

MEDIAN AND ULNAR NERVE CONDUCTION STUDIES AT THE WRIST: COMPARISON OF AUTOMATED AND TRADITIONAL METHODS

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Aims

To quantify the criterion validity of nerve conduction studies (NCS) performed by the NC-stat—an automated nerve testing device—using the results of NCS obtained by traditional methods as a reference standard.

Methods

Thirty-three patients referred for evaluation of upper extremity neuropathy had motor and sensory NCS performed by traditional methods (under the supervision of a neurologist board certified in electrodiagnostic medicine) and by the NC-stat (operated by one of three technicians—a medical student, a physical therapy assistant, and an occupational therapy assistant). Surface electrodes were used for antidromic stimulation of the median and ulnar nerves and for recording of the evoked responses. We assessed criterion validity using Pearson correlation coefficients, intraclass correlation coefficients (ICC), and receiver-operator characteristic (ROC) curves.

Results

Median nerve distal latencies showed greater correlation between methods than ulnar, while correlations between methods for amplitudes were similar for both nerves. Areas under the ROC curves for median nerve distal motor (DML) and sensory (DSL) latencies, sensory nerve action potential (SNAP) amplitude and median-ulnar latency differences (MUD) were above 0.9. Informative ROC curves could not be generated for the median nerve combined motor action potential (CMAP) amplitude or any ulnar measure due to a lack of sufficient numbers of abnormal results from the reference standard. The ROC analyses indicated that the NC-stat manufacturer's recommended reference ranges for distal latency measurements tend to bias the NC-stat towards sensitivity with some sacrifice in specificity with respect to the reference standard used in this study (data not shown).

Table 1. Correlations between NC-stat and traditional measurements and areas under ROC curves. (*2-tailed significance value for Pearson correlation)

Measure	Pearson r	p-value*	ICC	95% CI for ICC	ROC Area	95% CI for Area
Median DML (N = 30)	0.91	< 0.001	0.89	0.75-0.95	0.97	0.89-1.00
Ulnar DML (N = 33)	0.40	0.021	0.40	0.06-0.65	--	--
Motor MUD (N = 30)	0.88	< 0.001	0.85	0.67-0.93	0.91	0.78-1.00
Median DSL (N = 33)	0.92	< 0.001	0.88	0.66-0.95	0.92	0.82-1.00
Ulnar DSL (N = 33)	0.59	< 0.001	0.43	0.05-0.69	--	--
Sensory MUD (N = 33)	0.87	< 0.001	0.76	0.09-0.92	0.98	0.94-1.00
Median CMAP amplitude (N = 30)	0.39	0.032	0.01	-0.03-0.08	--	--
Ulnar CMAP amplitude (N = 33)	0.42	0.014	0.01	-0.01-0.05	--	--
Median SNAP amplitude (N = 33)	0.94	< 0.001	0.93	0.83-0.97	0.97	0.91-1.00
Ulnar SNAP amplitude (N = 33)	0.94	< 0.001	0.94	0.88-0.97	--	--

Conclusions

The NC-stat has good criterion validity for testing the median nerve at the wrist. Its portability and automation give it potential utility in research studies. Modifications of the reference ranges currently provided by the manufacturer may be appropriate for use in some settings. The data set did not allow for a complete evaluation of the NC-stat's performance for the ulnar nerve. Almost all subjects had normal ulnar nerve function, with little variability in measurements among the study group. The low ulnar correlations could be an effect of the tight range of values obtained for ulnar latencies, or a consequence of an intrinsic difficulty with testing the ulnar nerve, regardless of the method used.

This study was supported by NIOSH grant # R01OH008017-01: Post-offer Screening and Risk Factors for Carpal Tunnel Syndrome. Testing materials were provided by the NC-stat's manufacturer.