



AMERICAN COLLEGE OF  
OCCUPATIONAL MEDICINE  
ENVIRONMENTAL MEDICINE

## HAND, WRIST, AND FOREARM DISORDERS GUIDELINE

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			Pain upon passive abduction Triggering (rare) Pain worse with ulnar deviation, thumb flexion, adduction, stretch of first dorsal compartment (Finkelstein test)	
Trigger Finger, Trigger Thumb	High force and repetition Blunt trauma (rare)	Triggering Pain at volar metacarpal phalangeal joint Locked finger	Triggering Tender volar metacarpal crease Tendon nodule Synovial thickening of specific parts of flexor retinaculum	None
Carpal Tunnel Syndrome	High force and repetition, combinations of physical factors Vibration  (Associated factors include cold temperatures and glove use. Posture is unclear factor, thought to be a relatively weak factor.)	Numbness/tingling in thumb, index, middle, radial half of ring finger, especially at night or with activity Volar hand pain radiating into forearm may be present. Decreased grip strength Difficulty picking up small objects Hand symptoms diagram	Atrophy or decreased strength of abductor pollicis brevis, opponens (advanced cases) Decreased sensation in median nerve distribution (including monofilaments)	Electrodiagnostic studies
Ulnar Neuropathy at the Wrist and Hypothenar Hammer Syndrome	Repeated striking of the heel of the hand/hypothenar region on a tool or object	Pain in hypothenar region, blanching of ulnar artery distribution (especially 5th digit), Paresthesias in small and ring fingers	Tender hypothenar region, blanching of ulnar artery distribution (especially 5th digit), decreased sensation in small and ring fingers	Ulnar artery Doppler/ultrasound, electrodiagnostic studies
Hand-Arm Vibration Syndrome	Repeated, prolonged use of low-frequency, high-amplitude vibrating tool, especially in cold environments	Pain in the fingers, episodic finger blanching	Blanching of fingers, worse with cold provocation. Ulceration of finger tips when severe.	None
Nonspecific Pain	Unknown as condition is idiopathic; possibly resulting from combination of risk factors. May be psychological condition.	Pain, but non-specific	None	None
Ganglion	Unknown	Painful or painless mass on wrist, hand, or any other joint	Tender (or non-tender) mass most commonly over dorsal or volar wrist or hand	None

## Special Studies and Diagnostic Considerations

For most patients presenting with non-traumatic hand, wrist, and forearm disorders, special studies are not needed during the first 4 weeks. Most patients improve quickly, provided red flag conditions are ruled out. Exceptions include the following:

- In cases of wrist injury, with tenderness over the scaphoid (especially over the scaphoid tubercle), but minimal other findings, a scaphoid fracture may still be present. Initial radiographic images should be obtained, but may appear negative in the presence of nondisplaced scaphoid fracture. If clinical symptoms continue, a re-evaluation with new radiographs is advised in approximately 2 weeks.

## **Special Studies and Diagnostic and Treatment Considerations**

### **ELECTRODIAGNOSTIC STUDIES**

Appropriate electrodiagnostic studies (EDS), including nerve conduction studies (NCS), may help differentiate CTS from other conditions such as cervical radiculopathy, other median nerve neuropathies, or ulnar neuropathy at the elbow. (10, 177, 180, 183, 184, 406-448) In select or more difficult cases, especially if cervical radiculopathy is a concern, electromyography (EMG) studies should be incorporated. (406) NCS and EMG may be normal particularly in some mild cases of CTS. If EDS are negative, tests may be repeated later in the course of treatment if symptoms persist. It is also important to recognize that electrodiagnostic studies are abnormal in a large proportion of patients who are without symptoms and thus without CTS. (171) Thus, EDS testing in a patient with a low pre-test probability of CTS may result in inappropriate diagnosis of CTS. EDS has been purportedly not useful in diagnosing clear-cut CTS cases. (449)

