

# Interference of the Carpal Tunnel syndrome symptoms on occupational performance

## *Interferência dos sintomas da síndrome do Túnel do Carpo no desempenho ocupacional*

Kátine Marchezan Estivalet<sup>1</sup>, Carmine Thomas<sup>1</sup>, Aline Sarturi Ponte<sup>1</sup>, Dyannder da Silva Porciuncula Pinto<sup>2</sup>, Miriam Cabrera Corvelo Delboni<sup>1</sup>

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### ABSTRACT

**BACKGROUND AND OBJECTIVES:** The Carpal Tunnel syndrome is characterized as the compression syndrome with the highest incidence in the population, impairing the upper limbs and, consequently, occupational performance. The objective of this study was to identify the symptoms of the compression syndrome and the impact of the disease on upper extremity disorders in relation to occupational performance.

**METHODS:** This is a quantitative study with a descriptive approach, conducted with adults, both male and female, diagnosed with Carpal Tunnel syndrome. There was an initial evaluation to identify pain, edema, paresthesia, sensitivity alteration, and muscle weakness. The Disabilities of the Arm, Shoulder and Hand was used to assess the performance of fine motor activities as well as broader movements that require motor skills. This study used only the part of the instrument that evaluates the severity of symptoms concerning the week before the interview and other implications as pain, discomfort and weakness, difficulty in moving the upper limb, and to sleep.

**RESULTS:** Fifteen adults diagnosed with the Carpal Tunnel syndrome participated in this study (27 affected limbs), being the dominant side the most undermined. The main complaint was pain, with higher intensity at night, followed by paresthesia. The Carpal Tunnel syndrome also compromises occupational performance, especially in activities using hands, and in sleep quality.

**CONCLUSION:** It was noticed that the Carpal Tunnel syndrome interferes with occupational performance, as well as that pain is the main complaint.

**Keywords:** Carpal Tunnel syndrome, Nerve crush, Orthopedics, Upper extremity.

### RESUMO

**JUSTIFICATIVA E OBJETIVOS:** A síndrome do Túnel do Carpo caracteriza-se por ser a compressiva de maior incidência na população, comprometendo os membros superiores e, conseqüentemente o desempenho ocupacional. O objetivo deste estudo foi identificar os principais sintomas da síndrome compressiva e o impacto da doença nas desordens da(s) extremidade(s) superior(es) em relação ao desempenho ocupacional.

**MÉTODOS:** Trata-se de um estudo quantitativo com abordagem descritiva, realizado com pessoas adultas diagnosticadas com síndrome do Túnel do Carpo, de ambos os sexos. Houve a realização de avaliação inicial para identificar dor, edema, parestesia, alteração da sensibilidade e fraqueza muscular. O *Disabilities of the Arm, Shoulder and Hand* também foi usado para avaliar a capacidade de realizar movimentos motores finos, bem como movimentos mais amplos e que exigem capacidades motoras. No presente estudo, utilizou-se apenas a parte do instrumento que avalia a gravidade dos sintomas em relação à semana anterior da entrevista, além de outras implicações como dor, desconforto, fraqueza, dificuldade em mover o membro superior e dificuldade para dormir.

**RESULTADOS:** Participaram do estudo 15 pessoas com síndrome do Túnel do Carpo, totalizando 27 membros acometidos, sendo o lado dominante o mais comprometido. A queixa principal foi a dor, com maior intensidade no período noturno, seguida de parestesia. A síndrome compromete o desempenho ocupacional, principalmente em atividades envolvendo as mãos, e na qualidade do sono.

**CONCLUSÃO:** Percebeu-se que é uma síndrome compressiva que interfere no desempenho ocupacional, além de constatar que a dor é a principal queixa.

