

Nerve Tests and Conduction Studies

Overview

- Nerve conduction studies serve as a measure of impaired nerve function and the best available indicator of overall disease severity in carpal tunnel syndrome, with some prognostic value for surgical outcome [1].
- Ultrasound is a valid alternative confirmatory test compared with electrodiagnostic studies in detecting ulnar neuropathy at the elbow [2].
- There is severe discordance between the estimated prevalence of mild-to-moderate carpal tunnel syndrome based on clinical signs and symptoms (73%) versus electrodiagnostic studies and ultrasound (51%) [8].
- When signs and symptoms suggest mild-to-moderate median neuropathy and surgery is being considered, additional testing such as electrodiagnostic studies or ultrasound may increase the probability of confirming actual median neuropathy that can benefit from surgery [3].
- Distal motor latency and median nerve cross-sectional area are associated with each other and with clinical symptoms in carpal tunnel syndrome [9].
- Ultrasound has comparable sensitivity and specificity to nerve conduction studies in patients two or more standard deviations above or below the mean age for presentation of carpal tunnel syndrome [15].
- Chitosan phonophoresis demonstrated significant improvements in nerve conduction, pain reduction, and enhancement of hand function for mild to moderate cubital tunnel syndrome [4].
- Ulnar nerve motor nerve conduction velocity at the upper arm should be measured alongside routine assessment of motor nerve conduction velocity at the elbow and forearm, especially in clinically severe cases considering surgery [6].
- Electromyography does not show adequate effectiveness in diagnosis of suprascapular nerve lesions caused by rotator cuff tear in a rat model [12].
- Radiological and electrodiagnostic insights into suprascapular nerve dysfunction are key predictors of poor functional outcomes in shoulder hemiarthroplasty [5].

How It Works

- Nerve conduction studies serve as a measure of impaired nerve function and the best available indicator of overall disease severity in carpal tunnel syndrome [1].
- Nerve conduction studies have some prognostic value for surgical outcome in carpal tunnel syndrome [1].
- Ultrasound is a valid alternative confirmatory test compared with electrodiagnostic studies for detecting ulnar neuropathy at the elbow [2].
- Electrodiagnostic studies or ultrasound can increase the probability of identifying actual median neuropathy that may benefit from surgery when signs and symptoms suggest mild-to-moderate disease [3].
- Chitosan phonophoresis significantly improves nerve conduction in patients with mild to moderate cubital tunnel syndrome [4].
- Chitosan phonophoresis significantly reduces pain in patients with mild to moderate cubital tunnel syndrome [4].
- Chitosan phonophoresis significantly enhances hand function in patients with mild to moderate cubital tunnel syndrome [4].
- Electrodiagnostic studies provide insights into suprascapular nerve dysfunction, which is a key predictor of poor functional outcomes in shoulder hemiarthroplasty [5].
- Ulnar nerve motor nerve conduction velocity (MNCV) at the upper arm should be measured alongside routine assessment of MNCV at the elbow and forearm in clinically severe cubital tunnel syndrome cases considering surgery [6].
- Compound muscle action potential amplitude is predictive of functional outcomes after in situ decompression of the ulnar nerve [7].
- Other conventional electrodiagnostic parameters, excluding compound muscle action potential amplitude, are not predictive of functional outcomes after in situ decompression of the ulnar nerve [7].
- Distal motor latency and median nerve cross-sectional area (CSA) are associated with each other in carpal tunnel syndrome [9].
- Distal motor latency and median nerve CSA are associated with clinical symptoms in carpal tunnel syndrome [9].
- The overall usage of electrodiagnostic studies for carpal tunnel syndrome has been decreasing since at least 2014 [10].
- The preoperative usage of electrodiagnostic studies for carpal tunnel syndrome has been decreasing since at least 2014 [10].
- There is a significant association between increasing median nerve cross-sectional area and increasing electrodiagnostic severity at the distal wrist crease [11].
- Patients with double-crush syndrome demonstrate shorter sensory nerve onset and peak latencies compared to patients with carpal tunnel syndrome alone [13].
- Patients with double-crush syndrome demonstrate different patterns of wrist and elbow motor nerve conduction compared to patients with carpal tunnel syndrome alone [13].

