



# CARPAL TUNNEL SYNDROME, GENERALITIES, MANAGEMENT AND TREATMENT

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## ABSTRACT

**Introduction:** Carpal tunnel syndrome (CTS), also called median wrist mononeuropathy, is the most frequent nerve compression syndrome reaching up to 90%.

**Objective:** To detail the current information related to carpal tunnel syndrome and its management, as well as to analyze the conservative and surgical treatment of this disease.

**Methodology:** A total of 27 articles were analyzed in this review, including review and original articles, as well as clinical cases, of which 18 bibliographies were used because the other 9 articles were not relevant to this study. The sources of information were PubMed, Google Scholar and Cochrane; the terms used to search for information in Spanish, Portuguese and English were: túnel carpiano, síndrome do túnel do carpo e AINEs, carpal tunnel syndrome, treatment in patients with carpal tunnel syndrome and corticoids in carpal tunnel.

**Results:** Wrist flexion and extension increase pressure in the carpal canal, leading to the following symptoms: pain, numbness and paresthesia. Corticosteroid injections are recommended in mild to moderate carpal tunnel syndrome. Endoscopic carpal tunnel release has less postoperative pain, earlier recovery in grip and pinch strength, compared to open release. Postoperative complications are infrequent and most are minimal and transient.

**Conclusions:** Carpal tunnel syndrome is the oppression of the median nerve at the level of the wrist joint, which may be accompanied with limitation in epineural and axoplasmic blood flow, leading to nerve dysfunction, edema, and scarring. The diagnosis of carpal tunnel syndrome has been made through a mixture of clinical history and physical examination maneuvers, however, the use of ultrasound and electrodiagnostic tests is now being supported. There are conservative and surgical treatments, among which evidence shows that steroid injection and carpal tunnel release are effective and present good treatment results.

**KEY WORDS:** Syndrome, tunnel, carpal, mononeuropathy.



## INTRODUCTION

Carpal tunnel syndrome (CTS), also called median mononeuropathy of the wrist, is the most frequent nerve compression syndrome, reaching up to 90%. This clinical picture is generated by the compression of the median nerve at the moment of crossing the wrist in the carpal tunnel (1,2).

Frequently, carpal tunnel syndrome occurs in regular computer users, construction workers and other occupations where repetitive and frequent movements are performed (3).

Generally we have ten structures that penetrate the carpal tunnel: the median nerve, the flexor pollicis longus, four tendons of the flexor digitorum profundus and four tendons of the flexor digitorum superficialis. The flexor retinaculum forms the roof of the carpal tunnel where the transverse carpal ligament is incorporated. Below this is the median nerve, continuing and dividing into the digital nerves. The floor of the carpal tunnel is formed by the carpal bones(4).

The picture may consist of hyperesthesia or paresthesia in the sensory distribution of the median nerve in the hand, in addition to weakness in the intrinsic median innervated muscles of the hand(2).

Treatment is versatile, usually correlated with the preferences of the affected person, the physician and the severity of the syndrome(5).

## METHODOLOGY

A total of 27 articles were analyzed in this review, including review and original articles, as well as clinical cases, of which 18 bibliographies were used because the other 9 articles were not relevant to this study. The sources of information were PubMed, Google Scholar and Cochrane; the terms used to search for information in Spanish, Portuguese and English were: carpal tunnel, carpal tunnel syndrome, treatment in patients with carpal tunnel syndrome, síndrome do túnel do carpo e AINEs and corticoids in carpal tunnel.

The choice of the bibliography exposes elements related to carpal tunnel syndrome in the last 5 years; besides this factor, these studies have several important factors related to their different treatments.

## DEVELOPMENT

Carpal tunnel syndrome is the oppression of the median nerve at the level of the wrist joint related to the breakdown of nerve function and is caused by increased pressure in the carpal tunnel (3,4).

In a healthy person the pressure inside the carpal tunnel fluctuates between 2.5 and 13 mmHg, decreasing the cross-sectional area of the carpal tunnel could lead to an increase in pressure above 20 to 30 mmHg. This is where epineural and axoplasmic blood flow is limited, leading to nerve dysfunction, edema and scarring(4,6,7).

Among the risk factors and probable causes for presenting this syndrome are: advanced age, female sex,

pregnancy, obesity, repetitive movements, diabetes mellitus and autoimmune disorders(2,3).

In patients with carpal tunnel syndrome, flexion and extension of the wrist increase the pressure in the carpal canal, which leads to the following symptoms: pain, numbness and paresthesia in the first three fingers of the hand, as well as the radial half of the fourth finger. Those with moderate or severe disease may also reveal atrophy of the thenar muscles, decreased grip and pinch strength, and proximal migration of pain(4).

Conventionally, the diagnosis of carpal tunnel syndrome has been made through a mixture of clinical history and physical examination maneuvers, among which we find Tinel's test and Phalen's test. Currently, support is being given to ultrasound, electrodiagnostic tests and a combination of the two, because they show the underlying pathophysiology (5).

