

# COMPARISON OF PAIN SEVERITY AND CLINICAL FINDINGS OF PATIENTS WITH MILD AND MODERATE CARPAL TUNNEL SYNDROME

## Original Article

## HAFİF VE ORTA DÜZEY KARPAL TÜNEL SENDROMU OLAN HASTALARIN AĞRI ŞİDDETİ VE KLİNİK BULGULARININ KARŞILAŞTIRILMASI

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### ABSTRACT

**Aim:** In this study, we aimed to investigate whether there is a difference in patients with electrophysiologically mild and moderate carpal tunnel syndrome (CTS) in terms of pain severity, clinical symptoms, muscle strength and grip strength

**Materials and Methods:** This study is a retrospective study, 18 patients with mild CTS (24hands), 22 patients with moderate CTS (28hands) were enrolled by examining the data of patients admitted to the electroneuromyography (ENMG) laboratory between February-May2014 .

Patients' demographic characteristics were recorded. Tinnel and Phalen tests, presence of thenar atrophy and hypoesthesia, scores of Visual analog scale (VAS) and Douleur Neuropathique-4 (DN4) questionnaire were recorded. Manual muscle test scores of abductor pollicis brevis (APB), flexor pollicis brevis (FPB) and opponens pollicis (OP) muscles and grip strength values previously measured with a dynamometer were recorded.

**Results:** 18 patients (24 hands) with mild CTS and 22 patients (28 hands) with moderate CTS were detected. The patients with mild CTS were classified as Group 1 and patients with moderate CTS were classified as Group 2.

The groups did not differ in terms of demographic data ( $p>0.05$ ). There was no significant difference in terms of Tinnel test, Phalen test, sensory examination, manual muscle strength of APB, FPB, OP muscles and presence of thenar atrophy between the groups ( $p>0.05$ ). There was no significant difference in terms of grip strength between the two groups ( $p=0.200$ ). VAS pain scores were significantly higher in group 2 than that of Group-1 ( $p=0.031$ ). There was no statistically significant difference in terms

of DN4 scores between two groups ( $p=0.474$ ).

**Conclusion:** There is no significant difference except pain severity between patients with mild and moderate CTS. It would be better to plan conservative treatment strategies according to pain severity.

**Keywords:** karpal tünel sendromu, elektronöromiyografi, ağrı.

## ÖZET

**Amaç:** Bu çalışmada elektrofizyolojik olarak hafif ve orta düzey karpal tünel sendromu(KTS) tespit edilmiş hastalarda ağrı şiddeti, klinik bulgular, kas gücü ve kavrama gücü arasında fark olup olmadığının araştırılması amaçlandı.

**Yöntem ve Gereçler:** Bu çalışma retrospektif bir çalışmadır.2014 yılı Şubat-Mayıs ayları arasında elektronöromiyografi ünitesine başvuran ve KTS tanısı alan hastaların dosyaları incelenerek hafif düzey KTS olan 18 hasta (24el), orta düzey KTS olan 22 hasta (28el) çalışmaya alındı. Hastaların demografik özellikleri kaydedildi. Tinnel ve Phalen testleri, tenaratrofi ve hipoestezi varlığı incelendi. DN4 anketi değerlerive Vizüel Analog Skala (VAS) skorları kaydedildi. Abduktör pollicis brevis (APB), fleksör pollicis brevis (FPB) ve opponens pollicis (OP) manuel kas testi değerleri ve dinamometre ile ölçülmüş olan kavrama gücü değerleri kaydedildi.

