

# Carpal Tunnel Syndrome

Carpal tunnel syndrome was first appreciated in the 1950s and is a condition where by the median nerve is compressed as it passes out of the forearm, under a thick band of tissue called the flexor retinaculum, and into the hand. It is now endemic in the Western world. It is important to understand the anatomy of the nerve at this point, as this is integrally related with the understanding and treatment of this condition. Normally the nerve is adherent to the under surface of the flexor digitorum superficialis muscle belly, and then passes out from under this to enter the carpal tunnel above the tendons of the same muscle. Before it enters into the tunnel, it usually gives off a small palmar branch which is found about 2-5cm proximal to the start of the carpal tunnel and passes over the retinaculum to the radial side of the nerve (the thumb side). The median nerve itself then passes underneath the flexor retinaculum, and as it comes out the other side, it breaks up into a number of branches which supply sensation to half of the ring finger (the thumb side or radial side), middle finger, the index finger and the thumb, and it also supplies a branch which effects the muscles to the thumb, and this is called the recurrent motor branch. Normally this branch is quite distal to the end of the flexor retinaculum, and is on the under-surface or the deep surface of the nerve, and then bends back around to bury into the muscles which oppose and adduct the thumb (lift it from the palm), and normally this nerve drives the muscles of the thumb. Many anatomic variations have been described around the carpal tunnel. The palmar branch may come off on the ulnar side of the nerve, may pass through the flexor retinaculum or may even come off distal to the flexor retinaculum.

Likewise, the motor branch may come off on the superficial side of the nerve, may even pass through the flexor retinaculum, or in extremely rare situations comes off proximal to the flexor retinaculum in the wrist. The median nerve may also be bifid (double) as it passes under the flexor retinaculum. In addition to

variations in the nerve anatomy, there may also be other anatomical anomalies, such as a median artery (a large artery which runs down the middle of the wrist, through the flexor retinaculum, applying pressure to the median nerve) or anomalous muscles arising within the carpal tunnel.

In most instances, the cause for median nerve compression in the wrist is unknown. However, there may be an underlying cause for it, such as hypothyroidism, pregnancy, some sort of tumour in the carpal tunnel such as a lipoma (a fat tumour), a median artery anomalous muscle or reduced size of the carpal tunnel due to fracturing of the wrist. In some instances, wrist fractures or dislocations may produce acute carpal tunnel syndrome, which needs to be treated as an emergency.

The diagnosis of carpal tunnel is usually made on clinical grounds. Most commonly, patients will complain of waking at night with numbness or pain in the hands, which goes away when they hang the arm down or shake their hand. Initially the numbness is intermittent but may become permanent. When patients with carpal tunnel are examined, flexing the wrist whilst pressing the median nerve reproduces the symptoms. There may a Tinel's sign (tingling over the nerve when it is tapped), and there may also be weakness of the abductor pollicis brevis muscle that is tested by asking the patient to push the thumb away from the palm whilst resisting this movement. Electromyography studies can also confirm the diagnosis, but these tests are painful and there is very little correlation between the changes in EMG study and the symptoms experienced by the patient with carpal tunnel syndrome.

The treatment of carpal tunnel syndrome falls into two categories; operative and non-operative. Non-operative measures that can be taken include: Wearing a wrist splint at night and injection of the carpal tunnel with Kenacort A-40 steroid. Other medical treatment, such as diuretics and anti-inflammatories, have no place to play in the treatment of carpal tunnel syndrome. If these conservative measures fail, and there is no reversible cause of the carpal tunnel syndrome (such as thyroid disorders or pregnancy), then surgical treatment may be required. If left untreated, carpal tunnel syndrome will become progressive, damage to the median nerve will become irreversible and permanent numbness of the radial half of the hand and

weakness of the thumb will ensue, which may be debilitating. Surgery can be performed endoscopically or using an open technique. There are various endoscopic approaches that are used. All of these techniques have a steep learning curve and the cutaneous nerve branches to the middle finger and index finger particularly are at risk, or damage to other nerve structures may also ensue. The open technique has a lower risk of complications, particularly of nerve damage, however the post-operative recovery period is longer. It would appear that at six weeks, there is no difference between the endoscopic and open carpal tunnel release techniques.

The potential risks and complications of carpal tunnel release include nerve damage, wound infection, bleeding, scar abnormalities, pillar pain (pain when the operated wrist is pressed upon), regional pain syndrome (which is a potential risk for any hand surgery or hand injury), or flexor tendon weakness. In some instances, carpal tunnel release may not alleviate the symptoms, and it is vital to distinguish pre-operatively between carpal tunnel compression and median nerve compression at another level, or some other cause for the symptomatology that may mimic carpal tunnel syndrome.

Having said all of this, the disadvantages and the potential risks and complications are outweighed by the benefits of successfully treated carpal tunnel syndrome, and in most instances, surgery produces complete resolution of symptoms and full return of function of the hand. It should be noted however that grip strength is slightly weakened as a result of carpal tunnel release, and some unusual occupations (trapeze artists, rock climbers etc.) may not be able to resume their normal activities following this surgery. One should normally expect to be able to perform light duties two weeks after an open carpal tunnel release, and resume normal heavy manual labour, six weeks after carpal tunnel release.



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