of CTS are based on anatomical factors, namely the cross-sectional area (CSA) of the carpal tunnel, and wrist and hand anthropometric measurements.[5,6] Detailed characterization of the spatial constraints in the carpal tunnel and of the median nerve itself is lacking due to unstandardized imaging protocols. Recent advances in high-resolution ultrasound (HRUS) technology have the potential to solve these technical problems. A CSA view of the median nerve using HRUS at the carpal tunnel is an emerging technique in supporting the diagnosis of CTS and monitoring the efficacy of treatments.[7−16] Data are limited, however, owing to poor protocol standardization and CSA study designs. To our knowledge, no studies have correlated ultrasound findings of before and after carpal tunnel release with patient reported outcomes (PRO) such as the Quality of Life in Neurological Disorders (Neuro-QoL). The Neuro-QoL[17,18] questionnaire is an emerging patient-centered measurement tool to address quality of life issues in neurological conditions. It is used to assess health-related quality of life in many neurological disorders (eg, epilepsy, stroke, muscular dystrophies, Parkinson disease, multiple sclerosis), and encompasses physical, mental, and social domains. Each domain includes self-reported questionnaires to assess quality of life including, but not limited to, upper and lower limb function, activities of daily living, social interaction, depression, and anxiety. As such, it is a robust validated neurological disease PRO that is different from a disease-specific or region-specific PRO.

With respect to CTS, past research has focused on assessing objective clinical measures like electrodiagnostic tests with less emphasis on the development of validated patient-reported quality of life outcome tools, yet the treatment algorithm for CTS now relies heavily on patient-reported symptoms. The current general and regional upper limb outcome measures that are used in CTS studies include the Short-Form 36-item questionnaire[19] and the Disabilities of the Arm, Shoulder, and Hand[20] questionnaires. Hand function−specific and CTS-specific questionnaires have also been validated, and these include the Carpal Tunnel Syndrome Assessment Questionnaire (CTSAQ)[21,22] and the Michigan Hand Outcomes Questionnaire.[23] The CTSAQ is divided into 2 parts (symptom severity and function) and measures 8 common hand activity−related tasks and an 11-item symptom severity scale including night- and daytime pain, numbness, and weakness. The CTSAQ has been compared with objective tests, namely neurophysiological studies, with variable findings.

The Neuro-QoL Upper Extremity function domain (Table 1) is evaluated in this study and compared with objective structural changes of the median nerve before and after carpal tunnel release as well as to the reference standard CTSAQ outcome measure. Although the Neuro-Qol has been validated in more severe neurological diseases, its Upper Extremity Function Module has not been tested in an isolated upper extremity neurological condition. If it proves to be sensitive, it may be useful to include the Mental Health and Social Health Modules for CTS and other upper extremity neurological conditions in future research.

In this pilot study, we aimed to use HRUS in a standardized protocol with a prospective study design to characterize median nerve CSA before and after surgery. We also compared pre- and postsurgery PRO comparing Neuro-QoL with the CTSAQ, which served as the reference standard. Lastly, we examined the correlation between the HRUS findings and both PRO measures.

METHODS

Participants

This study was approved by the institutional review board. Participants adhered to the study protocol and signed an informed consent to participate. Twenty patients with CTS were studied. Participants with a clinical diagnosis of CTS were recruited from a single surgeon's (R.M.S.) hand clinic from January 1, 2014, to March 1, 2016. Carpal tunnel syndrome was diagnosed with a combination of the nerve compression test, Phalen test, Tinel test, 2-point discrimination, light touch, and motor testing of the thenar muscles. Although each finding was not present in every patient, the history of numbness, tingling, and nocturnal pain in the median nerve distribution; positive electrodiagnostic tests; and 2 or more positive physical findings were considered necessary for the diagnosis of CTS. A failure of nonsurgical treatment (use of a nighttime orthosis for 6 weeks) was an indication for surgery, which was a necessary component for being entered into this study. Patients with a diagnosis of moderate to severe CTS defined by electrodiagnostic criteria for the preceding 2 months were included.