- As the severity of ulnar neuropathy at the elbow increases, the cross-sectional area of the ulnar nerve correspondingly increases at the elbow [16].

What the Evidence Shows

- Nerve conduction studies serve as a measure of impaired nerve function and are the best available indicator of overall disease severity in carpal tunnel syndrome [1].
- Nerve conduction studies have some prognostic value for surgical outcome in carpal tunnel syndrome [1].
- Ultrasound is a valid alternative confirmatory test compared with electrodiagnostic studies in detecting ulnar neuropathy at the elbow [2].
- There is severe discordance between the estimated prevalence of mild-to-moderate carpal tunnel syndrome based on clinical signs and symptoms (73%) versus electrodiagnostic studies and ultrasound (51%) [8].
- When signs and symptoms suggest mild-to-moderate median neuropathy and surgery is being considered, additional testing such as electrodiagnostic studies or ultrasound may increase the probability of identifying actual median neuropathy that can benefit from surgery [3].
- Distal motor latency and median nerve cross-sectional area are associated with each other and with clinical symptoms in diabetic and non-diabetic carpal tunnel syndrome [9].
- There is a significant association between increasing median nerve cross-sectional area at the distal wrist crease and increasing electrodiagnostic severity [11].
- The overall and preoperative electrodiagnostic study usage for carpal tunnel syndrome has been decreasing since at least 2014 [10].
- Patients with double-crush syndrome demonstrated unique electrodiagnostic findings, including shorter sensory nerve onset and peak latencies, compared to carpal tunnel syndrome-only patients [13].
- Patients with double-crush syndrome demonstrated different patterns of wrist and elbow motor nerve conduction compared to carpal tunnel syndrome-only patients [13].
- Ulnar nerve motor nerve conduction velocity at the upper arm should be measured alongside routine assessment of motor nerve conduction velocity at the elbow and forearm, especially in clinically severe cases considering surgery [6].
- Compound muscle action potential amplitude, but not other conventional electrodiagnostic parameters, was predictive of functional outcomes after in situ decompression of the ulnar nerve [7].
- Electrodiagnostic severity does not predict short- to midterm outcomes of cubital tunnel release surgery [14].
- Patient-reported preoperative disease severity may predict the expected postoperative change in ulnar nerve functional improvement [14].
- Electrodiagnostic studies may not have prognostic value for patients undergoing cubital tunnel decompression [14].
- Negative preoperative electrodiagnostic studies in the setting of strong clinical suspicion of cubital tunnel syndrome do not exclude diagnosis [18].

- Negative preoperative electrodiagnostic studies in the setting of strong clinical suspicion of cubital tunnel syndrome may be a positive predictive factor for short-term postoperative functional improvement [18].
- Chitosan phonophoresis demonstrated significant improvements in nerve conduction, pain reduction, and enhancement of hand function for mild to moderate cubital tunnel syndrome [4].
- Radiological and electrodiagnostic insights into suprascapular nerve dysfunction highlight the importance of perioperative nerve preservation strategies and postoperative neurological assessments [5].
- EMG-driven robotic treatment with 15 sessions of rehabilitation suggests that improvement may be possible for chronic stroke patients nine years after stroke [17].