**Descritores:** Compressão nervosa, Extremidade superior, Ortopedia, Síndrome do Túnel do Carpo.

### INTRODUCTION

The carpal tunnel is a restrict and elliptic space, ventrally confined by the flexor retinaculum - inelastic and resistant, and dorsally by the anterior surface of the carpal bones<sup>1</sup>. In the carpal

Kátine Marchezan Estivalet – <https://orcid.org/0000-0001-9625-5515>;  
Carmine Thomas – <https://orcid.org/0000-0001-7312-2605>;  
Aline Sarturi Ponte – <https://orcid.org/0000-0003-4775-3467>;  
Diander da Silva Porciuncula Pinto – <https://orcid.org/0000-0001-9665-7186>;  
Miriam Cabrera Corvelo Delboni – <https://orcid.org/0000-0001-5049-4561>.

1. Universidade Federal de Santa Maria, Departamento de Terapia Ocupacional, Santa Maria, RS, Brasil.
2. Universidade Federal de Santa Maria, Departamento de Estatística, Santa Maria, RS, Brasil.

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#### Correspondence to:

Avenida Roraima, nº 1000 - Prédio 26 Anexo D, sala 4010B – Bairro Comobi  
97105-900 Santa Maria, RS, Brasil.  
E-mail: katinemarchezan@gmail.com

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tunnel, there are four flexor digitorum superficialis tendons and four flexor digitorum profundus tendons, the flexor pollicis longus tendon, and the median nerve<sup>1</sup>.

The Carpal Tunnel syndrome (CTS) is defined by the result from the median nerve being pressed in the wrist, and the most common cause is idiopathic<sup>2</sup>, being the neuropathy with the highest incidence at the upper extremity<sup>1</sup>. The environmental risks are the most significant<sup>2</sup> among the risk factors to trigger the neuropathy, primarily when related to work tasks that require great efforts such as carrying heavy loads, incorrect posture when performing tasks, stress and repetitive movements<sup>3</sup>. Therefore, CTS is also considered an occupational disease<sup>4</sup>.

The set of the CTS symptoms makes it difficult to perform routine activities, causing a failure in the integration of the three elements of occupational performance, namely, the field of performance, components of performance, and context of performance<sup>3</sup>. So, understanding the diagnosis components, especially understanding the symptoms related to the interference on the occupational performance, improves the decision making about the type of intervention necessary as preventive measures, focusing on rehab<sup>3</sup>.

Considering the CTS implications, since it is considered a contemporary and disabling<sup>2</sup> disease, the objective of this study was to identify the key symptoms of the CTS. This allowed us to measure the impact of the disease on upper extremities disorders related to occupational performance.

## METHODS

This is a quantitative study with a descriptive approach with people diagnosed only with CTS, that is, with the G56.0 code of the International Classification of Diseases and Related Health Problems (ICD-10). The data was collected from June to October 2019 at the Orthopedics and Traumatology Outpatient Clinic of a university hospital in the Upper Limb and Compressive Syndromes specialties.

The sample was non-probability judgmental sampling that selects the population, based on previously defined inclusion and exclusion criteria. During the data collection period, there were 255 visits at the outpatient clinic, and the sample was selected according to the criteria which objective is the non-interference of other diseases on the study results, detecting specifically the CTS symptoms and their implications on the occupational performance.

The main inclusion criteria were people with the upper limb compressive syndrome, but only those with a CTS diagnosis were selected. The following criteria were also respected: age between 18 and 59 years complete, both genders, since they are considered the young-adult audience where there is a higher incidence of CTS, and be a patient of the orthopedics outpatient clinic in the mentioned specialties. People with impaired body functions such as general and specific mental functions, sensory functions, especially sight, hearing and vestibular; and speech functions were excluded. These functions were selected due to the difficulty or impossibility in communication to collect the data. Also, people with a previous clinical history of any kind

of physical disability, or with a current clinical history of other types of neuro-musculoskeletal disease in the upper limbs, and people unwilling to participate in the study were excluded, as well as those with whom we were unable to contact to schedule the data collection. The participants' pre-selection was by electronic form.

There was an initial assessment by a questionnaire with some basic questions addressing personal and health issues to identify pain, edema, paresthesia (numbness, tingling, and burning), alterations in sensitivity, and muscle weakness.

