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Compressive Syndrome of the Ostio-fibrous Tunnel at Carp Level - A literary review

Síndrome Compressiva do Túnel Óstio-fibroso ao Nível do Carpo – Uma revisãoliterária

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ABSTRACT

CTS tunnel syndrome is characterized by compression of the median nerve within the carpal canal, at the level of the wrist. The etiology of this disease is still unknown, but it is secondary when related to other pathologies. Compression of the median nerve in the carpal tunnel results in most cases from chronic nonspecific flexor tenosynovitis, and may also occur in many other nosological entities or lesions that occupy space in the tunnel. The prevalence of ostium-fibrous tunnel compressive syndrome at the level of the carpus is estimated to be between 4% and 5% of the population, ranging from 51 to 125:100 000, and occurs more frequently in females, especially between 40 and 60 years of age. The main clinical manifestations include paresthesias in the territory of sensitivity of the median nerve (particularly in the thumb, index finger, middle and radial aspect of the ring finger), hyperesthesia (less frequent hypo- or anesthesia), wrist pain that may radiate to the fingers, hands, elbows, and in some cases, even the shoulder (such

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symptoms may disappear with limb movement or massage). Diagnosis should be clinical, based on the patient's history and physical examination. For physical examination, the Tinel and Phalen tests can be used. Complementary tests are used to buy the diagnosis, the most recommended being: electroneuromyography (ENMG), magnetic resonance imaging (MRI), computed tomography (CT) and ultrasonography (US). Treatment can be conservative or surgical. The conservative mode consists of the adoption of techniques to relieve symptoms, such as pain control through wrist orthoses for immobilization, injections and medications, alternative therapies, and physical therapy. Surgical treatment aims to decompress the median nerve and reduce pressure in the carpal tunnel. This approach is adopted when conservative treatment does not lead to improvement of the clinical picture within 6 to 8 weeks. The objective of this study is to review the medical aspects related to the compressive syndrome of the ostium-fibrous tunnel at the carpal level. The methodology employed is analytical through a review of the bibliographic literature. The data extracted in the research were from the US National Library of Medicine (PubMed) with the descriptors: median nerve, wrist and carpal tunnel syndrome, according to the Health Sciences Descriptors (DeCS). To cross-reference these, the Boolean operator AND was used. A total of 43 articles were found, and after inclusion and exclusion criteria, 36 articles were used. Those used for inclusion: articles in English, Portuguese or Spanish, between June 2015 and July 2021, and that were available in full and for free online access. Studies that did not address the relevant concept for the achievement of the objective were excluded; repeated studies; according to methodological quality criteria. Thus, the medical evaluation should be carried out in a specific way, making it essential to collect the clinical history, physical examinations and complementary exams in order to choose to improve conservative therapy and, subsequently, surgery, if applicable. These facts will allow a greater therapeutic success, allowing the greatest well-being of the patient.

Keywords: Median nerve, Wrist, Carpal tunnel syndrome.

INTRODUCTION

CTS tunnel syndrome is characterized by compression of the median nerve within the carpal canal, at the level of the wrist. It is the most common, best defined and most studied compressive neuropathy in human beings, and the most frequent cause is idiopathic. Although spontaneous regressions are possible, worsening of symptoms is the rule. (KOUYOMDJIAN, 1999, p. 1)

> Its first description is attributed to Paget, who reported a case of compression of the median nerve as a result of a fracture of the distal radius. In 19132, Marie and Foix published the first anatomical and histopathological description of an hourglass lesion of the median nerve with neuroma proximal to the flexor retinaculum (RF). Beginning in the 1950s, Phalen's work established the principles of CTS. (CHAMMAS; BORETTO; BURMANN; BRANCHES; GRANDSON; SILVA, 2014, p. 2)

The diagnosis of carpal tunnel syndrome is predominantly clinical through symptoms and tests. An electroneuromyographic examination may be recommended preoperatively or in case of an occupational disease. Through accurate clinical and electrophysiological diagnosis, with

early treatment, complete cure is possible in most cases. (CHAMMAS; BORETTO; BURMANN; GRANDSON; SILVA, 2014, p. 1)

LITERATURE REVIEW

ANATOMY INVOLVED IN THE SYNDROME

The median nerve is formed from the lateral and medial fascicles, originating from the anterior divisions of the brachial plexus. The anterior divisions of the brachial plexus direct the fibers coming from C5, C6, C7, C8 and T1 to the formation of the median nerve.

