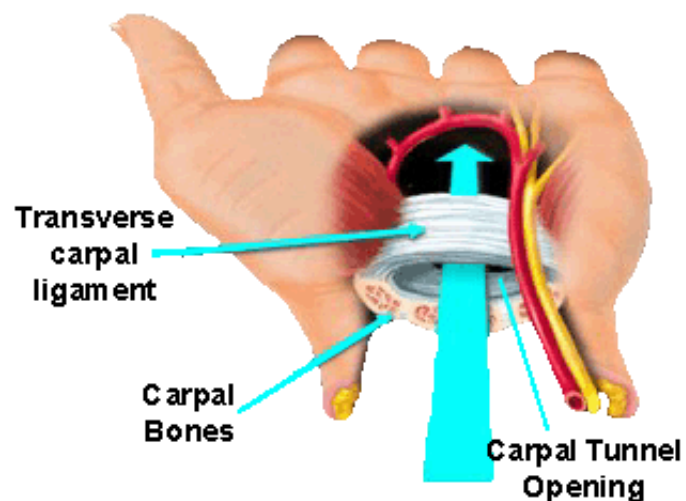


# Carpal Tunnel Syndrome

**Introduction** Carpal tunnel syndrome is a common problem that affects the hand and wrist. This condition, or syndrome, has become the focus of much attention in the last few years due to suggestions that it may be linked to occupations that require repetitive use of the hands - such as typing. In reality, there are many people who develop this condition - regardless of the type of work which he or she does.

**Anatomy** The Median Nerve  
Carpal tunnel syndrome (CTS) is a condition which results when the median nerve does not work properly. Usually, this is thought to occur because there is too much pressure on the nerve as it runs into the wrist through an opening called the carpal tunnel. It may be easier to understand how this occurs if you understand some of the anatomy of the wrist. The median nerve runs into the hand to supply sensation to the thumb, index finger, long finger, and half of the ring finger. The nerve also supplies a branch to the muscles of the thumb, the thenar muscles. These muscles help move the thumb and are very important in moving the thumb so that you can touch each of the other fingers. This motion is called opposition.

The carpal tunnel is an opening into the hand that is made up of the bones of the wrist on the bottom and the transverse carpal ligament on the top.



Looking at a cross section of the wrist allows one to visualize the anatomy of the carpal tunnel. Through this opening called the carpal tunnel, the median nerve and the flexor tendons run into the hand. Looking a little closer, we see that the median nerve lies just

under the transverse carpal ligament.

The flexor tendons are important because they allow us to move the fingers and the hand, such as when we grasp objects. The tendons are covered by a material called tenosynovium. The tenosynovium is very slippery, and allows the tendons to glide against each other as the hand is used to grasp objects. Any condition which causes irritation or inflammation of the tendons can result in swelling and thickening of the tenosynovium. As the tenosynovium covering all of the tendons begin to swell and thicken, the pressure begins to increase in the carpal tunnel - because the bones and ligaments that make up the tunnel are not able to stretch in response to the swelling. Increased pressure in the carpal tunnel begins to squeeze the median nerve against the transverse carpal ligament - because the nerve is the softest structure in the carpal tunnel. Eventually, the pressure reaches a point when the nerve can no longer function normally. Pain and numbness in the hand begins.

One of the first symptoms of carpal tunnel syndrome is numbness in the distribution of the median nerve. This is quickly followed by pain in the same distribution. The pain may also radiate up the arm to the shoulder, and, sometimes the neck. If the condition is allowed to progress, weakness of the thenar muscles can occur. This results in an inability to bring the thumb into opposition with the other fingers and hinders one's grasp.

There are many conditions which can result in irritation and inflammation of the tenosynovium, and eventually cause carpal tunnel syndrome. Different types of arthritis can cause inflammation of the tenosynovium directly. A fracture of the wrist bones may later cause carpal tunnel syndrome if the healed fragments result in abnormal irritation on the flexor tendons. The Key Concept to remember is that anything which causes abnormal pressure on the median nerve will result in the symptoms of pain, numbness and weakness of carpal tunnel syndrome. Recently, physicians have begun to recognize that activities that involve highly repetitive use of the hands can result in carpal tunnel syndrome. This is thought to be caused by inflammation and swelling of the tenosynovium due to overuse.

#### Causes

This disabling syndrome occurs more often in women than men, by a ratio of 3 to 1, usually between the ages of 30 and 50 years. Also, CTS is seen more frequently in people who tend to do forceful repetitive types of work, such as grocery store checkers, assembly line workers, meat packers, typist, accountants, writers,

etc. Most patients generally visit their doctor with these complaints, and the diagnosis is confirmed after physical examination and appropriate nerve testing.

