



What You Need to Know About Carpal Tunnel Syndrome



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Carpal tunnel syndrome (CTS) is a clinical diagnosis which occurs when compression of the median nerve occurs at the wrist. It is a cause of considerable discomfort and lost time from work.

Symptoms and signs of CTS

Clinical suspicion is based on a typical history. Initial symptoms include nocturnal paresthesias in the median nerve distribution often in the dominant hand. Persistent wrist flexion or extension results in increased pressure within the carpal tunnel resulting in nerve ischemia and paresthesias. Symptoms may be aggravated by repetitive actions such as driving or computer use. Discomfort occurs in the hands, forearms and sometimes to the upper arm. Some will drop things or report difficulty doing up buttons or opening jars. Women may be more at risk because of smaller wrists.

Examination initially may be normal. Decreased sensation may be present involving digits 1 to 4. Phalen's sign is more sensitive than Tinel's sign. There may be volar wrist fullness. Eventually, weak thumb abduction and

Vicki's case

Vicki, 45-years-old, has bilateral nocturnal hand paresthesias. Symptoms are improved by shaking the hand. Daytime paresthesias occur with computer use and cycling. Strength and reflexes are normal. She has numbness of the right index finger. Nerve conduction studies (NCS) confirm median neuropathy at the wrist bilaterally, right more than left. Nocturnal wrist splints give some benefit. She develops daytime right hand numbness and discomfort. She then has surgical intervention on the right with improvement.

thenar wasting may occur. Reflexes and ulnar innervated muscles should be normal.¹

What is the anatomy of the median nerve?

The carpal tunnel is located at the wrist with the carpal bones dorsally and the transverse carpal ligament on the volar surface. The median nerve and finger flexor tendons pass through the carpal tunnel.

The median nerve is formed by the fusion of the lateral and medial cords of the brachial plexus. Just distal to the antecubital fossa the

nerve innervates the pronator teres, flexor carpi radialis and flexor digitorum brevis. The anterior interosseous nerve is a pure motor nerve to the flexor digitorum profundus and flexor pollicis longus with a deep sensory branch to the wrist joint. The palmar cutaneous branch arises proximal to the carpal tunnel. In the palm, the motor branch goes to the thenar eminence (opponens pollicis and abductor pollicis brevis) and the sensory fibers go to digits 1 (medial side), 2, 3 and the radial side of the digit 4.²

Persistent wrist flexion or extension results in increased pressure within the carpal tunnel resulting in nerve ischemia and paresthesias.

Q&A What is the role of electrodiagnostic testing?

Nerve conduction studies (NCS)/electromyography (EMG):

1. Assess the functioning of the median nerve
2. Rule out other neuropathies such as ulnar neuropathy, multiple focal neuropathies (mononeuropathy multiplex) or polyneuropathies
3. Rule out mimics of median neuropathy such as brachial plexopathy, neurogenic thoracic outlet syndrome (rare) and radiculopathy

Q&A What does the electrodiagnostic report mean?

Sensory abnormalities on NCS usually precede motor involvement. Digits 2 or 3 are most commonly affected. Some digits are innervated by more than one nerve (digit 4-median-ulnar, digit 1-median-radial). In mild cases, the NCS may be normal, but are more likely to be abnormal if internal comparison studies are done.¹ Short segment testing, such as the palmar studies, often provides more accurate localization of the region of compression than longer segment (wrist-digit) studies. Comparison is reported between different nerves (median-ulnar, median-radial), different portions of the nerve wrist-palm vs. palm-digit or median palmar vs. ulnar palmar responses and opposite sides. If the sensory responses are absent then it is not possible to localize the site of slowing electrophysiologically.

Prolongation of median motor distal latency and reduced conduction velocity (< 50 m/s) occurs in demyelination of the nerve (Figure 1). The motor amplitude is markedly reduced (< 5 mV) in more severe neuropathy. Needle EMG may clarify whether this is old or new.

Q&A What is not CTS?

1. Neck pain does not occur in CTS. Radiculopathy could be accompanied by radiation of paresthesias, weakness and attenuation of reflexes

Carpal Tunnel Syndrome



Figure 1. Stimulation of the median motor nerve at the wrist with recording at the abductor pollicis brevis.


2. Weakness of thumb flexors (anterior interosseous branch) or numbness of the thenar region (palmar cutaneous branch) indicates involvement of the median nerve proximal to the carpal tunnel
3. Weakness and wasting of the hypothenar muscles could indicate ulnar neuropathy, lower brachial plexus involvement, neurogenic thoracic outlet syndrome (very rare) or C8-T1 radiculopathy
4. Paresthesias with no pain
5. Median neuropathy without any clinical symptoms. NCS must be interpreted in the clinical context



What is the treatment?

1. Conservative treatment including nocturnal wrist splints. In a recent study of individuals with CTS, 83% reported improvement with wrist splints³
2. NSAIDs and/or steroid injections may be helpful. Caution with repeated steroid injections as potential damage to tendons.¹ Vitamin B6 supplementation is controversial and doses > 200 mg q.d. are potentially neurotoxic²

Take-home message

- Carpal tunnel is a clinical syndrome
 - NCS/electromyography can be helpful in determining if there is an associated median neuropathy
 - Median neuropathy without paresthesias and pain is not carpal tunnel syndrome (CTS)
 - It is important to localize the lesion clinically and electrophysiologically to rule out mimics of CTS such as radiculopathy or plexopathy
 - Conservative measures should be tried first. Comorbidities should be managed. Some individuals will require surgical intervention
3. Surgery with release of the flexor retinaculum if there is a failure of conservative measures or muscle weakness. Response may depend on the duration and severity of symptoms
 4. Comorbidities such as rheumatoid arthritis, chronic renal failure, diabetes or thyroid disease need to be treated. Response to therapy is less predictable 

References

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3. Taylor-Gjevre RM, Gjevre JA, Strueby L, et al: Treatments For Carpal Tunnel Syndrome: Who Does What, When ... And Why? *Can Fam Physician* 2007; 53(7):1186-90.



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