

Changes in Cross-Sectional Area of the Median Nerve and Boston Carpal Tunnel Questionnaire Scores after Carpal Tunnel Release

Nick Francis Aloï¹, Mohammad Rahman¹, John R Fowler

¹Department of Orthopedic Surgery

INTRODUCTION: We hypothesized that postoperative Boston Carpal Tunnel Questionnaire Scores (BCTQ) and ultrasound (US) measurements of the median nerve cross-sectional area (CSA) at the distal wrist crease are significantly decreased at 2-week, 6-week, and ≥ 6 months follow-up appointments, compared to baseline values.

METHODS: This study was a retrospective chart review of patients who presented to a single hand clinic with evidence of carpal tunnel syndrome over a six-year period (2014-2020). Patients received baseline US measurements of the median nerve CSA as well as completion of the BCTQ. Postoperative US measurements and questionnaire scores were obtained at 2 weeks post-op, 6 weeks post-op, and ≥ 6 months after surgery. BCTQ scores were separated based on Symptom Severity Scale (SSS) and Functional Status Scale (FSS). Statistical analyses included a one-way ANOVA to compare the baseline values to the postoperative values, followed by pairwise comparisons via Tukey HSD post-hoc tests to evaluate differences between the means. Also, Pearson’s Correlations were used to examine the relationships between increasing median nerve CSA and increasing BCTQ scores, at each of the timepoints. Statistical significance was set at $p < 0.05$.

RESULTS: This study included 224 separate wrists. Median nerve CSA measurements were $13.2 \pm 4.5 \text{ mm}^2$ at baseline, $11.9 \pm 3.6 \text{ mm}^2$ at 2 weeks post-op, $11.6 \pm 4.5 \text{ mm}^2$ at 6 weeks post-op, and $11.7 \pm 4.4 \text{ mm}^2$ at 6 months or more ($p = 0.002$). Pairwise comparisons indicated significant differences between baseline median nerve CSA and all three post-op timepoints (all $p < 0.04$). BCTQ SSS scores were $3.14 \pm .76$ at baseline, $1.76 \pm .63$ at 2 weeks, $1.68 \pm .70$ at 6 weeks, and $1.41 \pm .64$ at 6 months or longer ($p < 0.001$). Pairwise comparisons indicated significant differences between baseline SSS scores and all three post-op timepoints (all $p < 0.001$), and between 2 weeks vs. 6 months or more SSS scores ($p = 0.002$). BCTQ FSS scores were $2.56 \pm .89$ at baseline, 2.03 ± 1.0 at 2 weeks, $1.65 \pm .77$ at 6 weeks, and $1.36 \pm .61$ at 6 months or longer ($p < 0.001$). Pairwise comparisons indicated significant differences between baseline FSS scores and all three separate post-op timepoints (all $p < 0.001$), and between 2 weeks vs. 6 weeks ($p = 0.003$) and 2 weeks vs. 6 months or more FSS scores ($p < 0.001$). The relationships between median nerve CSA and BCTQ scores are listed in Table 1. There were statistically significant associations between median nerve CSA and SSS scores at baseline and at the 2-week follow-up appointments.

DISCUSSION AND CONCLUSION:

These findings demonstrated a sustained decrease (improvement) in baseline median nerve CSA and patient-reported outcomes following CTR at 2 weeks, 6 weeks, and after 6 months. Few studies have investigated changes in median nerve US measurements following surgery, despite prior evidence of improved BCTQ scores.

Table 1. Pearson correlations between median nerve CSA and BCTQ scores at the three distinct

timepoints. N refers to the number of items in each comparison, and p-values < 0.05 are highlighted to indicate statistical significance.

	Pearson Coefficient	N	P-value
Baseline US CSA vs. Baseline SSS	0.201	216	0.003
Baseline US CSA vs. Baseline FSS	0.070	216	0.305
2 Week US CSA vs. 2 Week SSS	0.188	171	0.014
2 Week US CSA vs. 2 Week FSS	0.036	171	0.633
6 Week US CSA vs. 6 Week SSS	0.155	89	0.146
6 Week US CSA vs. 6 Week FSS	.083	89	0.437
≥6 Months US CSA vs. ≥6 Months SSS	0.134	67	0.279
≥6 Months US CSA vs. ≥6 Months FSS	0.015	67	0.906