

## Epidemiological Study and Clinico-Electrodiagnostic Correlation in Carpal Tunnel Syndrome

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### Abstract

**Aim:** This study analyzes the epidemiological distribution and the clinical-electric co-relation in carpal tunnel syndrome (CTS).

**Methods:** 100 consecutive patients referred to our out-patient service for carpal tunnel syndrome were included in this study. The clinical examination of the stage of CTS and electrophysiological study (EPS) was conducted and the BCTQ questionnaire was administered with an average of 15 minutes for each. The link between the electrical stage and the total points of the questionnaire was analyzed by the Bivariate Correlation analysis by finding the Pearson coefficient and the level of significance according to the Two-Tailed test of significance.

**Results:** It was found that the female-male ratio was 3.5 to 1 with the predominance of the age 51-60 -year-old. 35% were overweight and 17% were obese. The first predominant symptoms were paresthesia, tingling sensation in their fingertips and pain, which prevailed at night. It was seen that the highest percentage was in those with not more than secondary education. There was no significant relation with family history and CTS. The most common comorbidities were arterial hypertension and rheumatoid arthritis. 43% were referred to the neurologist by the family doctor. In the bivariate analysis a statistically significant link was found with  $p < 0.01$  with positive correlation  $r = 0.311$  for the right hand and  $p < 0.01$ ,  $r = 0.345$  for the left hand.

**Conclusions:** There is still a considerable number of patients diagnosed at an advanced stage, with faded opportunity for maximal benefit from timely treatment. This syndrome is more frequent in women with BMI > 25 and in certain professions that request repetitive flexion of the grip. Family doctor should be more alert on diagnosing this common syndrome in an early stage.

**Key words:** Carpal tunnel syndrome, entrapment neuropathy, median nerve.

### Background

Carpal tunnel syndrome is a neurologic condition caused by the compression of median nerve in the wrist due to the increased pressure at the carpal tunnel (1). This syndrome is the most commonly diagnosed compression neuropathy of the upper limb (2) (3). Despite it has been thoroughly re-

ported in the literature, there are still aspects of management (4) of this frequent syndrome, that need further study and clinical attention. The aim of this study is to present some epidemiological data of 100 cases diagnosed with CTS and the correlation between clinical and electrical stage (5) in carpal tunnel syndrome.

### Methods

We performed clinical examination, electrophysiological study (6) (7) (8) and the Boston Carpal Tunnel Syndrome Questionnaire BCTQ with all related data pointed out by the Authors for 100 consecutive patients referred at our out-patient service for carpal tunnel syndrome. The results were statistically analyzed with SPSS program.

### Results

In this study 78 % were female and 22% were male so the ratio was 3.5:1. The average age was 54.6 years old, with the interval 28-91 years old. Highest incidence was in 51-60 years old group (Figure 1).

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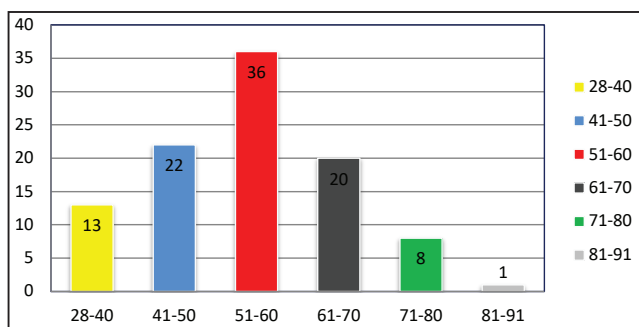


Figure 1: Graphical representation of age.

The patients' weight was at the interval of 53-111 kg with the average 73.3 kg. BMI was at the interval of 19-46 kg/m<sup>2</sup> with the average 27.62 kg/m<sup>2</sup>.

According to the calculations 53% of the patients were overweight, 17% obese and 30% with normal BMI (Figure 2).

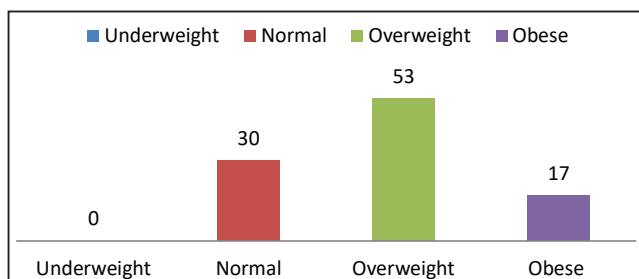


Figure 2: Distribution according to BMI

The highest education level was high school with 47% (Figure 3). Three most frequent professions were farmer 17%, teacher 12% and charwomen 8%.