This nerve enters the upper limb through the armpit and travels down the medial part of the arm. The moment it penetrates the forearm between the two heads of the pronator teres muscle, it innervates all the wrist flexor muscles, fingers, and pronators, except the ulnar half of the flexor digitorum profundus and the flexor carpi ulnaris muscle.

In addition, the median nerve also plays an important role in the sensory innervation of a large part of the skin of the palmar aspect of the hand and the skin of the thumb, index finger, middle finger and lateral part of the ring finger.

The median nerve innervates basically all the wrist and finger flexors, which means that it is related to the grasping movement, that is, closing the fingers. One of the signs of carpal tunnel syndrome is loss in grip strength.

The carpal tunnel consists of an osteofibrous tunnel bounded by the carpal bones and the flexor retinaculum (RF). It is bounded at the ulnar border by the hamate hâmulus, the pyramidal and the pisiform and at the radial border by the scaphoid, the trapezius and the flexor carpi radialis (FRC) tendon. (CHAMMAS; BORETTO; BURMANN; GRANDSON; SILVA, 2014, p. 2)

The transverse carpal ligament, also called the flexor retinaculum, is a crossing point for basically all flexors beyond the median nerve, such as the superficial flexor digitis tendon (FSD), the four tendons of the deep flexors of the fingers (FPD), and the flexor pollicis longus tendon (FLP). (CHAMMAS; BORETTO; BURMANN; GRANDSON; SILVA, 2014, p. 2)

Generally, carpal tunnel syndrome is secondary to other pathologies. The most frequent cause is tendinitis of the flexor muscles. Compression of the median nerve in the carpal tunnel results in most cases from chronic nonspecific flexor tenosynovitis, and may also occur in many other nosological entities or lesions that occupy space in the tunnel.

AETIOLOGY

The cause of carpal tunnel syndrome is still unknown. Secondary STCs can be related to continent or content anomalies. In addition, dynamic CTS are often found in occupational pathologies. (CHAMMAS; BORETTO; BURMANN; GRANDSON; SILVA, 2014, p. 4)

According to Chammas, Boretto, Burmann, Ramos, Neto and Silva (2014), idiopathic carpal tunnel syndrome occurs more frequently in females (65% to 80%) aged between 40 and 60 years, and about 50% to 60% are bilateral. Bilateral syndromes are linked to a synovial hypertrophy of the flexor tendons, usually caused by connective tissue degeneration with vascular sclerosis, edema, and collagen fragmentation. Factors such as repetitive manual activities and exposure to vibrations and cold are less important when compared to genetic and anthropometric factors (carpal tunnel size).

Secondary carpal tunnel syndromes are usually due to any condition that causes continent anomalies (modify the carpal tunnel walls) and, consequently, causes compression of the median nerve. Such anomalies may occur due to dislocation or subluxation of the carpal bones, fractures, arthrosis of the wrist, inflammatory or infectious arthritis, and acromegaly. Following the same context, the so-called content anomalies caused by tenosynovial hypertrophy, inflammatory or metabolic tenosynovitis, fluid distribution anomalies (such as in the third trimester of pregnancy), persistent arterial hypertrophy of the median nerve, intratunnel tumor, hematomas and obesity may also occur. (CHAMMAS; BORETTO; BURMANN; GRANDSON; SILVA, 2014, p. 5)

Dynamic carpal tunnel syndrome occurs when pressure in the carpal tunnel increases in extension and flexion of the wrist. Often, repetitive movements with wrist flexion-extension, finger flexion and forearm supination are related to the cause of this increase. (CHAMMAS; BORETTO; BURMANN; GRANDSON; SILVA, 2014, p. 5)

Acute causes of carpal tunnel syndrome are trauma, burns, infections, acute thrombosis of the median nerve artery, and often hemorrhage due to anticoagulant overdose or in case of hemophilia. (CHAMMAS; BORETTO; BURMANN; GRANDSON; SILVA, 2014, p. 5)

