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ARAŞTIRMA / RESEARCH

Anxiety, health anxiety and somatosensory amplification levels in individuals with carpal tunnel syndrome with normal electromyography

Elektromyografisi normal karpal tünel sendromlu bireylerde anksiyete, sağlık anksiyetesi ve somatosensoryal amplifikasyon düzeyleri

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Abstract

Purpose: The aim of this study was to investigate the levels of anxiety, health anxiety and somatosensory amplification in patients who presented with the clinical manifestation of Carpal Tunnel Syndrome (CTS) without electromyography findings.
Materials and Methods: Patients who applied to the Physical Therapy and Rehabilitation outpatient clinic, respectively, and were diagnosed with CTS with clinical findings were included in the study. The patients who were determined to have no evidence of conduction loss in EMG were evaluated by using Short Health Anxiety Inventory (HAI-18), SomatoSensory Amplification Scale (SSAS), Beck Depression Inventory (BDI), Beck Anxiety Inventory (BAI), Visual Analog Scale (VAS) and Boston Carpal Tunnel Questionnaire (BCTQ).
Results: A total of 111 participants were included in the study, of whom 56 were patients and 55 were healthy control subjects. There was no significant difference between the patient and control groups in terms of age, gender, and body mass index (BMI). A statistically significant relationship was observed between these scales and the VAS, BCTQ symptom-severity and BCTQ function status in the positive direction.
Conclusion: In our study, it was shown that the patient group showed higher anxiety, health anxiety and somatosensory amplification characteristics, and these features were associated with the severity of the CTS clinical scales. Studies with large-scale samples are needed to be carried out to confirm the results of this study.
Keywords:. Carpal tunnel syndrome, electromyography, anxiety, depression

Öz

Amaç: Bu çalışmada Karpal Tunel Sendromu (KTS) klinik tablosu ile başvuran ve Elektromyografi (EMG) sonucunda sinir iletimi normal tespit edilen hastalarda anksiyete, sağlık anksiyesi ve somatosensoryel amplifikasyon düzeylerinin araştırılması amaçlanmıştır.
Gereç ve Yöntem: Çalışmaya Fizik Tedavi ve Rehabilitasyon polikliniğine sırasıyla başvurmuş klinik bulgular ile KTS tanısı konulan hastalar alındı. EMG'de iletim kaybı bulgusu olmayan hastalara Sağlık Anksiyetesi Ölçeği-18 (HAI-18), Bedensel Belirtileri Abartma Ölçeği (BBAÖ), Beck Depresyon Ölçeği (BDÖ), Beck Anksiyete Ölçeği (BAÖ), Görsel Ağrı Skalası (VAS) ve Boston Karpal Tünel Sorgulama Anketi (BKTSA) uygulandı.
Bulgular: Çalışmamız 56 hasta, 55 kontrol olmak üzere 111 vakadan oluştu. 42 erkek olmak üzere, 69 vaka kadın cinsiyetteydi. Hasta ve kontrol grubu arasında yaş, cinsiyet, beden kitle indeksi (BKİ) açısından anlamlı bir farklılık yoktu. Uygulanan ölçekler ile VAS, BKTSA semptom şiddeti ve BKTSA fonksiyonel durum arasında pozitif yönde anlamlı ilişki gözlendi.
Sonuç: Çalışmamız ile bu hasta grubunun yüksek anksiyete, sağlık anksiyetesi ve somatosensoryal amplifikasyon özellikleri gösterdiği ve bu özelliklerin KTS klinik ölçeklerinin şiddeti ile ilişkili olduğu gösterilmiştir. Mevcut sonuçlarımızı doğrulamak için daha geniş örneklemlerde çalışmalara ihitiyaç vardır.

Anahtar kelimeler: Karpal tünel sendromu, elektromyografi, anksiyete, depresyon

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INTRODUCTION

The most common mononeuropathies encountered in clinical practice are entrapment neuropathies. In these neuropathies, the nerve suffers damages as it passes through localized narrow areas. Carpal tunnel syndrome (CTS) is the most common peripheral entrapment neuropathy that occurs with the compression of the median nerve in the wrist. Entrapment neuropathies affect only a small part of the nerve, yet they have significant physical, psychological, and economic impacts[1-2]. The prevalence and incidence of carpal tunnel syndrome reported in different studies vary due to the differences in the diagnostic criteria. The general opinion is that carpal tunnel syndrome develops clinically in one out of every ten people[1].

Nerve conduction studies (electromyography (EMG)) are very sensitive methods that enable the examination of the median nerve dysfunction caused by the nerve damage[3]. The degree of demyelination and axonal loss that occurs due to EMG can be determined. Therefore, it is very useful to evaluate the nerve function and measure nerve damage in CTS[3]. It has been reported that EMG findings have effects on prognosis[1]. CTS is assessed as functionally mild in patients with clinical symptoms but with normal EMG findings[4]. However, there are also CTS patients with normal EMG findings yet with poor prognosis and with no satisfactory results in terms of clinical manifestation.