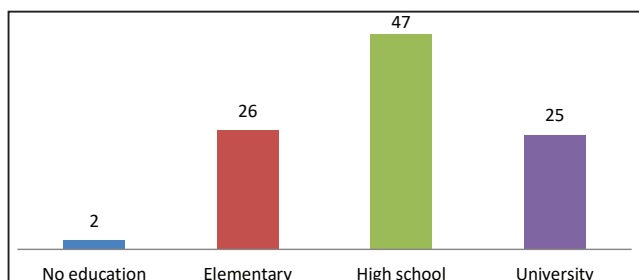


Figure 3: Distribution according to highest educational level.

Among the symptoms were referred numbness in 95% of the patients, pain in 59%, tingling sensation in 52%. Other symptoms were swelling, heat, weakness, burning sensation and vibration (Figure 4). In 88% of cases the symptoms were predominantly at night.

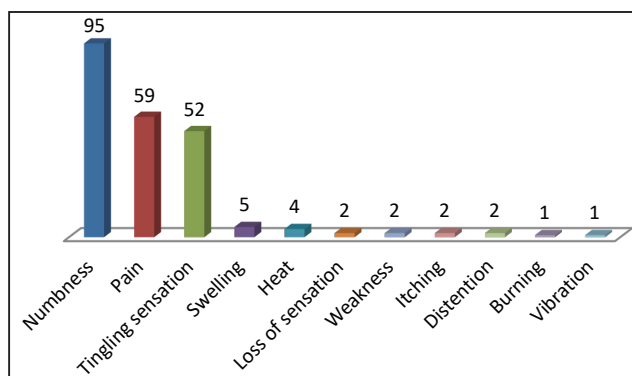


Figure 4: Distribution of symptoms in percentage.

Only 20% of patients referred to have a family member with a history of CTS.

Other medical conditions were arterial hypertension 29%, rheumatoid arthritis 25%, osteoporosis 6%, hypothyroidism and spondyloarthritis 7% (Figure 5).

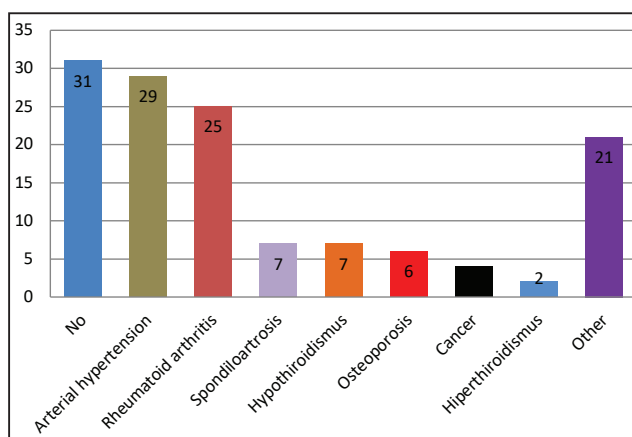


Figure 5: Distribution of concomitant diseases.

The average time from the beginning of the symptoms to the first visit to the doctor was found to be 4.37 years. With the interval 3 weeks until 25 years (Figure 6).

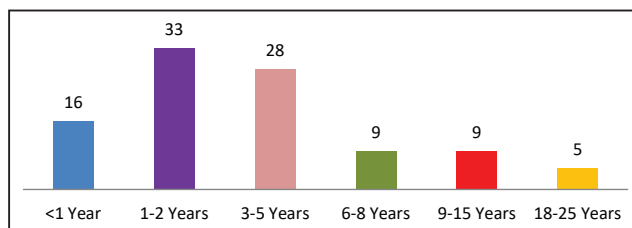


Figure 6: Graphical presentation of the time lapse from first symptoms to first medical visit.

From the first meeting with the doctor until the diagnosis the time was in the average 9.7 months. The minimum was 0.2 months and the maximum was 12 years.