The Disabilities of the Arm, Shoulder and Hand (DASH)<sup>5</sup> that assesses the capacity to perform fine motor movements and broader movements requiring motor skills was also used. The present study used only the part of the instrument that assesses the severity of the symptoms concerning the week before the interview and other implications such as pain, discomfort, weakness, difficulty in moving the upper limb, and to sleep. Each item received a score on a scale from one to five, according to the severity level or difficulty, where one is none, two is small, three is median, four is high, and five is extreme severity or difficulty<sup>5</sup>.

The results were tabulated and presented as relative and absolute frequency and percentage.

The Research Ethics Committee approved the study with number CAAE 97504718.8.0000.5346 and opinion number 3.468.030/2019. All participants in the study were previously informed and agreed to participate and signed the Free and Informed Consent Term (FICT).

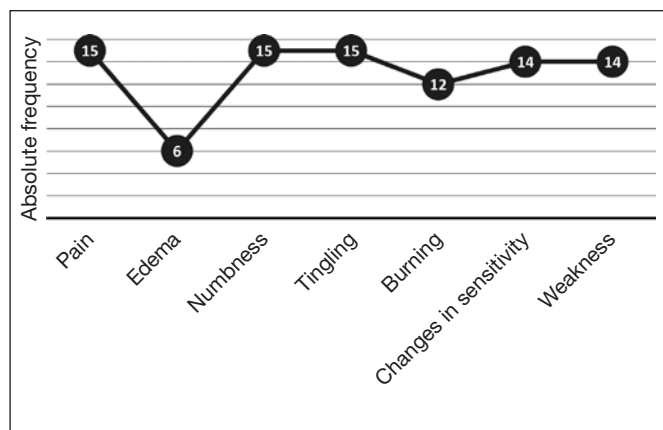
## RESULTS

Considering the data collection period, of the total of 255 visits at both outpatient clinics, 94.11% of people were excluded due to the study's selection criteria. Of them, 37.64% were excluded due to age, mainly because they were over 60. Also, 46.27% of the people were excluded due to an impairment of other body function since CTS can present associated diseases, and 45.49% had only the neuro-musculoskeletal function involved.

Therefore, the study had 15 participants with the diagnosis of CTS. Only one participant was male (6.66%), and 14 (93.33%) were female. The mean age was 48 years, ranging from 41 to 59 years, considering the adult age group. Among participants, 12 (20% of the cases) were unilateral, and three (80%) bilateral, totaling 27 involved limbs. In all participants, the involved limb was on the dominant side.

Figure 1 shows the key implications concerning the symptoms and other conditions caused by CTS, as absolute frequency.

The main symptoms reported by all participants (100%) were pain - the key complaint of all of them - as well as paresthesia - numbness (100%), and tingling (100%). Other conditions present in most of the participants (93.3%) were changes in sensitivity, usually hypoesthesia, that is the decrease or loss of sensitivity, in addition to muscle weakness in the hand, especially in the site of innervation of the median nerve. The less reported sign was edema, present only in six participants (40%).



**Figure 1.** Absolute frequency of the symptoms and other conditions of the Carpal Tunnel syndrome (n=15)

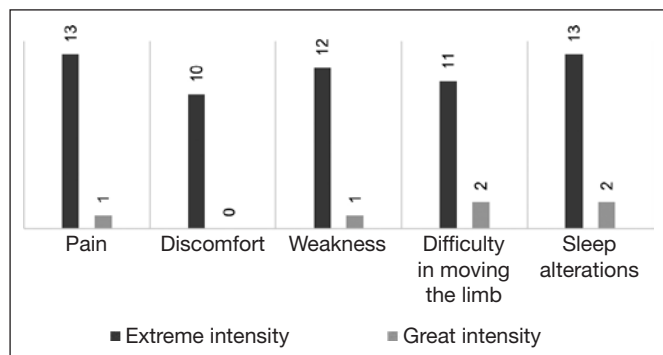
The intensity of pain was also addressed - mild, moderate, severe, and very severe, as well as the time of occurrence - night, day, and upon waking (Table 1).

As we can see, the level of pain was moderate and/or severe. Pain is more frequent at night, considered an severe pain by all participants.

