Subjective and Objective Differences in Patients with Unilateral and Bilateral Carpal Tunnel Syndrome and the Role of Obesity in Syndrome Severity

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INTRODUCTION:

Recently, US has gained popularity as a useful tool in the diagnosis and prognostication of carpal tunnel syndrome (CTS) in diseased patients. Minimal evidence has presented on the existing severity assessment differences between patients with bilateral and unilateral disease. Similarly, the influence of BMI on subjective and objective measures of CTS severity is not well characterized. The purpose of this study was to evaluate the diagnostic outcomes between patients with unilateral and bilateral CTS to investigate the differences in disease severity. Diagnostic outcomes between obese and non-obese CTS patients were also analyzed. It was hypothesized that: 1) ultrasound can detect the more symptomatic side in patients with bilateral CTS 2) obesity influences both patient-reported and objective (nerve conduction studies (NCS), median nerve cross-sectional area (CSA)) parameters in patients with CTS.

METHODS:

This was a retrospective study performed on CTS patients from 2014 to 2021. Boston Carpal Tunnel Syndrome Questionnaire (BCTSQ), CTS-6 and median nerve CSA measures were obtained. NCS recorded distal motor latency (DML) and distal sensory latency (DSL). Patients were divided into unilateral and bilateral CTS cohorts based on clinical symptoms. Patients were also divided into obese (body mass index (BMI) greater than or equal to 30) and non-obese CTS cohorts. Three separate analyses were completed in this study. The first analysis investigated the median nerve CSA between the hands of bilateral CTS patients. The second analysis compared the diagnostic outcomes between bilateral and unilateral CTS patients. The third analysis compared the diagnostic outcomes between obese and non-obese patients. Statistical analysis used the Wilcoxon signed-rank testing for paired continuous variables, Mann-Whitney U testing for non-paired continuous variables, and chi-squared for contiguous variables with a significance level of $p < 0.05$.

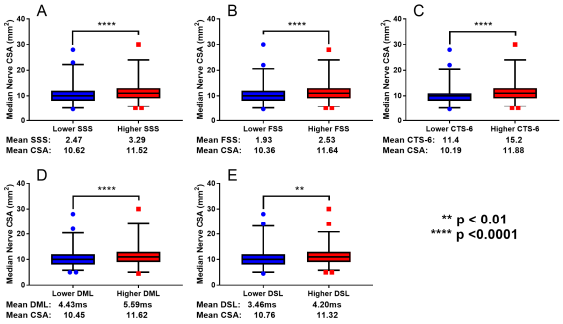
RESULTS:

109 patients (218 nerves) with bilateral and 112 patients (112 nerves) with unilateral CTS were recruited for the study. Bilateral CTS patients had a significantly larger median nerve CSA on their more symptomatic side, when defined by higher BCTSQ score ($p < 0.0001$), CTS-6 score ($p < 0.0001$), DML ($p < 0.0001$), and DSL ($p < 0.01$). Bilateral CTS patients also had a significantly higher symptom severity scale (SSS) ($p < 0.01$) and DSL ($p < 0.001$) when compared to unilateral CTS patients. Obese patients had a significantly higher median nerve CSA ($p < 0.01$) and prolonged DML and DSL ($p < 0.0001$) despite similar CTS severity as reported by BCTSQ and CTS-6 scores.

DISCUSSION AND CONCLUSION:

This study analyzed the efficacy of US measurement of the median nerve CSA in identifying the more symptomatic hand in a bilateral CTS patient cohort. The results revealed that the median nerve CSA was significantly larger in the more symptomatic CTS hand regardless of the parameter (BCTSQ, CTS-6, NCS) used to establish severity**.** The absolute differences in median nerve size were overall larger with subjective (BCTSQ and CTS-6) rather than objective (NCS) measures of disease severity, which may suggest that US correlates best with patient perception of their disease. Another objective of this study was to identify if bilateral patients have worse CTS severity than unilateral patients. The findings revealed that bilateral CTS patients had significantly worse sensory measures (SSS, DSL) without compromised functional measures (functional status scale (FSS), DML)**.** Both the BCTSQ and NCS assessments have predicted CTS severity in other studies. Lastly, the investigation of obesity (BMI >=30) as it relates to CTS showed that obesity significantly affects quantitative metrics (US, NCS) of CTS, but does not affect symptomatic severity (CTS-6, BCTSQ). Other studies agree that higher BMI values significantly impact NCS results in CTS cohorts.

In summary, ultrasound is a useful tool that is able to differentiate the more severe symptomatic side in patients with bilateral CTS. The benefits of US evaluation may spare the time and cost of other diagnostic modalities. Additionally, this study provides evidence that obesity is correlated with disease severity in addition to being a risk factor for CTS.



** p < 0.01
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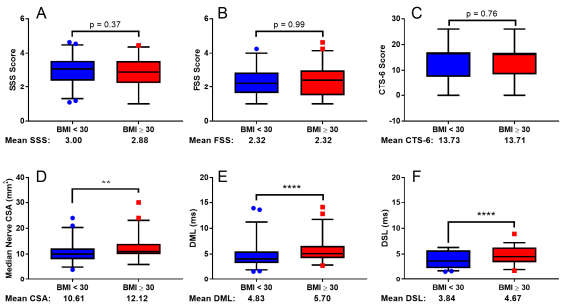

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