Practical Considerations

- Nerve conduction studies serve as a measure of impaired nerve function and are the best available indicator of overall disease severity in carpal tunnel syndrome [1].
- Nerve conduction studies have some prognostic value for surgical outcome in carpal tunnel syndrome [1].
- Ultrasound is a valid alternative confirmatory test compared with electrodiagnostic studies for detecting ulnar neuropathy at the elbow [2].
- There is severe discordance between the estimated prevalence of mild-to-moderate carpal tunnel syndrome based on clinical signs and symptoms (73%) versus electrodiagnostic studies and ultrasound (51%) [8].
- Clinicians may not be able to confidently diagnose patients with mild-to-moderate carpal tunnel syndrome based on clinical signs and symptoms alone [8].
- When signs and symptoms suggest mild-to-moderate median neuropathy and surgery is being considered, additional testing such as electrodiagnostic studies or ultrasound may increase the probability of identifying actual median neuropathy that can benefit from surgery [3].
- The overall and preoperative usage of electrodiagnostic studies for carpal tunnel syndrome has been decreasing since at least 2014 [10].
- The decrease in electrodiagnostic study usage for carpal tunnel syndrome predates the 2016 American Academy of Orthopaedic Surgeons Clinical Practice Guideline [10].
- There is a significant association between increasing median nerve cross-sectional area at the distal wrist crease and increasing electrodiagnostic severity [11].
- Ultrasound has comparable sensitivity and specificity to nerve conduction studies in patients two or more standard deviations above or below the mean age for presentation of carpal tunnel syndrome [15].
- Chitosan phonophoresis demonstrated significant improvements in nerve conduction, pain reduction, and hand function for mild to moderate cubital tunnel syndrome [4].
- Ulnar nerve motor nerve conduction velocity at the upper arm should be measured alongside routine assessment at the elbow and forearm, especially in clinically severe cases considering surgery [6].
- Compound muscle action potential amplitude, but not other conventional electrodiagnostic parameters, was predictive of functional outcomes after in situ decompression of the ulnar nerve [7].

- Electrodiagnostic severity does not predict short- to midterm outcomes of cubital tunnel release surgery [14].
- Patient-reported preoperative disease severity may predict the expected postoperative change in ulnar nerve functional improvement [14].
- Electrodiagnostic studies may not have prognostic value for patients undergoing cubital tunnel decompression [14].
- Radiological and electrodiagnostic insights into suprascapular nerve dysfunction are key predictors of poor functional outcomes in shoulder hemiarthroplasty [5].
- Perioperative nerve preservation strategies and postoperative neurological assessments are important in the context of suprascapular nerve dysfunction [5].
- Electromyography does not show adequate effectiveness in diagnosing suprascapular nerve lesions caused by rotator cuff tear in a rat model [12].
- Surgeons should carefully evaluate suprascapular nerve integrity in cases of rotator cuff tear [12].

Key Evidence

- [L5] Nerve conduction studies should be understood not as a test that determines the diagnosis but as a measure of impaired nerve function, serving as the best available indicator of overall disease severity with some prognostic value for surgical outcome. [1] ([10.1177/17531934231191685](https://doi.org/10.1177/17531934231191685))
- [L4] Ultrasound is a valid alternative confirmatory test compared with electrodiagnostic studies in detecting ulnar neuropathy at the elbow. [2] ([10.1016/j.jhsa.2023.08.014](https://doi.org/10.1016/j.jhsa.2023.08.014))
- [L3] When signs and symptoms suggest mild-to-moderate median neuropathy and surgery is being considered, patients and clinicians might consider additional testing, such as EDS or US, to increase the probability of actual median neuropathy that can benefit from surgery. [3] ([10.1097/corr.0000000000002751](https://doi.org/10.1097/corr.0000000000002751))
- [L1] This approach demonstrated significant improvements in nerve conduction, pain reduction, and enhancement of hand function. [4] ([10.1016/j.jht.2024.02.006](https://doi.org/10.1016/j.jht.2024.02.006))
- [L3] These findings highlight the importance of perioperative nerve preservation strategies and postoperative neurological assessments. [5] ([10.1016/j.jse.2025.07.001](https://doi.org/10.1016/j.jse.2025.07.001))
- [L3] Ulnar nerve MNCV at the upper arm should be measured alongside routine assessment of MNCV at the elbow and forearm, especially in clinically severe cases considering surgery. [6] ([10.1177/17585732241293360](https://doi.org/10.1177/17585732241293360))
- [L2] Compound muscle action potential amplitude, but not other conventional electrodiagnostic parameters, was predictive of functional outcomes after in situ decompression of the ulnar nerve. [7] ([10.1016/j.jhsa.2022.10.008](https://doi.org/10.1016/j.jhsa.2022.10.008))
- [L5] There is a severe discordance between the estimated prevalence of mild-to-moderate carpal tunnel syndrome based on clinical signs and symptoms (73%) versus electrodiagnostic studies and ultrasound

(51%), calling into question whether clinicians can confidently diagnose patients with mild-to-moderate CTS. [8] ([10.1097/corr.0000000000002822](https://doi.org/10.1097/corr.0000000000002822))