Besides the identification of activities that participants face difficulty or can not perform, DASH also allows addressing the severity of pain and other symptoms, such as the difficulty in moving the upper limb and sleep. Figure 2 shows the level of severity, not only of pain but of other symptoms and conditions caused by CTS and referred to as of extreme intensity (5) and high intensity (4).

**Table 1.** Intensity and moment of the pain (n=15)

| Level of pain in the hand | During the day number of participants (n and %) | Upon waking number of participants (n and %) | During the night number of participants (n and %) |
|---------------------------|---|--|---|
| Severe                    | 07 (46.7)                                       | 08 53.3)                                     | 15 (100)  |
| Moderate                  | 07 (46.7)                                       | 06 (40.1)                                    | 0   |
| Mild                      | 01 (6.6)  | 01 (6.6)                                     | 0   |
| Total general             | 15 (100)  | 15 (100)                                     | 15 (100)  |



**Figure 2.** Identification of the relationship of pain and other conditions in the upper limb by the Disabilities of the Arm, Shoulder and Hand (n=15)

It was observed that pain in the upper limb, when performing a specific activity, follows the several conditions concerning CTS, being reported as extreme by 86.7% of the participants. Difficulty to sleep, represented by sleep alterations, was reported by all participants, and of extreme difficulty for most of them (86.7%) and very difficult for the remaining participants (13.3%).

There was also the prevalence of muscle weakness in the upper limb, especially the hand, in 12 participants (80%), in addition to the extreme difficulty in moving the limb by 11 participants (73.3%). Such information is important due to the possibility of interference in the performance of occupational activities due to the motor and sensory impairment caused by CTS. Skin discomfort, reported as a pinpricking sensation, is present in 66.7% of the participants with extreme intensity, but among the variables, it is the symptom with less complaint.

## DISCUSSION

In most of the cases, the CTS etiology is idiopathic, but there are situations of secondary order as continent and content abnormalities, dynamic abnormalities such as labor pathologies, and acute as in the case of trauma<sup>6</sup>. When talking about CTS, much is said about its incidence considering gender and age. In this study, females and adults are predominant, and the highest peak between 45 and 59 years (75% of females) and the second between 75 and 84 years (64% females)<sup>1</sup>, even with the possibility of interrupting the professional career<sup>7</sup>. The meta-analysis conducted with 87 studies<sup>4</sup> showed the high incidence of CTS where females are the most affected by the disease, indicating that in most of the epidemiologic studies, the highest prevalence of CTS is in the female population<sup>8</sup>. Another study with 386 people with CTS, 322 were female (83%), and 64 were male (17%), with an average age of 57 years (30 to 81 years range)<sup>9</sup>.

It is known that the bilateral involvement is the most common in CTS, more than 50% of the cases, and the dominant hand is usually the first and most severely involved<sup>10</sup>. It is worth noticing that in this study, the most involved hand was also the dominant hand, the right hand being the one. However, there is also the possibility of unilateral symptoms in 75% of the cases where the left side was involved in 54.8% of the cases<sup>11</sup>. So, it is worth mentioning that the bilateral characteristic increases with the duration of the symptoms<sup>6</sup>.

Data on age and the dominant side are critical for an initial assessment, as well as the dimension and treatment plan<sup>7</sup>. However, biopsychosocial aspects should also be taken in consideration since women are more prone to have CTS, and the incidence of the disease increases more linearly with age and the body mass index than in relation to the other factors; not to mention the risk of CTS due to stressing tasks, where the social support is considered a protecting factor<sup>6</sup>.

In general, the CTS clinical picture includes complaints about pain when in forced flexion and extension position; or paresthesia such as numbness and tingling through the median nerve trajectory, worsening at night, the presence of at least one positive clinical test or evidence of atrophy in the thenar region<sup>11</sup>. There are also cases with edema<sup>3</sup>.

In the early stage of the compressive syndrome, the symptom is primarily at night due to the increase of the intratunnel pressure that can occur for several reasons, among them the tendency to flexion the wrist and the increase in blood pressure during the second half of the night<sup>1</sup>.