EPIDEMIOLOGY

The prevalence of ostium-fibrous tunnel compressive syndrome at the level of the carpus is estimated to be between 4% and 5% of the population, ranging from 51 to 125:100 000, and occurs more frequently in females, especially between 40 and 60 years of age. CTS comprises about 40.8% of all diseases classified as RSI/WMSD; Compression of the median nerve in the

carpal tunnel results in most cases from chronic nonspecific flexor tenosynovitis, wrist arthrosis, inflammatory arthritis, intratunnel tumor, fractures of the distal radius and/or dislocations of the carpal joint and secondary to trauma; The use of manual force above 4 kg, repetitiveness of movements, high levels of vibration of the upper limbs, and prolonged work with the wrists in extension or flexion were also reported as risk factors; CTS can also present in fluid distribution abnormalities (pregnancy 25% of cases), metabolic tenosynovitis (diabetes mellitus and amyloidosis), acromegaly, among others (SILVA, et al; 2014). According to several studies, CTS is the most common compressive neuropathy. (PERFECT; 2019).

Regarding the affected side reported by the patient, bilateral symptoms occurred in 72.5% (symmetrical in 20.2%, greater on the right in 38.0% and greater on the left in 14.3%) and unilaterally in 27.5% (right in 19.3% and left in 8.1%). Regarding the time of day, the majority reported (85.3%) a predominance of symptoms at night and in the morning (upon awakening); Continuous cases occurred in 12.9% and only 1.8% during the day. (SILVA, et al; 2014)

Pain occurred in a little more than half of the cases (58.2%); in which there was extension to the forearm was 17.6% and to the entire upper limb including shoulder in 13.6%. Pain only in isolated or combined fingers was not common (2.4%). However, with regard to the general symptoms reported in the phalanges, most patients (42.5%) reported symptoms throughout the hand; in the other cases: III finger (13.8%), III-IV finger (10.1%) and I-II-III finger (9.7%); there were no complaints of isolated involvement of the IV or V fingers. Numbness and tingling were, in general, reported in the hand, but the pain condition extended approximately in 39.4% (SILVA, et al; 2014).

Patients with an evolution time of up to one month corresponded to 9.7%, up to six months, 33.1%, up to 1 year, 50.6%, up to 2 years, 64.1% and up to 5 years, 79.5%. It should be noted that 16.2% of the cases underwent electrophysiological evaluation with a symptomatology duration of at least 10 years. Tenar atrophy, reflecting axonal degeneration (denervation) of the median nerve, occurred in 6.2% of cases, 3.8% of which occurred on the right (SILVA, et al; 2014).

With regard to known diseases, self-reported diabetes mellitus was observed in 4.4%, even excluding cases with electrophysiological peripheral neuropathy. Diseases associated with lower incidence were Parkinson's and myopathy with 0.6%, scleroderma and hypothyroidism with 0.4%, and rheumatoid arthritis, and systemic lupus erythematosus with 0.3% (PERFEITO; 2019).

In view of the above, the most sought after specialties for the resolution of signs and

symptoms were: Orthopedics (34.6%), rheumatology (22.9%), neurology/neurosurgery (19.3%) and vascular surgery (12.4%), revealing how the symptoms of CTS can be interpreted by patients (SILVA, et al; 2014).

Regarding the decision of surgical treatment, the decision of surgical decompression is strongly influenced by the electrophysiological evaluation and 75% of confirmed cases go for surgery. On the other hand, in patients with normal nerve conduction and a clinical picture suggestive of CTS, specialists should avoid surgical intervention. In 2008, 127,269 people aged 20 years and over underwent surgery from an STC in metropolitan France, an incidence of 2.7/1,000 (females 3.6/1,000, males 1.7/1,000). There were two frequency peaks, the first, the highest, between 45 and 59 years of age (75% female) and the second between 75 and 84 years (64% female) (CHAMMAS et al,. 2014).

