Accuracy of in-office nerve conduction studies for median neuropathy: a meta-analysis

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CRD summary
This review concluded that in-office nerve conduction measurement detected median neuropathy with clinically relevant accuracy with similar performance to inter-examiner agreement within a traditional electrodiagnostic laboratory. This conclusion is unlikely to be reliable.

Authors' objectives
To determine the diagnostic accuracy of nerve conduction measurements by in-office equipment for median neuropathy using traditional electrodiagnostic laboratory measurements as a reference standard.

Searching
PubMed was searched for articles published between 1998 and 2010. Search terms were reported. Bibliographies of relevant studies and review articles were searched.

Study selection
Prospective cohort studies were eligible for inclusion if they evaluated in-office nerve conduction measurements for detecting median neuropathy in symptomatic adults against diagnostic criteria that included at least one nerve conduction parameter measured in a traditional electrodiagnostic laboratory under neurologist supervision (measures considered acceptable were specified). Interpretation of the reference standard had to be blinded to the index test results. Studies had to report sufficient information to construct 2x2 tables of test performance.

Included cohorts incorporated patients identified on the basis of upper extremity symptoms, suspected carpal tunnel syndrome, referral for hand surgery or scheduled carpal tunnel release surgery. Mean age ranged from 44 to 55 years. Prevalence of median neuropathy ranged from 21% to 90%. All studies assessed either median nerve distal motor latency or median to ulnar nerve distal sensory latency as the index test. The threshold for an abnormal index test ranged from 3.88ms to 4.05ms for distal motor latency.

The authors did not state how many reviewers selected the studies.

Assessment of study quality
The quality of included studies was assessed using the 14-item QUADAS scale. The authors did not state how many reviewers performed the assessment.

Data extraction
Data were extracted on study characteristics plus numbers of true-positive, false-positive, true-negative, false-negative and unavailable results on a per-hand basis. Authors were contacted for missing data; where no data were provided, 2x2 tables of test performance were extrapolated where possible. Where several thresholds were reported, the one that gave the highest specificity was chosen.

The authors did not state how many reviewers performed the data extraction.

Methods of synthesis
Pooled estimates of sensitivity, specificity and the diagnostic odds ratio (DOR) with related 95% confidence intervals (CI) were calculated separately. Statistical heterogeneity was assessed using the $X^2$, $I^2$ and Cochran-Q statistics depending on the outcome measure. Threshold effects were assessed by calculating the Spearman's correlation between true- and false-positive rates after logit transformation.

Results of the review
Five studies that assessed a total of 448 hands (range 33 to 186) were included in the review. All studies were considered to be generally of high quality but some had limitations in reporting of unavailable index test results (which ranged from 5.8% to 8.5% where reported). Other methodological limitations were stated as single instances.
Pooled sensitivity was 88% (95% CI 83 to 91; $I^2=41\%$). Pooled specificity was 93% (95% CI 88 to 96; $I^2=59\%$). Pooled diagnostic odds ratio was 62 (95% CI 30 to 128; $I^2=0\%$). The test for a threshold effect was not statistically significant (p=0.10).

**Authors’ conclusions**

In-office nerve conduction measurements detected median neuropathy with clinically relevant accuracy. Performance was similar to inter-examiner agreement within a traditional electrodiagnostic laboratory.

**CRD commentary**

The methods and results of this review were not clearly reported. The inclusion criteria appeared to broadly support the review question but two of the three existing nerve conduction measurements technologies were specifically excluded due to a lack of availability in USA so the relative accuracy of potentially relevant comparators available elsewhere was unknown. The review was funded by the manufacturer of the test evaluated within the review.

Attempts to identify and select relevant evidence from a limited range of sources and the method used to assess the quality of the studies retrieved were described briefly; any efforts to prevent errors and bias in these processes were not mentioned. Pooled estimates of sensitivity and specificity were independently derived from heterogeneous values and likely clinically diverse patients; the reliability and generalisability of the pooled results was uncertain and likely to be overestimated. More robust methods of analyses are available to produce pooled estimates that maintain the within-study link between sensitivity and specificity.

The presented pooled specificity implied the index test is suitable for ruling in median neuropathy. However, when extracting data, rather than extract all data for each available threshold, data for the threshold that gave the highest value for specificity was selected from each study. As a result the threshold of the tests within the analyses varied across studies. The pooled estimates of sensitivity and specificity are of limited value as the optimal threshold for the test was not identified.

Given the limitations of the review and the small number of studies available, the conclusions seem overly strong and are unlikely to be reliable.

**Implications of the review for practice and research**

**Practice:** The authors stated that physicians using in-office nerve conduction measurement should interpret test results in a clinical context and take into account the pretest probability of median neuropathy. The latter would require likelihood ratios, which although calculable from the sensitivities and specificities, were not presented in this review.

**Research:** The authors stated that future studies should adhere to the STARD reporting guidelines, fully reporting reference standard characteristics, the rate of unavailable results and sufficient data to complete 2x2 tables of test performance.

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