The American Association of Electrodiagnostic Medicine, the American Academy of Neurology, and the American Academy of Physical Medicine and Rehabilitation jointly published a practice parameter for electrodiagnostic studies in CTS. (406) However, the quality of EDS varies widely in practice (450) and this practice guideline is sometimes not adhered to, requiring the treating physician to be familiar with these issues to better interpret the findings in a clinical context. Additionally, cut-off points for abnormal values have yet to be fully standardized and the correlations between symptom severity and EDS severity are not uniformly strong. (11, 167) In patients with suspected CTS where electrodiagnostic confirmation would alter treatment plans, the following EDS studies are recommended (in the majority of these studies, the hand temperature should be 32°C or warmer): (406)

1. Perform a median sensory NCS across the wrist with a conduction distance of 13 to 14cm. If the result is abnormal, compare the result of the median sensory NCS to the result of a sensory NCS of one other adjacent sensory nerve in the symptomatic limb.
2. If the initial median sensory NCS across the wrist has a conduction distance greater than 8cm and the result is normal, one of the following additional studies is recommended:
  - a. Comparison of median-sensory- or mixed-nerve conduction across the wrist over a short (7 to 8cm) conduction distance to the ulnar sensory-nerve conduction across the wrist over the identical 7 to 8cm conduction distance, or
  - b. Comparison of median sensory across the wrist with ipsilateral radial or ulnar sensory conduction across the wrist, or
  - c. Comparison of median sensory or mixed nerve conduction through the carpal tunnel to sensory or mixed NCS of proximal or distal segments of the ipsilateral median nerve.
3. Motor conduction study of the median nerve recording from the thenar muscle and of one other ipsilateral nerve with distal latency.
4. Optional comparisons may include ipsilateral median-ulnar motor nerve distal latencies and median-ulnar motor conduction differences.
5. Needle EMG is optional as it is primarily used for evaluation of cervical radiculopathy. (406)

#### *1. Recommendation: EDS for Diagnosis and Pre-operative Assessment of CTS*

**Quality EDS (see above) are recommended to assist in securing a firm diagnosis for those patients without a clear diagnosis of CTS. EDS are also recommended to objectively secure a diagnosis of CTS prior to surgical release in workers compensation patients. (451) If EDS is elected, in most cases of CTS, only the sensory and motor conduction studies are necessary for diagnosis confirmation. If the examination is more complex, then addition of the EMG component of the EDS should be obtained.**

*Strength of Evidence – Recommended, Evidence (C)*

*Level of Confidence – Moderate*

#### *2. Recommendation: EDS for Initial Evaluation of CTS Patients*

**EDS is not recommended for initial evaluation of most CTS patients with a confirming history and clinical signs as it does not change the management of the condition. EDS is also not**

**recommended prior to glucocorticosteroid injection as a good history and clinical suspicion is believed to be sufficient to warrant the intervention which would not likely be altered by EDS.**

*Strength of Evidence – Not Recommended, Insufficient Evidence (I)*  
*Level of Confidence – High*

3. *Recommendation: Commercial Products for Performing EDS for CTS Patients*  
**Automated devices to accomplish EDS is recommended for highly selected CTS patients.**(452, 453)

*Indications* – EDS that is not readily obtainable by an American Board of Electrodiagnostic Medicine-certified electrodiagnostician (e.g., geographic distance). There also should be no concern about other potentially confounding conditions such as cervical radiculopathy.

*Strength of Evidence – Recommended, Evidence (C)*  
*Level of Confidence – Low*

#### *Rationale for Recommendations*

EDS are the only unequivocally objective measures of median nerve function. (10, 406, 451, 454-456) However, there are both false-positive and false-negative test results that demand that the physician understand the pre-test probabilities and be capable of interpreting the results and placing them in an appropriate clinical context. For example, EDS should not be ordered in settings where the clinical history suggests a low likelihood of CTS because the probability of a false-positive test result may be well above 50%. EDS are primarily of assistance in: 1) identifying an anatomic location of nerve conduction slowing; 2) identifying objective evidence for alternate diagnostic considerations (e.g., cervical radiculopathy); and 3) quantifying nerve function to assure the physician that an operative state such as CTS is present. EDS are not invasive or minimally invasive (depending on whether the EMG component is required), have minimal adverse effects, and are high cost. They are recommended for evaluation of select cases, especially if the diagnosis is unclear or surgery is planned.