CLINICAL MANIFESTATIONS

In most cases, they have an insidious onset, that is, they are neglected by patients, so when they go to a professional, they are already at a more advanced stage. It develops through activities that result from repetitive movements of flexion and extension of the wrist associated with compression and vibration forces, together with the inelasticity of the transverse carpal ligament, which results in compression of the median nerve causing the compressive syndrome in a bone-fibrous tunnel at the level of the carpus, which generates an inability to perform anatomical movements of the affected segment. However, there are other factors that can promote increased pressure in the carpal tunnel, such as: trauma, synovial cyst, rheumatoid arthritis, gout, hypertrophy of the thumb abductor, pregnancy, hypothyroidism, acromegaly, infections, and amyloidosis (FILHO; OLIVE TREE; 2017).

The main clinical manifestations include paresthesias in the territory of sensitivity of the median nerve (particularly in the thumb, index finger, middle and radial aspect of the ring finger), hyperesthesia (less frequent hypo- or anesthesia), wrist pain that may radiate to the fingers, hands, elbows, and in some cases, even the shoulder (such symptoms may disappear with limb movement or massage). An almost pathognomonic sign of CTS is nocturnal acroparesthesia, disrupting sleep, along with the perception of tremor or redness of the affected hand. There may also be evidence of thenar atrophy and limitation of the range of motion of the radiocarpal joint (ESTIVALET, et al; 2020)

The Phalen maneuvers (sustained flexion of the wrist causing paresthesias in the affected hand) and the Tinel sign (sensation of shock with radiation to the hand and fingers to the

percussion of the wrist) are of great value for the clinical diagnosis. The evaluation of the use of provocative tests for the diagnosis of the syndrome shows that the Phalen test has great sensitivity, and the Tinel sign, although less sensitive, is more specific. However, compression of the median nerve in its path (Durkan's sign), and electroneuromyography is the gold standard test for diagnosis (CASTRO, et al; 2015).

CTS can be clinically classified into mild, moderate, and severe. In mild symptomatology, the patient presents intermittent symptoms, with or without the positivity of the provocative tests (Phalen and Tinel), with this he does not present muscle hypertrophies and sensitivity may be normal or with mild hyperesthesia, predominantly nocturnal symptoms, return to normality is quickly achieved by change of posture or movement of the hands. In moderate cases, the symptoms become more frequent, there is decreased sensitivity to vibratory stimulus, loss of manual ability (deficit for clamping), positive provocative tests, thenar muscle weakness and electroneuromyographic examination reveals sensory and motor deficits. The syndrome is considered severe when the symptoms are persistent, has marked sensory loss, with severe functional deficiency and marked thenar and skin atrophy, electroneuromyographic examination demonstrates potential for motor denervation and/or indeterminable sensory potential; a poorer prognosis even after decompression (SILVA, et al; 2014)

It can be concluded that, by means of an adequate propaedeutics, the best way to diagnose CTS is the study of conduction of the median nerve through the transverse carpal ligament. In this syndrome, the characteristic abnormalities are the local reduction of speed conduction in the distal, motor, and sensory fibers, with or without a reduction in the amplitude of the action potential of the median nerve (ESTIVALET, et al; 2020).

DIAGNOSIS

Initially, it should be remembered that there is no gold standard for the diagnosis of Ostium-fibrous Compressive Tunnel Syndrome at the Carpal Level (CTS) (CHAMMAS et al., 2014). According to FIGUEREDO et al., (p. 25, 2018), the diagnosis should be clinical, based on the patient's history and physical examination. For the physical examination, the Tinel and Phalen tests can be used, while the complementary tests have the function of confirming the diagnosis of CTS and ruling out other possibilities. The most recommended complementary tests are electroneuromyography (ENMG), magnetic resonance imaging (MRI), computed tomography (CT) and ultrasonography (US).