It is essential to differentiate acute carpal tunnel syndrome from chronic carpal tunnel syndrome, since acute carpal tunnel syndrome requires urgent release. Acute CTS can be subdivided into traumatic and non-traumatic. Traumatic CTS is caused by trauma to the wrist and carpal bone, resulting in rupture, direct or indirect entrapment of the nerve, which may be caused by hematoma and/or inflammation of adjacent soft tissues. Among the causes of acute non-traumatic CTS are pseudogout, tophaceous gout, soft tissue infections, calcifying tendinitis, septic arthritis, tumoral calcinosis and pigmented villonodular synovitis, although they are not very frequent (4,8).

When assessing CTS it is recommended to differentiate with the following pathologies: overuse injury, cervical radiculopathy, cervical disc disease, cervical spondylosis, cervical myofascial pain, traumatic and radiation-induced brachial plexopathy, neuropathies, mononeuritis multiplex, multiple sclerosis, tendinitis, tenosynovitis and thoracic outlet syndrome(3).

Carpal tunnel syndrome is usually evident following a distal radius fracture and may be transient. Prophylactic carpal tunnel release is not indicated in the absence of signs and symptoms following a distal radius fracture(9).

There are conservative and surgical treatments, among which evidence shows that steroid injection and carpal tunnel release are effective and have good treatment results(5).

In the first instance the treatment is not surgical, it can be through splints and orthopedic devices, however surgical treatment was shown to be superior to conservative treatment, regardless of the surgical technique used. In addition, post-surgical complications are infrequent and most of them are minimal and temporary(10).

Corticosteroid injections are recommended in mild to moderate carpal tunnel syndrome, since they provide symptom improvement, although their effects are usually temporary (4).

Corticosteroids may have benefits, but should be used with caution as they may have negative effects(11).

Conservative treatment is first line in non-deficient CTS and surgical intervention when it presents or progresses with severe sensory or motor deficits(5).



Oral corticosteroid therapy with 20 mg daily for two weeks temporarily improves CTS symptoms in the short term and can be used(12).

The use of NSAIDs, pyridoxine and diuretics in the treatment of CTS has been described, however they are not effective(13).

Laser acupuncture and traditional acupuncture show little or no effect on short-term symptoms compared to sham acupuncture or placebo(14).

Surgical treatment involves releasing the transverse carpal ligament longitudinally which relieves pressure inside the carpal tunnel and frees the median nerve. It can be performed by an open or endoscopic approach. The most appropriate one should be individually assessed according to the patient's factors and also take into account the surgeon's skill with each technique. One study showed that treatment with open surgery for carpal tunnel release has superior results compared to treatment with wrist splints (4,15).

Surgical treatment of CTS is unevenly distributed among race, gender, and socioeconomic status. More research is needed to recognize the source of these inequalities for greater equity in patient care (16).

Currently, hydrodissection or transverse carpal ligament release under ultrasound guidance shows promise but more evidence is needed. The endoscopic compression release that has shown the most favorable results is named after Agee et al, where only a 0.5-1.0 cm incision proximal to the wrist flexion crease is made following the deep surface of the flexor retinaculum to the distal fat pad. Sectioning of the flexor retinaculum is initiated distally. This lowers the risk of damage to the neurovascular bundles to less than 1% and can usually be guided by ultrasound (5).

Some research has shown that endoscopic carpal tunnel release has less postoperative pain, as well as earlier recovery of grip and pinch strength, allowing early return to work compared to open release. Infraretinacular or transcarpal tunnel approaches may be associated with a higher risk of median nerve injury (17,18).

As for sutures, absorbable sutures are presumed to confer considerable savings by eliminating the need for removal, however it is not known whether they provide superior, inferior or equivalent results compared to non-absorbable sutures (19).

Myofascial self-stretching of the carpal ligament may be a conservative treatment option since a study of patients showed improvement in numbness, tingling, pinch strength and sensory range(2).

Occasionally, the syndrome may recur even after undergoing surgery. Those with carpal tunnel syndrome secondary to wrist fracture or diabetes have a less favorable prognosis, as do those with axonal loss on electrophysiological testing(3).

Among the most common complications of carpal tunnel syndrome are chronic wrist and hand pain, irreparable damage to the median nerve, atrophy and weakness of the muscles at the

base of the thumb. In addition, postoperative complications include neuroma of the palmar cutaneous branch of the median nerve, joint stiffness, hypertrophic scarring, dysesthesia and inability to relieve symptoms (3).

## CONCLUSIONS

Carpal tunnel syndrome is the oppression of the median nerve at the level of the wrist joint, which may be accompanied with limited epineural and axoplasmic blood flow, leading to nerve dysfunction, edema and scarring. Flexion and extension of the wrist increase pressure in the carpal canal, leading to the following symptoms: pain, numbness and paresthesia. The diagnosis of carpal tunnel syndrome has been made through a mixture of clinical history and physical examination maneuvers, however, the use of ultrasound and electrodiagnostic tests is now being supported. There are conservative and surgical treatments, among which evidence shows that steroid injection and carpal tunnel release are effective and have good treatment results. Corticosteroid injections are recommended in mild to moderate carpal tunnel syndrome. Endoscopic carpal tunnel release has less postoperative pain, earlier recovery of grip and pinch strength compared to open release. Postoperative complications are infrequent and most are minimal and transient.

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