52% of patients were seen first by a neurologist and 35% by a rheumatologist.

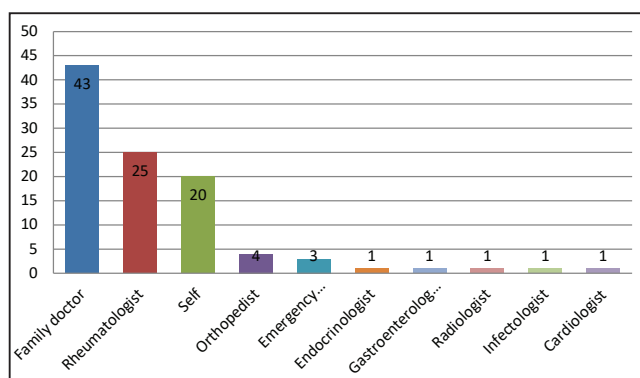


Figure 7: Distribution of the references to the neurologist.

As shown in Figure 7, references to neurologist were in 43% of cases from the family doctor and in 25% from rheumatologist. 20% went to neurologist themselves.

Electrophysiological classification for both hands were with higher incidence for the 3rd and 2nd grade followed by 5th grade (grading of six electrophysiological stages) shown in Figure 8.

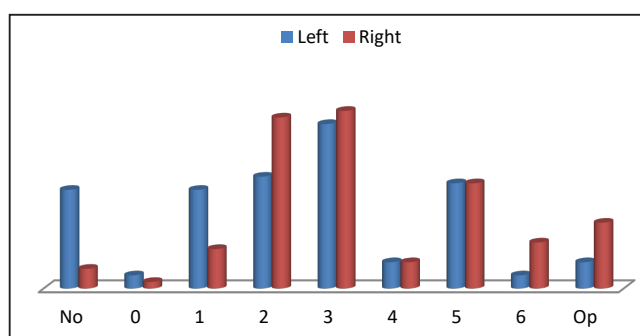


Figure 8: Distribution of electrophysiological classification in left and right hand.

The average of points from BCTQ Questionnaire for the right hand was 34.46 point and for the left hand 31.73 point. The medium grade predominates.

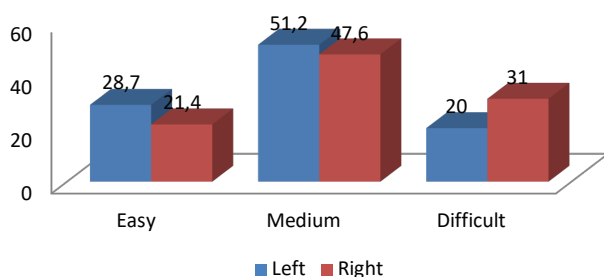


Figure 9: Distribution of the total points from the BCTQ Questionnaire.

During night pain was present at both hands in all patients, mostly of medium intensity (Figure 10).

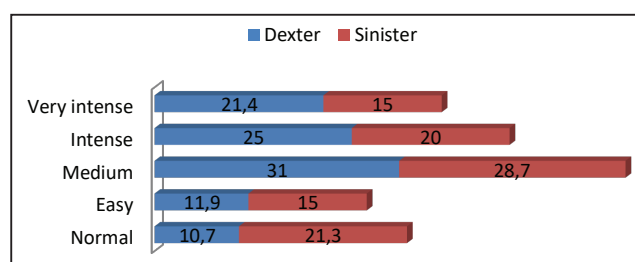


Figure 10: Percentage according to pain intensity at night in the hand.

Pain on right hand waking up the patient from sleep during the last week was predominant over 5 times versus left hand pain.

At day-time pain was referred more frequently of medium intensity for the right hand and intense for the left hand.

Pain that lasted for more than 60 minutes was present in 13% of patients for the right hand and 11% for the left hand.

Approximately in 24% for right hand and 13% for left hand the pain was constant (Figure 11).