For effective clinical diagnosis, challenge tests should be used. It is important to remember that anatomically the median nerve is located behind the palmar longus tendon and in front of the flexion fold of the wrist. Tinel's sign is positive if the patient notices paresthesia during percussion of the palmar aspect of the wrist at the level of the median nerve, and this test has a sensitivity of 26% to 79% and specificity of 40% to 10%. Phalen's sign is positive if the patient reports paresthesia in the territory of the median nerve when performing maximal active flexion of the wrist for 60 seconds. The sensitivity of this test is 67% to 83% and the specificity is 47% to 100%. The wrist flexion compression test, on the other hand, consists of applying pressure on the median region of the carpal tunnel with the wrist flexed at 60º, forearm in supination and elbow extended. The result is positive if the patient has paresthesia in the territory of the median nerve. This test has a sensitivity of 82% and a specificity of 99% (CHAMMAS et al., 2014).

As for the complementary tests, ENMG consists of a stimulus stage and a detection stage, and the test allows the study of the sensory and motor nerve conduction of the median nerve. The earliest and most sensitive electrical change in CTS is the decrease in sensory conduction velocity between the palms, fingers, and wrist. The median transtunnel velocity considered pathological is < 45m/s. ENMG has a sensitivity of 54%, but a specificity of 97.5% (CHAMMAS et al., 2014). According to PAIVA et al., (p. 70, 2021), ENMG is considered the diagnostic method of choice for patients with suspected peripheral neuropathy because it provides additional information on myelin dysfunction and axonal loss.

For FIGUEREDO et al., (p.26, 2018), ENMG is considered a gold standard for some authors, but for others there is no such standard, as there is a wide variety of symptoms, different etiologies, and an incomplete knowledge of the pathophysiology of CTS.

O grupo de trabalho francês 'National Agency for Health Accreditation and Evaluation' (Anaes) chegou à conclusão de que:

> "ENMG is located after the clinical examination; ENMG is not indispensable for diagnosis in a typical way; ENMG is not required prior to corticosteroid infiltration; It is recommended in cases of doubt. It is an aid in differential diagnosis; It is recommended before the surgical decision is made; It is requested in the recognition of an occupational disease." (CHAMMAS et al., 2014).

US began to be used as a diagnostic tool for CTS in the 1990s, and it also began to be used for the diagnosis of musculoskeletal disorders, such as neuropathy of the peroneal nerve and ulnar nerve (PAIVA et al., 2021). FIGUEREDO et al., (p. 27, 2018) evidence that the most frequent ultrasound findings found in studies that evaluated CTS were the aspects of the median

nerve (MN). Initially, morphological changes may be imperceptible, but as the disease progresses, an increase in the caliber of the MN can be identified, as well as fibrosclerosis and demyelination in histology, associated with thickening of the proximal region of the tunnel at the level of the first row of the carpus. In addition to these findings, we can identify decreased nerve mobility and echogenicity, increased vascularization, and anatomical variations that may contribute to CTS. US has the advantage of being user-friendly, low-cost, portable, non-invasive, available in most health services, and well tolerated by patients (PAIVA et al., 2021).

MUNER et al., (p. 7, 2021) show that the most indicated complementary tests for the identification of CTS are electrodiagnostic studies (EDX), especially if ENMG and nerve conduction studies (NEC) are performed together, as they are non-invasive tests with great diagnostic capacity. It was observed that the warming of the hands could generate diagnostic errors in the process, while once again the anamnesis and physical examination can increase the diagnostic chances. Regarding the ultrasonographic studies, the cross-sectional area (AST) of the median nerve at the entrance of the tunnel has been described as the best measure for the identification of CTS, but there are still doubts as to whether US is a good primary diagnostic method, since other authors who have evaluated the diagnosis of CTS by this method have taken into account a previous EDX examination. therefore, US was not used as the primary diagnostic method.

TREATMENT

In the context of CTS, treatment can be conservative or surgical. Conservative treatment consists of the adoption of techniques to relieve symptoms, such as pain control by means of wrist orthoses for immobilization, injections and medications (especially corticosteroids), alternative therapies and physical therapy (with emphasis on analgesia, gain of range of motion of the hand and/or wrist, and improvement of muscle function) (BROLESI and LONGEN, 2019). This approach can be used in patients with mild to moderate symptoms, an evolution of less than one year, and with the cause of the symptoms identifiable (LOBO et al., 2018).

Perfeito and Figueiredo (2019) highlight that the symptoms presented by the patient are determinant for the choice of therapy adopted and the subsequent result. Ergonomic adjustments, use of splints, kinesiotherapy, acupuncture and electrothermophototherapy are treatment alternatives.

