

PAIN TOPICS

Carpal Tunnel Syndrome

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Introduction

Carpal tunnel syndrome (CTS) is poorly understood, but seems to be related to increased pressure on the median nerve within the carpal tunnel (a confined area between the carpal bones and the transverse carpal ligament through which all of the digital flexor tendons and the median nerve pass from the forearm into the hand). CTS is a relatively recently recognized illness. Until Phalen's descriptions in the 1950's, older patients with complaints of numbness in their hands were told they had "circulation problems" or otherwise reassured. In recent times, the diagnosis of carpal tunnel syndrome has taken on a life of its own. Most people are aware of a concern that repetitive motion, particularly computer use, may cause carpal tunnel syndrome in spite of a dearth of strong evidence to support this claim. The prevalence of such overstatements in the media (including the Internet) contributes to substantial concerns that are probably unjustified. The diagnosis—one of the most straightforward in hand surgery—is misused and abused, usually in an attempt to understand upper limb pain complaints.

Anatomy of the carpal tunnel

The [carpal tunnel](#) is a narrow passageway on the ventral (palm) side of the wrist formed of bones and the transverse carpal ligament. The median nerve and a bundle of tendons pass through the tunnel. The median nerve controls the thumb and first 3 fingers of the hand.

Pathology

Very little is known about the cause and pathophysiology of carpal tunnel syndrome. What is known is based primarily on clinical observations. There is an increased pressure in the carpal tunnel that is more prevalent with advancing age. There is a strong genetic component as shown in recent twin studies. The disease is usually bilateral as shown in long-term follow-up studies. All of these argue strongly for more of an inherent or systemic origin than a relationship to activities.

Acute flexor tenosynovitis can be associated with symptoms of median nerve compression, but chronic cases are not associated with abnormalities of the flexor tenosynovium (the membrane that covers the tendon). Anatomic aberrations are unusual. The relationship to repetitive work is disputed. Studies reach varying conclusions and methodologies are often suspect. In my opinion, given the substantial implications of claiming an association between certain activities and a disease, physicians need to have very strong evidence that such an association is warranted. Because we do not have strong evidence supporting a causal relationship between repetitive activity and carpal tunnel syndrome, I think that it is irresponsible to advocate one.

Certainly there are transient cases of CTS, particularly in younger individuals with acute flexor tenosynovitis, but the question remains whether all chronic cases are progressive. Clinical experience and some data would suggest that they are, but we still observe patients with mild disease.

Clinical Features

Numbness, not pain, is the hallmark of carpal tunnel syndrome. The classic complaint is waking at night or in the morning with numbness in the fingers. Humans tend to sleep in a fetal position and flexion and extension of the wrist increase pressure in the carpal tunnel, thereby eliciting symptoms. It supports the diagnosis if patients report numbness in the [expected anatomic distribution](#). This history is so characteristic that carpal tunnel syndrome could probably be diagnosed over the phone with a high degree of accuracy, at least in its earlier stages.

Symptoms during the day are usually brought out by activities that place the wrist in substantial flexion or extension. Numbness can be associated with pain, but this is typically more of a discomfort in the volar wrist area (where the palm and wrist come together). Often patients will describe a more generalized arm aching. The important point is that substantial pains should not be ascribed to carpal tunnel syndrome, as they are rarely directly related.

Constant numbness and atrophy or weakness of the [thenar intrinsic muscles](#) of the hand (tested as the ability to maintain palmar abduction of the thumb against resistance) are late findings indicative of advanced nerve damage. Numbness, or loss of threshold sensitivity, can be quantified with Semmes-Weinstein monofilament testing (a test of loss of sensation that uses a calibrated filament to apply measured pressure to the affected area), which can usually be done by a hand or occupational therapist. Provocative signs (intentional manipulations of the hand that may produce the reported symptom) such as [Phalen's test](#) (full passive flexion of the wrist for 60 seconds) and Durkan's test (pressure applied over the median nerve at the transverse carpal ligament) are very helpful for confirming the diagnosis.

Diagnostic Tests

Electromyography and nerve conduction velocity testing (EMG/NCV) is an excellent test for carpal tunnel syndrome. Not only can it detect the presence or absence of nerve dysfunction, it can quantify it. Some data suggest that a very prolonged distal sensory latency is associated with a high risk of advancing disease. It can also check for other peripheral neuropathy and confirm the diagnosis. Patients should be advised that the test is somewhat painful.

Management

Patients with characteristic history and corroborative physical exam for carpal tunnel syndrome that do not have signs of advanced nerve damage (numbness, weakness, atrophy) are managed with night splints except in the unusual cases where night-time symptoms are not prominent. NSAID's and vitamins do not affect the disease. The typical complaint is of numbness rather than pain, but for patients with pain non-narcotic analgesics are helpful. There is no danger in continuing repetitive or forceful activities although symptoms might be worse. The role of steroid injections is debatable, but they do not seem to affect the long-term course of the disease and inadvertent intraneural injection of steroids can be a problem.

