LONGER DISTAL MOTOR LATENCY PREDICTS BETTER OUTCOMES OF CARPAL TUNNEL RELEASE

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Introduction:
Carpal tunnel release (CTR) is a well-established treatment for carpal tunnel syndrome (CTS). However, the procedure itself is not always successful in reducing primary complaints of symptoms (1). Understanding the correlations between success and specific pre-surgical clinical variables would be helpful to both the surgeon and the occupational medicine practitioner in identifying and prescribing successful treatment.

Previous studies have examined the correlations of several factors with the outcome of carpal tunnel surgery. Clinical factors include nerve conduction tests of the median nerve at the wrist, where longer distal motor latencies (DML) indicate a worse neuropathy. As an indicator of surgical success, however, the literature presents mixed results. Some studies conclude that pre-operative nerve conduction tests are not indicators for surgical outcomes (1, 2) while other studies that use a continuous representation of DML suggest a possible relationship exists (3, 4).

The authors have recruited a large community-based cohort of working CTR patients where nerve conduction data were required for inclusion and surgical outcomes were assessed with self-reported measures of symptoms and functional limitations of the upper extremity as well as preoperative clinical and sociodemographic variables. For this study, therefore, the null hypothesis put forth is that within this cohort there is no relationship between preoperative nerve conduction tests metrics, mainly DML, and the surgical outcomes as measured by symptom severity and upper extremity functional limitations 6-months postoperatively.

Methods:
The data used in these analyses were obtained through a prospective observational community-based study of patients who received carpal tunnel release between April 1997 and October 1998 within the state of Maine. Patients were eligible for the study if they presented to one of fifteen participating surgeons -- representing orthopedic, plastic surgery and neurosurgical specialties -- symptoms including numbness or tingling in at least two of the first four digits of at least one month's duration and the physician had the diagnostic impression of CTS with confirmation by nerve conduction testing. Once giving consent, recruited patients completed questionnaires preoperatively and at two-, six- and twelve-months postoperatively. The questionnaires and consent forms were approved by the IRB. Of the patients referred to the coordinating center, 197 agreed to participate in the study and completed baseline preoperative questionnaires. At six-months postoperatively 158 completed a similar questionnaire. The age of the patients ranged from 22 to 74 years (average 45, sd 10 years).

The surgical outcome measures were defined as symptom severity, upper extremity functional limitations and satisfaction with surgery assessed with self-reported measures of symptoms, functional limitations and dissatisfaction with surgery (Table 1). In contrast the DML was not significantly correlated with the preoperative symptom severity and upper extremity functional limitations. In multiple linear regression analyses that adjusted for other variables having significant correlations with DML (Table 2), the significant associations between longer DML and less severe symptoms and functional limitations at six months persisted (p< 0.02 for effect of DML on both outcomes) with no evidence of confounding.

Results:
The results suggest that longer distal motor latencies of the median nerve at the wrist indicate better surgical outcomes for this cohort. Univariate analysis presents a significant correlation between longer DML and better (lower) postoperative levels of symptom, functional limitations and dissatisfaction with surgery (Table 1). In contrast the DML was not significantly correlated with the preoperative symptom severity and upper extremity functional limitations. In multiple linear regression analyses that adjusted for other variables having significant correlations with DML (Table 2), the significant associations between longer DML and less severe symptoms and functional limitations at six months persisted (p< 0.02 for effect of DML on both outcomes) with no evidence of confounding.

Table 1: SCCs of DML with Surgical Outcomes (6-month postoperatively)

<table>
<thead>
<tr>
<th>Variable</th>
<th>SCC (p)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Symptom severity</td>
<td>-0.33 (0.00)</td>
</tr>
<tr>
<td>UE functional limitations</td>
<td>-0.23 (0.01)</td>
</tr>
<tr>
<td>Surgery dissatisfaction</td>
<td>-0.34 (0.00)</td>
</tr>
</tbody>
</table>

Table 2: Significant Spearman Correlation Coefficients (SCC) with DML

<table>
<thead>
<tr>
<th>Variable</th>
<th>SCC (p)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age</td>
<td>0.23 (0.01)</td>
</tr>
<tr>
<td>General functional limitations</td>
<td>-0.21 (0.02)</td>
</tr>
<tr>
<td>Co-morbidity of other MSDs</td>
<td>-0.19 (0.03)</td>
</tr>
<tr>
<td>Workers compensation</td>
<td>0.19 (0.02)</td>
</tr>
</tbody>
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Discussion:
The results reject the null hypotheses, but do pose a paradoxical relationship between DML and surgical outcome where longer DML indicates better outcomes. Intuition suggests the opposite, that the longer DML would indicate more severe damage to the nerve and hence less success through CTR. A limitation of this study is that the data are dominated by mild and moderate classifications of CTS via nerve conduction tests with a very small number of extreme cases (n<2). This is a result of the fact that the cohort is a working population and therefore would seek early treatment in order to continue working or receive workers' compensation. The data, therefore, cannot reliably explore the relationship between severely prolonged DML and surgical outcomes.

For the working population, however, the results suggest that diagnosed patients with moderately prolonged DML that are otherwise in general good health and do not suffer from other types of musculoskeletal disorders benefit the most from CTR. The outcomes become less pronounced when a patient’s DML is mildly prolonged and is not generally healthy or suffers from other musculoskeletal disorders. For these cases, the symptoms may be related to something other than a pure compression of the median nerve at the wrist.

Other limitations of the data lie in the nature of the nerve conduction data, mainly in that they were not collected in a consistent manner and that all other data are self-reported. These limitations, however, should bias the data toward a null hypothesis. They would increase the variance in the data decreasing the power to detect significant differences. Nevertheless significance was found.

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References:

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