**Bulgular:** Hafif düzey KTS olan 18 hasta (24el), orta düzey KTS olan 22 hasta (28 el) tespit edildi. Hafif düzey KTS olan hastalar Grup-1, orta düzey KTS olan hastalar Grup-2 olarak nitelendirildi. Gruplar arasında demografik veriler açısından fark yoktu ( $p>0.05$ ). Her iki grup arasında fizik muayene bulguları (Tinnel Testi, PhalenTesti, yüzeyel duyu muayenesi, abduktör pollicis brevis, fleksör pollicis brevis ve opponens pollicis kaslarının manuel kas testi değerleri, tenaratrofi varlığı) açısından fark yoktu ( $p>0.05$ ). Dinamometre ile ölçülen kaba

kavrama gücü değerleri açısından anlamlı fark saptanmadı ( $p=0.200$ ). Ağrı şiddeti açısından VAS Ağrı skorları Grup-2'de Grup-1'e göre anlamlı olarak daha yüksekti ( $p=0.031$ ). DN4 değerleri açısından iki grup arasında fark yoktu ( $p=0.474$ ).

**Sonuç:** Hafif ve orta düzey KTS olan hastalarda ağrı şiddeti dışında belirgin fark bulunmamakta olup, konservatif tedavi stratejileri ağrı düzeyine göre planlanabilir.

**Anahtar kelimeler:** karpal tünel sendromu, elektronöromiyografi, ağrı

## INTRODUCTION

Carpal tunnel syndrome (CTS) is the most common entrapment neuropathy, and the pathology is the compression of the median nerve at the wrist (1,2). The CTS is seen three times more in women than men and usually presents between the ages of 30-50 (3).

In literature, it has been reported that CTS was found 0.1-0.5%in the general population (4-6).Although many diseases may cause CTS, the etiology is usually idiopathic. The pressure in the carpal tunnel increases pathophysiologically and nerve becomes malnourished, and demyelination occurs from resulting ischemia. If compression is severe the axonal loss and Wallerian degeneration are also added to pathology (7). The important and often the first clinical manifestation of the disease is hand numbness, which decreases with shake-jerk movement at night.Numbness often happens in the first three fingers. Another prominent symptom is pain, radiating to hand, wrist and forearm. The patients' daily life activities and life qualities are negatively affected by all of these findings. If median nerve compression is heavy and lasting for a long time, more obvious clinical signs like then are atrophy, hand weakness and reduction in fine skills may occur (8).

However, we believe that the difference between functional impairment in daily

practice and symptom severity for patients with mild and moderate CTS defined electrophysiologically are not well defined. Therefore, we aimed to investigate whether there is a difference between patients with CTS diagnosed electrophysiologically as mild or moderate according to patients' symptoms, examination findings, and grip strength.

## MATERIAL AND METHODS

A retrospective medical record review was performed between February-May 2014 for the patients admitted to ENMG unit and diagnosed with mild or moderate CTS according to nerve conduction studies. Patients with diabetes mellitus, endocrine disorders such as thyroid diseases, inflammatory, autoimmune diseases, renal diseases, malignancy, distal radius fracture history, cervical disc disease, fibromyalgia, wrist trauma, history of surgery, and pregnant were excluded from the study.

The data of the patients were included if examination findings, dynamometric measurements, the VAS and the DN-4 scores were completely full filled in their folders.

According to nerve conducting studies, the patients were defined as mild CTS if median sensory nerve conduction velocity was slow, median motor distal latency was normal, and, as mild CTS if the median sensory nerve conduction velocity was slow and the median motor distal latency was long (9). Patients' demographic characteristics (age, gender, occupation, hand dominance, affected side), the current symptoms (pain, numbness), examination findings (Tinel and Phalen's tests, presence of atrophy, dynamometric rough grip strength, loss of sensation, manual muscle strength) were recorded. The level of pain was determined by using a visual analog scale (VAS) and the Turkish valid form of DN4 questionnaire. Measuring grip strength by hand dynamometer (Dynatest Hand Dynamometer Riester, Germany) was

made with elbow in 90 ° flexion, wrist in neutral, and at sitting position (10).

## STATISTICAL ANALYSIS

Statistical analyses were performed using SPSS 16.0. Results were expressed as mean  $\pm$  standard deviation for quantitative data, and as number and percentage for qualitative data. Comparisons between groups were analyzed with chi-square test for qualitative data, and with the Mann-Whitney U test for quantitative data.