Local corticosteroid injection has the effect of reducing tenosynovial volume and has a direct effect on the MN. Although effective, this technique presents a risk of damaging the NM

and generating a neurological deficit associated with persistent pain. The injection point is located 4 cm proximal to the flexion fold of the wrist and halfway between the tendon of the palmaris longus and flexor carpi ulnaris. The needle should be placed at 45º from the carpal tunnel and the injection should be done slowly. Results are observed after a few days to two-three weeks, and temporary relief after the procedure indicates a good prognosis for surgical treatment. It is necessary to respect the interval of at least one month between two injections, and the use of more than 3 injections is not indicated. Nocturnal immobilization in a neutral position with an orthosis generates results similar to those of corticosteroid injections, since the position of the wrist with the splint decreases intracanalicular pressure (CHAMMAS; BORETTO; BURMANN; GRANDSON; SILVA, p. 438, 2014).

Still on the conservative approach, it is important to recognize the role of physical therapy. Within the area, treatments such as stretching, which reduces the thickness of the carpal tunnel structures by stretching the muscles and tendons, use of paraffin (which generates superficial heat, leading to pain relief and improvement of local blood flow), laser therapy, electrotherapy, manual therapy, kinesio tape, acupuncture, hydrotherapy, strengthening, workplace gymnastics, thermotherapy and cryotherapy. (BROLESI and LONGEN, p. 106-119, 2019).

A noteworthy conservative treatment is the use of therapeutic US, which is used for the treatment of various musculoskeletal disorders thanks to the potential for heating deep tissues, which provides a reduction in inflammation and edema, increased tendon and nerve flexibility, relief of pain, recovery of function, increased circulation, and promotion of tissue healing and repair. In addition, it also helps to accelerate the recovery of conduction velocity that is reduced in patients with CTS (BROLESI and LONGEN, 2019).

Surgical treatment aims to decompress the MN and reduce pressure in the carpal tunnel. This approach is adopted when conservative treatment does not lead to improvement of the clinical picture in the period of 6 to 8 weeks, that is, in cases where the clinical picture persists and leads to functional impairment, affecting the performance of activities, in addition to being indicated in patients with evidence of denervation and/or patients with thenar atrophy. Several surgical techniques can be adopted, such as the open approach (section of the transverse carpal ligament) or the arthroscopic approach, which consists of performing two access sites, one in the palm of the hand and the other in the wrist, ensuring less tissue invasion. The most chosen surgical approach is the open approach, performed with local anesthesia associated with the opening of the antebrachial fascia, keeping the region bandaged for one week (BROLESI and

LONGEN, 2019; VÁZQUEZ-ALONSO and DÍAS-ÁVALOS, 2018; OKAMURA et al., 2018).

According to CHAMMAS et al., (p. 439, 2014), the open technique is the oldest. The incision made is 3 to 4 cm and extends from the flexion crease of the wrist to the extension of the radial edge of the fourth finger. The middle palmar aponeurosis is radially incised and the flexor retinaculum (RF) should be exposed with the retractors, being incised in its middle part on the ulnar side of the fourth finger axis, respecting an ulnar margin to limit flexor subluxation. RF dissection should be continued distally to the superficial palmar arch and median-ulnar anastomosis. After separating the synovium from the flexors with the scissors, it will be possible to check the contents of the carpal tunnel. To check the median nerve, the radial border of the RF should be raised with a retractor, remembering that the MN is the most superficial element. Some procedures can be associated with this technique, such as synovectomy of the flexors, epineurotomy of the median nerve, exploration of the thenar branch, release of the Guyon's pocket in case of acroparesthesia of the fifth finger, RF reconstruction, and opposition transfer of the thumb.

Regarding the postoperative period, CHAMMAS et al., (p. 440, 2014) highlight that digital mobilization can be performed from the immediate postoperative period and that the stitches are removed from the fifteenth day onwards. Strength activities should be partially reintroduced after three weeks and completely after 6 to 8 weeks.