There are other commercial diagnostic products;(452, 453, 457, 458) and some studies have suggested there may have sufficient accuracy,(445, 452) however, there are relatively few studies available and thus the use of these studies may be currently limited to where there is both no concern about radiculopathy and other disorders and the EDS test is not readily available (e.g., due to distance geographical issues).

#### *Evidence for the Use of Electrodiagnostic Studies*

There are 20 moderate-quality studies incorporated into this analysis.(319, 445, 451-453, 455, 456, 459-471) There are 4 low-quality studies in Appendix 2.(472-475)

*A comprehensive literature search was conducted using PubMed, Scopus, CINAHL and Cochrane Library without date limits using the following terms: electrodiagnostic studies, nerve conduction study (NCS), electromyography (EMG); carpal tunnel syndrome, median neuropathy, CTS, carpal tunnel, median nerve, compression, entrapment, neuropathy, nerve disease, syndrome, median nerve, median neuropathy; controlled clinical trial, controlled trials, randomized controlled trial, randomized controlled trials, random allocation, random\*, randomized, randomization, randomly; systematic, systematic review, retrospective, and prospective studies. We found and reviewed 96 articles in PubMed, 371 in Scopus, 23 in CINAHL, and 23 in Cochrane Library. We considered for inclusion 20 from PubMed, 30 from Scopus, 5 from CINAHL, 6 from Cochrane Library and 30 from other sources. Of the 91 articles considered for inclusion, 67 trials and 7 systematic studies met the inclusion criteria.*

## **Ulnar Nerve Entrapment at the Wrist (Including Guyon's Canal Syndrome and Hypothenar Hammer Syndrome)**

### ***Diagnostic Criteria***

There is no quality evidence comparing diagnostic testing for this disorder. Most case series report electrodiagnostic testing assisted in making a diagnosis. The characteristic finding is a prolonged distal motor latency. One report opined that idiopathic or "cumulative stress" cases have no characteristic pattern.(50) Electrodiagnostic calculations are complicated by the curvilinear course of the deep motor nerve. Witmer described a technique reducing the complexity that may be useful to the electromyographer.(1118)

### ***Special Studies and Diagnostic and Treatment Considerations***

#### **ELECTRODIAGNOSTIC STUDIES**

*Recommendation: Electrodiagnostic Testing for Ulnar Nerve Entrapment at the Wrist*

**Electrodiagnostic testing is recommended to confirm clinical suspicion of ulnar nerve entrapment at the wrist.**

*Strength of Evidence – Recommended, Evidence (C)*

*Level of Confidence – Moderate*

#### *Rationale for Recommendation*

There are 3 moderate studies supporting the use of electrodiagnostic testing.(1119-1121) However, studies need to be performed by well-trained electrodiagnosticians, preferably certified by the American Board of Electrodiagnostic Medicine.

#### *Evidence for the Use of Electrodiagnostic Studies*

There are 4 moderate-quality studies incorporated into this analysis.(1119-1122)

A comprehensive literature search was conducted using PubMed, Scopus, CINAHL, Cochrane Library, and Google Scholar without date limits using the following terms: Electrodiagnostics nerve conduction study, electromyography, Ulnar Nerve Entrapment at the Wrist (Including Guyon's Canal Syndrome and Hypothenar Hammer Syndrome) diagnostic, diagnosis, sensitivity, specificity, positive predictive value, negative predictive value, and predictive value of tests, efficacy, and efficiency. We found and reviewed 0 articles in PubMed, 48 in Scopus, 2 in CINAHL, 3 Cochrane Library, and 350 from Google Scholar. We considered for inclusion 0 from PubMed, 2 from Scopus, 0 from CINAHL, 0 from Cochrane Library, 0 from Google Scholar, and 2 from other sources. Of the 4 articles considered for inclusion 4 diagnostic studies met the inclusion criteria.