## RESULTS

After assessing medical records of patients who were diagnosed by ENMG, it was found that 18 patients (24 hands) had mild, 22 patients (28 hands) had moderate CTS. The patients with mild CTS were classified as Group 1, and patients with moderate CTS were classified as Group 2.

The mean age of the patients for Group 1 was  $47.83 \pm 8.899$  years (20-60), and  $52.57 \pm 6.79$  years (40-65) for Group 2. 17(94.4%) of patients in Group 1 were female, 1 patient (5.6 %) was male, 21 of patients (95.4%) in Group 2 were female, 1 patient (4.6%) was male. 14 of the patients (79%) in Group 1 were housewives, 2 patients (13%) were retired, 1 patient (4%) was baby sitter, and 1 patient (4%) was technician. 16 patients (78%) in group 2 were housewives, 1 patient (4%) was retired, 1 patient (4%) was baby sitter, 2 patients (7%) were butchers (7%), 2 patients (7%) were officers. Right hand was the dominant hand in 21 patients (87.5%), and left hand was the dominant hand (87.5%) in 3 patients (12.5%) in group 1. All 28 hands (100%) in group 2 were right dominant. In Group-1, 14 (41.7%) right hand, and 10 (58.3%) left hand were affected by disease. In Group-2, 14 (50%) right-hand, and 14 left-hand were affected. Patient demographics are shown in Table-1.

	<b>Grup 1(mild CTS)</b> <b>n=24 hand</b> <b>(18 patients)</b>	<b>Grup 2(moderate CTS)</b> <b>n=28 hand</b> <b>(22 patients)</b>	<b>p</b>
<b>Age (year)</b> <b>mean,</b> <b>min-max</b>	47,83±8,899 (20-60)	52,57±6,796 (40-65)	0.050
<b>Sex</b> <b>Female/Male</b> <b>(n)</b>	17/1	21/1	0.650
<b>Job</b>	14 Housewife (%79) 1 Babysitter (%4) 2 Retired (%13) 1 Technician (%4)	16 Housewife(%78) 1 Babysitter (%4) 1 Retired (%4) 2 Butcher (%7) 2 Officer (%7)	0.777
<b>Dominant hand</b>	Right 21 (87.5%) Left 3(12.5%)	Right 28 (100%)	0.56
<b>Affected side</b>	Right 10 (41.7%) Left 14 (58.3%)	Right 14 (50%) Left 14 (50%)	0.552

Table 1: The demographic characteristics of the group

- DN4: DN4 questionnaire ,
- VAS: Visual analog scale,
- APB: abductor pollicis brevis
- FPB: fleksor pollicis brevis,
- OP: opponens pollicis

Findings on The physical examination findings of the patients are shown in Table-2. Accordingly; in Group 1, 12 of the 24 hands (50%); in Group-2, 18 of the 28 hands (64.3%) had positive signs of

Tinel, in Group-1, 16 patients (66.7%), in Group-2, 22 patients (78.6%) had positive Phalen's Test. In Group 1, hypoesthesia was present in 7 (29.2%) of 24 patients, and in Group 2, hypoesthesia was present

in 7(25%) of the 28 patients. Comparison of pain and grip strength values of the

patients in Group-1 and Group-2 are shown in Table-3.

	<b>Grup-1 (mild CTS)</b> <b>Median (min-max)</b>	<b>Grup-2 (moderate CTS)</b> <b>Median (min-max)</b>	<b>P</b>
<b>DN4</b>	5,00 (1-9)	4,43 (0-9)	0,474
<b>VAS</b>	5,13 (0-8)	6,86 (0-10)	0,031
<b>Grip strength</b>	3,4348 (1,00-6,00)	2,95 (0,7-6)	0,200
<b>APB</b>	4,75 (4-5)	4,54 (4-5)	0,113
<b>FPB</b>	4,92 (4-5)	4,79 (4-5)	0,196
<b>OP</b>	4,75 (4-5)	4,93 (4-5)	0,078