If the night splinting is not sufficient or there are signs of advanced disease, an EMG/NCV is ordered to confirm the diagnosis, gain information about the severity of the problem, and document the status of the nerve for comparison after interventions such as surgery. Some have questioned the need for EMG/NCV given the characteristic history and physical; however, in the context of all of the misinformation regarding carpal tunnel syndrome and the misconceptions of physicians and patients alike, it is still a worthwhile test. The diagnosis is so misused that objective information is important.

When there are signs of advanced nerve damage on physical examination carpal tunnel release is indicated. Sensory dysfunction often improves after release of the transverse carpal ligament—although it can take over a year—but weakness and atrophy do not.

When the splints are not adequately treating the symptoms—i.e. patients still wake up at night in spite of splinting—and the EMG/NCV shows moderate to severe dysfunction, surgery is warranted.

The surgical treatment of mild disease is less clear-cut. Mild disease can usually be managed with night splints. If the major complaint is pain, the pain is out of proportion to what would be expected from carpal tunnel syndrome, or complaints do not fit anatomic patterns, the surgeon should beware. Carpal tunnel syndrome and idiopathic arm pains are so common that they frequently overlap. The finding of mild median nerve dysfunction on EMG/NCV does not mean that the pain complaints are related to the median nerve dysfunction and carpal tunnel release for pain in this setting is much less likely to help and may be meddling.

Technical Details and Recovery

Now that surgeons have adopted the technique of carpal tunnel release through a small palmar incision with local anesthesia, endoscopic release offers few benefits. Because endoscopic release is more difficult, takes more time, cannot be done under local anesthesia, requires expensive equipment, and has a slightly greater risk of nerve injury, its popularity is waning.

A small dressing is applied after the surgery and removed in a few days. No splints are used and patients are encouraged to use the hand for light tasks immediately. Patients can return to deskwork as soon as they are comfortable—often the next day. Laborers need to protect the healing wound for about a month.

The scar is occasionally tender as are forceful thumb movements, but otherwise there are few problems in the absence of complications, which are fortunately rare.

Conclusions

In appropriately selected patients, carpal tunnel release is one of the most rewarding surgeries performed by hand surgeons and patients are very grateful. On the other hand, the diagnosis of carpal tunnel syndrome should be applied very carefully as it has substantial implications for patients, physicians, employers, insurers, and lawyers. The diagnosis can be easily confirmed by EMG/NCV and the concept of EMG negative carpal tunnel syndrome is not helpful. When the primary complaint is pain, the diagnosis is rarely carpal tunnel syndrome and doctors and patients should look elsewhere. Unexplained pain complaints in the upper limb are extremely common. Although doctors don't like to say "I don't know" and patients don't like to hear it, honesty is always the best policy. It is preferable for all involved if the lack of a diagnosis is acknowledged, referring to the pain as idiopathic pain.



Additional carpal tunnel references:

- **eMedicine** is a collection of peer-reviewed articles on many medical topics. Articles for consumers are also available on some topics. eMedicine is available free via the [Treadwell Library Home Page](#) (click on eTreadwell—Databases—eMedicine), and is accessible on MGH computers. Type "carpal" into the Search window.
- **MEDLINEplus** is the consumer-oriented web site of the National Library of Medicine. Type "carpal" into the Search window. Some material is available in Spanish.
- **Well-Connected** is a consumer-oriented medical information service available free via the [Treadwell Library Home Page](#) (Click on Consumer—Well-Connected), and is accessible on MGH computers. Some material is available in Spanish. Many of the articles are written by Harvard Medical School Faculty
- A **recent article** of note:
Andersen JH, Thomsen JF, Overgaard E, Lassen CF, Brandt LP, Vilstrup I, Kryger AI, Mikkelsen S. Computer use and carpal tunnel syndrome: a 1-year follow-up study. *JAMA* 2003, Jun 11;289(22):2963-9.

Treadwell Library Home Page: <http://massgeneral.org/library/default.asp>

MEDLINEplus: <http://www.nlm.nih.gov/medlineplus>

Images:

Carpal tunnel anatomy:

http://www.medem.com/medem/images/jamaarchives/JAMA_BoneandJoint_CarpalTunnel_lev20_CarpalTunnelSyndrome_JPP_01.jpg

Distribution of numbness: <http://health.yahoo.com/images/health/dc/10/1081.jpg>

Thenar muscles: <http://www.healthpages.org/AHP/LIBRARY/HLTHTOP/CTS/thenmsc.gif>

Phelan's test: <http://www.medscape.com/content/2001/00/40/85/408540/art-mos5854.01.fig22.jpg>