According to the study, pain is related to paresthesia, mentioned as a burning and tingling sensation. One study compared the distribution of the pain throughout the involved upper limb and, according to the study, 21% of the patients reported paresthesia and pain in the forearm; 13% in the elbow; 7.5% in the arm; 6.3% in the shoulder; and 0.6% in the neck region<sup>12</sup>. Therefore, pain can have proximal irradiation to the arm and shoulder<sup>6</sup>.

Pain was the main symptom reported. Since the pain was moderate during the day or very severe at night, it was considered of high frequency in the general population, being the most common symptom<sup>11</sup>. It is most usual at night, even awakening the person<sup>13</sup>. A study about the impact of CTS on sleep quality confirmed the correlation of sleep disorders and people with CTS with a significant reduction in sleep duration – about 2.5 hours less than the recommended – running the risk of comorbidities<sup>14</sup>. So, it was realized that pain interferes with sleeping, whether preventing the person from falling asleep or waking up at night because of the pain<sup>7</sup>. Among the symptoms identified in the study, pain is the most frequent, especially at night, and it is the main complaint of the participants.

Some occupational factors, especially in labor activities, are considered a risk to trigger CTS, such as repetitive movements of the flexor digitorum (tendons that pass with the nerve in the carpal tunnel), exposure to vibration and increase in manual force<sup>15,16</sup>, in addition to inadequate posture for long periods; invariability in tasks; mechanic pressure on certain parts of the body, in particular, the upper limbs; static muscle work; shocks and impact; cold; and organizational and psychosocial factors<sup>6</sup>. Moreover, with the loss of sensation in the fingers, it is possible to face difficulties in performing simple daily activities, as grasping an object<sup>7</sup>. So, it is imperative to think about the tasks performed by people with this neuropathy since activities that involve wrist flexion for long periods can increase pain<sup>5</sup>, leading to the need to wear a resting splint<sup>7,16,17</sup>.

The approach to occupational dysfunction in CTS requires a holistic view to better understand the problem, not only the functional aspects and body structure but also considering the implications of the disease in several areas of the occupational performance, namely daily-life, productive and leisure activities<sup>7</sup>. Therefore, the objective of the intervention plan is to increase the independence to perform daily activities and reduce the risk factors that influence occupational performance<sup>17</sup>.

Considering the possibilities of intervention, Occupational Therapy is a profession that can work with the person with CTS<sup>18</sup> to provide guidance to minimize the symptoms and improve the occupational performance bringing satisfaction to the patient. Among some approaches by the occupational

therapist (OT) in the view of the Biomechanical Model are some directions to control the edema and pain at the surgery site, and the care not to have scar adhesion, as well as exercises to slide the tendon and nerve, and eventual muscle strengthening that are also post-surgical care<sup>17</sup>. Therefore, it is up to the OT to develop the intervention by the rehab of the upper limb using the knowledge on anatomy and biomechanics, and based on the Human Occupation Model, to help to acquire the skills, performance patterns, and occupation<sup>3</sup>.

Whenever the occupational performance is impaired, the OT should intervene with preventive measures to promote health, and measures focusing on rehab to prevent the worsening of the clinical picture<sup>3,19</sup>. The preventive work of the Occupational Therapy can provide guidance concerning household and daily activities, adapting the way of doing them, aiming at improving the quality of life and preventing the worsening of the symptoms<sup>17</sup> with a positive effect on results of the long-term conservative treatment<sup>19</sup>.

The size of the sample was a limitation of the study. Other studies are necessary, with larger samples and the possibility to discuss the implications of CTS on occupational performance; relate CTS with other diseases in the upper limbs; use the randomized clinical trial methodology to assess the pain situation and paresthesia, and the treatment possibilities of people with CTS.

## CONCLUSION

CTS can impair occupational performance, especially in activities involving the upper limbs. The main complaint is pain, which can be very severe, usually at night, affecting sleep and occupational activities. Besides pain, paresthesia also interferes with occupational performance.

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