**Symptoms** Pinching or compression of this nerve by the transverse carpal ligament sets into motion a progressively crippling disorder which eventually results in wrist pain, numbness and tingling in the hand, pain consisting of a “pins and needles” feeling at night, weakness in grip and a feeling of incoordination.

**Diagnosis** Evaluation begins by your doctor obtaining a history of the problem, followed by a thorough physical examination. Your description of the symptoms and the physical examination are the most important parts in the diagnosis of carpal tunnel syndrome. Commonly, patients will complain first of waking in the middle of the night with pain and a feeling that the whole hand is asleep. Careful investigation usually shows that the little finger is unaffected. This can be a key piece of information to make the diagnosis. If you awaken with your hand asleep, pinch your little finger to see if it is numb also, and be sure to tell your doctor if it is or isn't. Other complaints include numbness while using the hand for gripping activities, such as sweeping, hammering, or driving. The major physical findings reflect that pressure is increased in the carpal tunnel.

If more information is needed to make the diagnosis, electrical studies of the nerves in the wrist may be requested by your doctor. Several tests are available to see how well the median nerve is functioning, including the nerve conduction velocity (NCV). This test measures how fast nerve impulses are conducted through the nerve.

**Treatment** Non-Operative Treatment

In the early stages of carpal tunnel syndrome, a simple brace will sometimes decrease the symptoms, especially the numbness and pain occurring at night. These braces simply keep the wrist in a neutral position (not bent back too far nor bent down too far). When the wrist is in this position, the carpal tunnel is as big as it can be - so the nerve has as much room as possible. The brace needs to be worn at night while you sleep to prevent the numbness and pain occurring at night. If you have symptoms during the day as well, the brace may help reduce those symptoms as well.

Anti-inflammatory medications may also help control the swelling of the tenosynovium and reduce the symptoms of carpal tunnel

syndrome. These medications include the common over the counter medications such as ibuprofen and aspirin. In some studies, high doses of Vitamin B-6 have also shown some efficacy in decreasing the symptoms of carpal tunnel syndrome.

There is some evidence that exercises may prevent or control the symptoms of carpal tunnel syndrome. Another good discussion of the technical aspects of the reducing the risks of carpal tunnel syndrome suggests that wrist position may contribute to the problem. Workplace ergonomics have long been thought to be a contributing factor and alteration of the worksite is a must for patients doing any type of repetitive work.

If these simple measures fail to control your symptoms an injection of cortisone into the carpal tunnel may be suggested. This medication will decrease the swelling of the tenosynovium and may give temporary relief of symptoms. It is used not only to treat the problem, but serves to aid in diagnosis. If you don't get even temporary relief from the injection, it may be a sign that other problems exist that are causing the carpal tunnel symptoms. There is also a newer way to get cortisone medications down into the carpal tunnel. Iontophoresis is a technique where an electrical current is used to move the molecules of the medication through the skin down into the carpal tunnel. It is less painful than an injection, but is probably not as effective.

## Surgical Treatment

If all of the previous treatments fail to control the symptoms of carpal tunnel syndrome, surgery may be required to reduce the pressure on the median nerve. There are several different surgical procedures designed to relieve pressure on the median nerve. The most common are the traditional open incision technique described below, and the newer Endoscopic Carpal Tunnel Release using a smaller incision and a fiberoptic TV camera to help see inside the carpal tunnel.

## Basic Steps in Open Carpal Tunnel Release

**Step 1** A small incision, usually less than 1/2 inch, is made in the palm of the hand.

**Step 2** After the incision is made through the skin, a structure called the palmar fascia is visible. An incision is made through this

material as well, so that the constricting element, the transverse carpal ligament, can be seen.

Step 3 Once the transverse carpal ligament is visible, it is cut with either a scalpel or scissors, while making sure that the median nerve is out of the way and protected.

Step 4 Once the transverse carpal ligament is cut, the pressure is relieved on the median nerve.

Step 5 Finally, the skin incision is sutured or glued together with Dermabond. At the end of the procedure, only the skin incision is repaired. The transverse carpal ligament remains open and the gap is slowly filled by scar tissue.

A bulky dressing is applied to the hand following surgery. You should leave this in place until your first office visit after the surgery. Your sutures will be removed 10 - 14 days after surgery unless Dermabond was used and no sutures have to be removed. You should avoid any heavy use of the hand for 4 weeks after your surgery. You should not get the stitches wet. Expect the pain and numbness to begin to improve after surgery, but you may have tenderness in the area of the incision for several months.