It was demonstrated in the previously conducted studies that CTS patients have higher rates of anxiety, depression, substance use, and somatoform pain disorders[5-6]. It has also been reported that the depression and anxiety levels in CTS patients are associated with sensory loss, hand weakness, thenar atrophy and hand pain[6]. There are numerous studies, in which a relationship was found between CTS and functional involvement[7-8]. However, there are no studies, in which the effects of the psychological factors and the psychological mood of patients on the symptoms of patients diagnosed with CTS clinically but without electrophysiological findings, were studied.

Therefore, in this study, it is aimed to assess the levels of anxiety, health anxiety and somatosensory amplification in patients who presented with the clinical manifestation of CTS and whose nerve conduction levels were found to be normal in EMG.

MATERIALS AND METHODS

Sample

This study was conducted as a cross-sectional study. The ethics committee approval (Decision No: 2020/418) of the study was obtained from the Gaziantep University Ethics Committee. Informed consents have been obtained from all the patients included in the study. The study has been conducted in accordance with the principles of the Declaration of Helsinki.

181 consecutive patients who applied to Gaziantep University Medical Faculty Hospital Physical Medicine and Rehabilitation outpatient clinic between December 2020 and January 2021 were included in the study. Different diagnostic criteria for CTS have been defined in the literature[5].We included 181 patients who were diagnosed with CTS by history and physical examination in this study[9]. EMG was performed according to American Association Society of Neuromuscular and Electrodiagnostic Medicine (AANEM) guidelines[10].The EMG findings of the 68 patients, from among the 181 patients with CTS symptoms that applied to the outpatient clinic during the study period, were found to be within the normal limits. The exclusion criteria were determined as follows; being treated for a psychiatric disorder, having any type of thyroid dysfunction or diabetes mellitus, being pregnant, and not being in the 18-65 age range. Cervical radiculopathy and thoracic outlet syndrome were confirmed by physical examination and X-ray and excluded. Accordingly, 6 of these 68 patients were determined to have comorbidities; 3 patients had hypothyroidism, 2 patients had hyperthyroidism and 1 patient had diabetes mellitus. Additionally, 2 patients were determined to have been receiving psychiatric treatment. Consequently, the patient group was formed with 56 subjects who voluntarily accepted to participate in the study, from among the remaining 60 patients after excluding the patients with comorbidities; whereas the control group was formed with 55 healthy subjects without physical illness, have not been diagnosed with any psychiatric illnesses at the time of the study nor in the past, have not been using alcohol/substance at the time of the study and matched with the patient group in terms of demographic data such as age, gender, and marital status. The control group is volunteers who have applied to the health board and have not been diagnosed with any disease.

Measures

Socio-demographic and clinical data form

A socio-demographic data form was designed by the authors of this study based on their clinical experiences and the literature, and administered in accordance with the objectives of the study. This semi-structured form included socio-demographic information such as age, gender, marital status, educational background, occupation as well as clinical data such as the duration of the relevant symptoms.

Somatosensory Amplification Scale (SSAS)

SASS is a 10-item scale developed by Barsky et al.[11] and has been shown to be valid and reliable. These items assess a range of disturbing somatic sensations, most of which do not indicate a disease. Patients assign each item a point value, from 1 to 5. The validity and reliability studies of the Turkish adaptation of SASS were carried out by Güleç et al.[12].

Short Health Anxiety Inventory (HAI-18)

Health Anxiety Inventory was developed at first as a 64 item-inventory by Salkovskis et al.[13], which was then reviewed and a shorter version was developed including 18 items. The inventory was developed to assess health anxiety regardless of physical health status. The validity and reliability studies of the Turkish adaptation of HAI-18 were carried out by Aydemir et al.[14].

Beck Depression Inventory (BDI)

BDI was developed by Beck et al.[15] to assess an individual's risk of depression, the level of depressive symptoms and the change in severity. BDI includes a total of 21 items. Each item is assigned a point value, from 0 to 3. The total score obtained from the inventory is calculated by adding these individual scores assigned to each item resulting in a total score that is between 0 and 63 points. The validity and reliability studies of the Turkish adaptation of BDI were carried out by Hisli[16], who determined the reliability coefficient of the inventory as 0.80.

Beck Anxiety Inventory (BAI)

BAI was developed by Beck et al. [17] to assess the frequency of anxiety symptoms experienced by an individual. BAI includes a total of 21 items. Each item is assigned a point value, from 0 to 3. The total score obtained from the inventory is calculated by adding these individual scores assigned to each item resulting in a total score that is between 0 and 63 points. Higher total scores indicates higher levels of anxiety in an individual. The validity and reliability studies of the Turkish adaptation of BAI were carried out by Ulusoy et al.[18].

Visual Analog Scale (VAS)

VAS was used to assess the pain intensity in this study. Patients were asked to rate their pain taking into consideration the last week by assigning a point value, from 0 to 10. In this scale, 0 points indicate "no pain", 1 to 4 points indicate mild pain, 5 to 6 points indicate moderate pain, and 7 to 10 points indicate severe pain[19].