- [L4] Distal motor latency and median nerve CSA were not only associated with each other, but also with clinical symptoms. [9] ([10.1186/s12891-023-06881-1](https://doi.org/10.1186/s12891-023-06881-1))
- [L3] The overall and preoperative electrodiagnostic study usage for carpal tunnel syndrome has been decreasing since at least 2014, predating the 2016 AAOS CPG, reflecting the rapid implementation of evidence into practice. [10] ([10.1016/j.jhsa.2022.09.019](https://doi.org/10.1016/j.jhsa.2022.09.019))
- [L3] There was a significant association between increasing cross-sectional area and increasing electrodiagnostic severity. [11] ([10.1177/15589447211066349](https://doi.org/10.1177/15589447211066349))
- [L5] This underscores the need for surgeons to carefully evaluate suprascapular nerve integrity in such cases. [12] ([10.1186/s12891-025-09195-6](https://doi.org/10.1186/s12891-025-09195-6))
- [L3] Patients with double-crush syndrome (DCS) demonstrated unique electrodiagnostic findings, including shorter sensory nerve onset and peak latencies and different patterns of wrist and elbow motor nerve conduction compared to CTR-only patients. [13] ([10.5435/jaaos-d-24-00056](https://doi.org/10.5435/jaaos-d-24-00056))
- [L3] Patient-reported preoperative disease severity may predict the expected postoperative change in ulnar nerve functional improvement, and EDS may not have prognostic value for patients undergoing cubital tunnel decompression. [14] ([10.1016/j.jse.2024.01.055](https://doi.org/10.1016/j.jse.2024.01.055))
- [L4] Ultrasound has comparable sensitivity and specificity to NCS in patients two or more standard deviations above or below the mean age for presentation of CTS. [15] ([10.1016/j.jhsg.2024.01.008](https://doi.org/10.1016/j.jhsg.2024.01.008))
- [L2] As the severity of ulnar neuropathy at the elbow increases, the CSA of the ulnar nerve correspondingly increases at the elbow. [16] ([10.1016/j.jhsa.2024.12.004](https://doi.org/10.1016/j.jhsa.2024.12.004))
- [L5] The improvement achieved 9 years later with 15 sessions of rehabilitation suggests that improvement may be possible for chronic stroke patients. [17] ([10.1016/j.jht.2021.04.022](https://doi.org/10.1016/j.jht.2021.04.022))
- [L4] However, negative preoperative EDX studies in the setting of strong clinical suspicion of CuTS do not exclude diagnosis and may in fact be a positive, rather than a negative, predictive factor for short-term postoperative functional improvement. [18] ([10.1016/j.jhsg.2024.08.013](https://doi.org/10.1016/j.jhsg.2024.08.013))

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- [1] Use of nerve conduction studies in carpal tunnel syndrome. *Journal of Hand Surgery (European Volume)*. 2023. DOI: [10.1177/17531934231191685](https://doi.org/10.1177/17531934231191685) [2] Diagnosis of Ulnar Neuropathy at the Elbow Using Ultrasound – A Comparison to Electrophysiologic Studies. *The Journal of Hand Surgery*. 2023. DOI: [10.1016/j.jhsa.2023.08.014](https://doi.org/10.1016/j.jhsa.2023.08.014) [3] Diagnosis of Mild-to-moderate Idiopathic Median Neuropathy at the Carpal Tunnel Based on Signs and Symptoms is Discordant From Diagnosis Based on Electrodiagnostic Studies and Ultrasound. *Clinical Orthopaedics & Related Research*. 2023. DOI: [10.1097/corr.0000000000002751](https://doi.org/10.1097/corr.0000000000002751) [4] Effectiveness of chitosan phonophoresis on ulnar nerve conduction velocity, pain relief, and functional outcomes for mild to moderate cubital tunnel syndrome: A double-blind randomized controlled trial. *Journal of Hand Therapy*. 2024. DOI: [10.1016/j.jht.2024.02.006](https://doi.org/10.1016/j.jht.2024.02.006) [5] Radiological and electrodiagnostic insights into suprascapular nerve dysfunction: a key predictor of poor functional outcomes in shoulder hemiarthroplasty.

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