Some authors highlight that there are no major differences in the treatment performed by open approach and arthroscopy, that is, each approach has its particularities, but both are generally capable of producing satisfactory results (FERNANDES et al., 2018).

COMPLICATIONS AND SEQUELAE

According to Chammas et al., (p. 440, 2014), the factors associated with a worse prognosis are: Diabetes Mellitus with polyneuropathy, alcohol and tobacco use, occupational disease, impaired general condition, preoperative ENMG normality, tenary amyotrophy, and multiple nerve compression syndrome.

According to Fernandes et al. (2020), Failure of Surgical Treatment of Carpal Tunnel Syndrome (ITCSTC) is associated with three different clinical situations and symptoms. The first situation is that in which the patient maintains persistent symptoms in the postoperative period (corresponds to 40% of TCTIs); the second situation corresponds to the success of the surgical intervention, with recurrence of symptoms after a period and the third occurs when there is remission of the symptoms prior to surgery, but patients report different symptoms in the

postoperative period, and paralysis of the thenar muscles and worsening of symptoms after surgery are related to iatrogenic lesions and range from 15% to 67% of the causes of ITCSTC. For these cases, early reintervention is indicated in order to confirm the diagnosis and treatment.

The most common causes of ITCSTC associated with the timing of surgery are incomplete section of the transverse carpal ligament, intraoperative nerve injury, and difficulty in identifying changes in the anatomy of the tendons. Incomplete decompression is the cause of 50-58% of cases of persistent symptoms and can lead to an acute worsening of symptoms by generating a nerve compression located at a point on the median nerve (FERNANDES et al., 2020).

On the other hand, the postoperative causes of CTTTI are scarring adhesions around the MN and the reconstitution of the transverse carpal ligament by scar tissue. Adhesions have been reported to appear in 88% of patients who underwent surgical revision. These adhesions can be localized or diffuse and are responsible for preventing nerve movement within the carpal tunnel, as well as reducing nerve vascularization.

> "One of the ways to avoid these adhesions around the median nerve is to use the ulnar access route and eccentric opening of the flexor retinaculum in the most ulnar region, thus avoiding the formation of scar tissue immediately above the median nerve." (FERNANDES et al., 2020).

Complications of surgical treatment of CTS should be divided into minor and severe. The smaller ones correspond to scarring neurogenic pain (injury to the nerve branches involved in the innervation of the palm of the hand in the region where they cross the line that passes through the radial border of the fourth finger, being more common in endoscopic surgeries), *pillar pain* or pain in the ulnar border (pain at the level of the hypothenar eminence and at the level of the thenar eminence), algoneurodystrophy and instability of the ulnar flexor tendons by means of RF section (severe pain at the ulnar edge of the CT scan, which returns to the forearm through the path of the flexor ulnaris of the fingers).

Serious complications are rare. The most relevant are: transient neuropraxia (more common after endoscopic), partial or complete section of the median or ulnar nerves or their branches (similar incidence in the endoscopic and open approach) and lesion of the superficial vascular arch (as it is located close to the RF) (CHAMMAS et al., p. 441-442, 2014).

METHODOLOGY

The methodology employed is analytical through a review of the bibliographic literature. The data extracted in the research were from the US National Library of Medicine (PubMed) with the descriptors: median nerve, wrist and carpal tunnel syndrome, according to the Health Sciences Descriptors (DeCS). To cross-reference these, the Boolean operator AND was used. A total of 43 articles were found, and after inclusion and exclusion criteria, 36 articles were used. Those used for inclusion: articles in English, Portuguese or Spanish, between June 2015 and July 2021, and that were available in full and for free online access. Studies that did not address the relevant concept for the achievement of the objective were excluded; repeated studies; according to methodological quality criteria.

CONCLUSION

Carpal tunnel syndrome (CTS) is defined by compression of the median nerve at the wrist. This disease is more frequent due to idiopathic causes, but it can come from other pathologies. The medical evaluation should be made based on anamnesis and physical examination. After that, complementary tests are requested to confirm the case, in this way, the specific conservative therapy for each patient is established. If there is no improvement in the condition, it is necessary to apply the surgical technique. In this pathology, sequelae and complications can occur, so you should always maintain the necessary care for the cases.

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