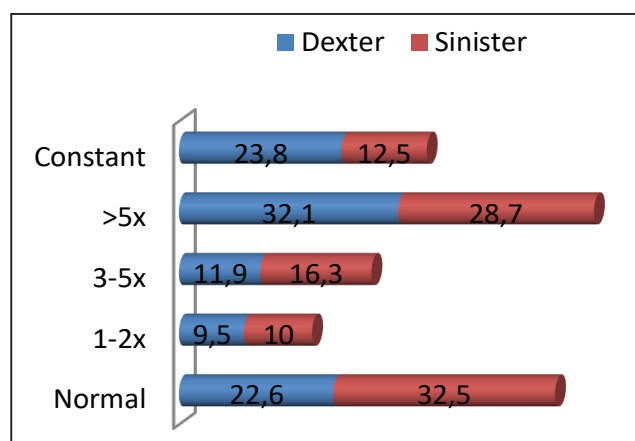


Figure 11: Graphical representation of pain frequency.

Weakness and loss of sensation at the hand and wrist, along all day was mostly medium (Figure 12).

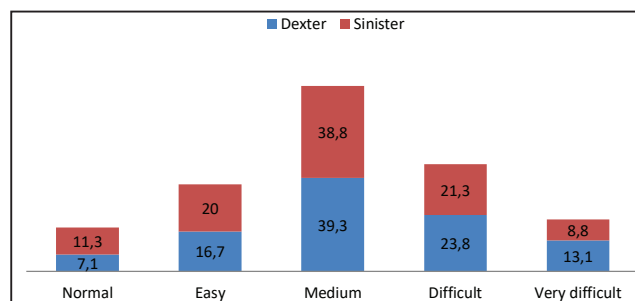


Figure 12: Distribution of the percentages in weakness in hand and wrist

Loss of sensation in hand was mostly medium for both hands (Figure 13).

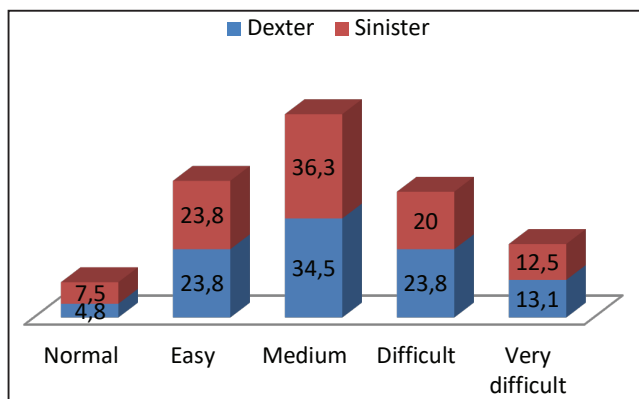


Figure 13: Distribution of the loss of sensation in both hands.

28.6% of the patients for right hand and 26.3% for the left hand, wake up at last week more than 5 times with numbness and tingling sensation (Figure 14).

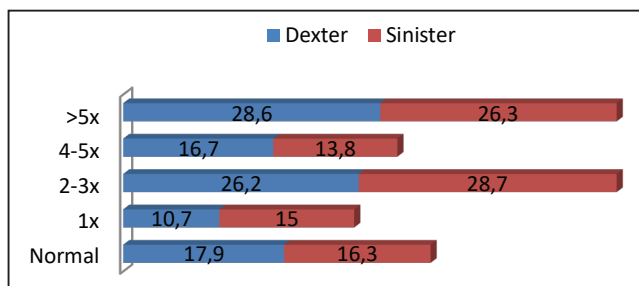


Figure 14: Distribution of awakening from numbness and tingling sensation.

Grasping and use of small objects was found very difficult in 8.3% of the cases for right hand and 3.8% for left hand (Figure 15).

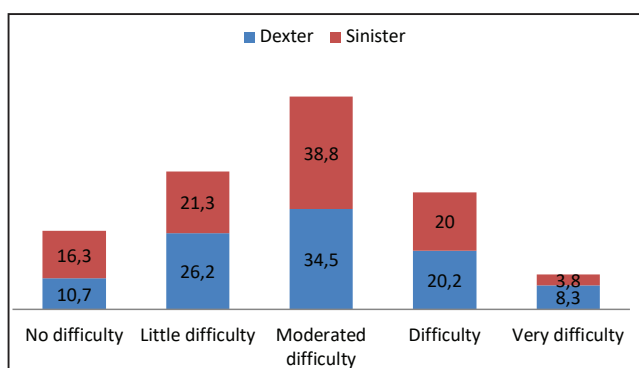


Figure 15: Distribution of difficulty in grasping and using small objects.