*Table 3: Assessment of pain and grip strengths of the Groups*

- DN4: DN4 questionnaire
- VAS: Visual analog scale
- APB: abductor pollicis brevis
- FPB: fleksor pollicis brevis
- OP: opponens pollicis

Accordingly, there was no significant difference in the evaluations of DN4 ( $p=0.474$ ), grip strength measurements with the dynamometer ( $p=0.200$ ), abductor pollicis brevis ( $p=0.113$ ), flexor pollicis brevis ( $p=0.196$ ) and opponens pollicis ( $p=0.078$ ) muscles manual muscle strength scores. However, the VAS pain score was significantly higher in group 2 ( $p=0.031$ ) than that of Group-1.

## DISCUSSION

Although there is not a certain consensus for the diagnosis of CTS, often it is diagnosed by the evaluation of the patient's symptoms, physical examination findings and EMNG testing/results (11,12). Determining the severity of CTS is also important as diagnosis. Compression of the median nerve causes functional disability by the adverse effects on quality of life and hand function. Compression level is defined with EMNG as mild, moderate and severe. This distinction is important for the arrangement of the treatment. Because conservative approach is suggested for mild-moderate CTS and often surgical treatment is recommended in severe CTS.

In our study, we investigated whether there is a difference between electrophysiologically determined compression level and clinical findings, muscle strength, grip strength. The majority of our patients were middle-aged housewives who excessively used their hands in daily life.

According to the results of electrophysiological studies patients separated into two groups, mild and moderate CTS.

On physical examination thenar atrophy was not observed in both groups. There was no significant difference between the two groups for presence of provocative tests (Tinel test, Phalen's test) and hypoesthesia.

In the literature, studies that investigated the relationship between

the CTS diagnosed by EMNG and clinical symptoms conflicting results were reported (13,15).

In studies that examined the presence of thenar atrophy and provocative tests positivity, thenar atrophy was increased directly to the severity of the compression have been reported. Also provocative tests were not helpful in the diagnosis in consequence of severity of the compression due to increasing sensory disturbance and not promoted by EMNG findings (13,16,19).

APB, FPB and OP muscle strengths and grip strength, measured by a dynamometer, of groups were compared. There is no significant difference was found between groups.

Contrary to the results of our study, Dr. Keskin et al. (16). determined mild-moderate-severe CTS patients grip strength decreased gradually from mild to severe. Liu et al. reported that grip strength test was sensitive which could be used in the evaluation of patients with CTS (19).

In the literature there are studies that indicated a decrease in motor function and motor coordination with age (20,21). Severe CTS patients clinical findings were more significant and thenar atrophy developed in a large part of these patients. Therefore we excluded severe CTS patients from our study.

In our study, the only significant difference between two groups was VAS pain score that was higher in group-2 than group-1.

Umay et al. investigated the relationship with compression severity and clinical symptoms, functional findings, quality of life assessments. In contrast to our study, they reported that pain severity did not reflect the compression level (22). In our study, DN-4 questionnaire assessing the neuropathic pain scores were not different between the 2 groups.



The most important limitations of our study are the small number of patients and absence of severe CTS group.

More studies with larger number of patients including mild, moderate and severe CTS groups are needed for demonstrating the relationship between clinical findings and nerve entrapment showed by ENMG.

In conclusion, our study group includes a limited number of patients with middle aged women predominantly. For that reason we can not generalize our results to the population. When we compared mild with moderate CTS patients, we observed that severity of pain was increased due to compression. However this increase has not significant effect on objective findings.

In the treatment regulation, mild CTS patients have less pain than simple treatment options such as splinting may be initiated for them. On the other hand for moderate CTS patients intra-articular steroid injection, physical therapy treatment can be planned. However, it is expected that quality of life and functional impairments will be affected due to the increase of compression severity.

Volatile agents, hypothermia, hypoxia, hypercarbia, and spinal ischaemia suppress both SSEPs and MEPs

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