From the answers of the BCTQ Questionnaire, we collected the total points for each patient. Figure 16 shows the questions and the distribution of the points.

Boston Carpal Tunnel Syndrome Questionnaire (BCTQ)					
(-) Symptom severity scale (11 items)					
	1	2	3	4	5
1. How severe is the hand or wrist pain that you have at night?	Normal	Slight	Medium	Severe	Very serious
2. How often did hand or wrist pain wake you up during a typical night in the past two weeks?	Normal	Once	2 to 3 times	4 to 5 times	More than 5 times
3. Do you typically have pain in your hand or wrist during the daytime?	No pain	Slight	Medium	Severe	Very serious
4. How often do you have hand or wrist pain during daytime?	Normal	1-2 times / day	3-5 times / day	More than 5 times	Continued
5. How long on average does an episode of pain last during the daytime?	Normal	<10minutes	10-60 Continued	>60minutes	Continued
6. Do you have numbness (loss of sensation) in your hand?	Normal	Slight	Medium	Severe	Very serious
7. Do you have weakness in your hand or wrist?	Normal	Slight	Medium	Severe	Very serious
8. Do you have tingling sensations in your hand?	Normal	Slight	Medium	Severe	Very serious
9. How severe is numbness (loss of sensation) or tingling at night?	Normal	Slight	Medium	Severe	Very serious
10. How often did hand numbness or tingling wake you up during a typical night during the past two weeks?	Normal	Once	2 to 3 times	4 to 5 times	More than 5 times
11. Do you have difficulty with the grasping and use of small objects such as keys or pens?	Without difficulty	Little difficulty	Moderately difficulty	Very difficulty	Very difficult

Figure 16: Boston Carpal Tunnel Syndrome Questionnaire.

The link between the electrical stage and the total points of the questionnaire was analyzed by the Bivariate Correlation analyses by finding the Pearson coefficient and the level of signification according to the Two-Tailed test of significance shown in Table 1.

	Dexter	Sinister
Correlation coefficient	r=0.311	r=0.345
Alpha	0.01	0.01
P	0.004 (p<0.01)	0.002 (p<0.01)
CI 95%	29.18893 - 33.35869	26.56784 - 31.00716

Table 1: Final results from Bivariate Correlation.

The correlation is positive and statistically significant.

## Discussion

CTS is the most frequent entrapment syndrome of peripheral nerves.

During our practice as national referral center for peripheral nerve surgery, we have noticed a late stage of CTS at surgery.

This was the reason for which we conducted this study in order to have a full knowledge of the reasons and factors that influence this phenomenon.

In this study we gathered data concerning 100 consecutive patients referred for surgical treatment.

The majority of the patients were female workers in their fifties.

The average time from the first symptoms to the first medical visit was referred to be 4.37 years with the interval 3 weeks until 25 years. The very long time was characteristic of those patients who referred episodes of improvement of symptoms related to the work load for the hands or pregnancies. Most of the patients with long time lapse from first symptoms to first visit were inhabitants of rural areas and lower education level.

Another factor that influenced the late stage at referral for surgery was found to be the referral from family doctor first and from rheumatologist in second place. Patients seen from neurologists were diagnosed and referred earlier for surgical treatment. Average 9.7 months lapsed from first visit to diagnosis of CTS with interval of 0.2 months to 12 years. Majority of the patients with late referral were suffering concomitant diseases such as rheumatoid arthritis, polyarthralgia, fibromyalgia, recurrent tendinitis or diabetes mellitus.

The reasons for late diagnosis were predominance of chronic painful syndromes of the hand mentioned above, and secondly due to the lack of attention of family doctors to CTS. Hence continuous education remains a very important tool for a more efficient medical service.

## Conclusion

The delay in diagnosis of CTS is the major factor of advanced clinical and electrophysiological stage at surgery.

There is a direct link between electrical stage and clinical stage confirmed from BCTQ questionnaire with positive correlation statistically significant for these two variables.

Similar conclusions with other studies were found about the age (9), gender, BMI (10)(11).

**COI Statement:** This paper has not been submitted in parallel. It has not been presented fully or partially at a meeting or podium or congress. It has not been published nor submitted for consideration beforehand.

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