Boston Carpal Tunnel Questionnaire (BCTQ)

BCTQ was developed by Levine et al[20]. BCTQ consists of two parts; symptom severity scale and functional capacity scale. The first part of BCTQ, that is the Boston Symptom Severity Scale, consists of 11 questions that assess the symptoms. Each question has five separate answers, which are assigned a point value, from 1 to 5. The mean scale score is obtained by dividing the total scale score by the number of questions. The higher the scale score, more severe the symptoms. The second part of BCTQ, that is the Boston Functional Capacity Scale consists of 8 questions that assess functional capacity. Each question has five separate answers, which are assigned a point value, from 1 to 5. The mean scale score is obtained by dividing the total scale score by the number of questions. Higher scale scores indicate decreased functional capacities. The validity and reliability studies of the Turkish adaptation of BCTQ were carried out by Sezgin et al.[21].

Statistical analysis

Ready-to use statistical software SPSS (Statistical Package for Social Sciences) for Windows version 22 was used for statistical analyses. Kolmogorov–Smirnov test was used to determine whether the parameters are normally distributed. Categorical data were reported as numbers and percentages, whereas the numerical data were reported as mean ± standard deviation. Chi-square test and independent samples t-test were used for the comparison of the categorical (sex and educational status) and numerical data (SSAS, HAI-18, BAI, BDI, VAS and BCTQ) of the patients, respectively. The linear associations between the normally distributed variables (SSAS, HAI-18, BAI, BDI, VAS and BCTQ) were evaluated using the Pearson's correlation coefficient. P values of <0.05 were considered to indicate statistical significance.

RESULTS

A total of 111 participants were included in the study, of whom 56 were patients and 55 were healthy control subjects. 69 of these cases were female, whereas 42 of them were male. There was no significant difference between the patient and control groups in terms of age, gender, and body mass index (BMI) (p> 0.05 for all). However, there was a significant difference between the groups in terms of educational level as there were more university graduates in the control group (p <0.05). Right wrist was affected in 18 patients, left wrist was affected in 13 patients, and both wrists were affected in 25 patients. The mean duration of having CTS symptoms was determined to be 18.11 ± 24.01 months. Characteristics and comparisons of the groups are given in Table-1.

Table 1. Characteristics of groups and their comparison

Characteristics	Groups		*t(109)*	χ2	p
	Patients M±SD or N (%)	Control M±SD or N (%)			
Age (year)	36.61±10.76	33.53±8.72	-1.489		0.139
Sex					
Female	37 (66.1%)	32(58.1%)		.734	0.391
Male	19(33.9%)	23(41.9%)			
BMI	26.01±4.69	24.56±4.23	-1.703		0.091
Educational Status					
Illiterate	3(%5.3)	1(1.8%)			
Primary School	24(42.9%)	7(12.7%)		19.698	0.001
High School	5(8.9%)	3(5.5%)			
University	24(42.9%)	44(80%)			
Symptoms side					
Right	18(32.1%)				
Left	13(23.2%)				
Bilateral	25(44,7%)				
Symptoms duration (month)	18.11±24.01				

M (mean) ± SD (standard deviation).BMI: Body Mass Index

Table 2. Comparison of applied scales between patient and control groups

Scales	Groups		*t*	*df*	p
	Patients M±SD	Control M±SD			
SSAS	29.08±9.35	23.38±9.29	-3.224	109	0.002
HAI-18	16.32±9.87	9.00±7.38	-4.417	109	<0.001
BAI	21.96±15.58	7.27±7.37	-6.365	78.745	<0.001
BDI	15.54±12.31	6.20±8.63	-4.634	98.658	<0.001
VAS	5.34±2.12	0.24±0.60	-17.260	64.075	<0.001
BCTQ symptom severity scale	2.50±0.81	1.13±0.26	-11.973	66.858	<0.001
BCTQ function status score	2.30±1.12	1.19±0.50	-6.716	76.627	<0.001

Values are presented as M (mean) ± SD (standard deviation). *t: t test. SSAS: Somatosensory Amplification Scale, HAI-18:Health Anxiety Scale-18, BAI: Beck Anxiety Inventory, BDI: Beck Depression Inventory, BCTQ: Boston Carpal Tunnel Syndrome Questionnaire

In order to assess the psychological factors, both patient and control groups were evaluated by using certain scales and inventories. Accordingly, the mean SSAS, HAI-18, BAI and BDI scores obtained by the patient and control groups were calculated as 29.08 ± 9.35 and 23.38 ± 9.29, 16.32±9.87 and 9.00±7.38, 21.96±15.58 and 7.27±7.37, and as 15.54±12.31 and 6.20±8.63, respectively. On the other hand, VAS and BCTQ scales were used for patient and control groups, in order to assess the CTS symptoms. Accordingly, the mean VAS, BCTQ symptom severity scale and BCTQ functional capacity scale

scores obtained by the patient and control groups were calculated as 5.34±2.12 and 0.24±0.60, 2.50±0.81 and 1.13±0.26, and as 2.30±1.12 and 1.19±0.50, respectively. The mean scores obtained from the scales were used to assess the clinical parameters of CTS. The comparisons are given in Table-2. Analysis of the correlation between the somatosensory amplification level, health anxiety and anxiety levels of the patients and the scales which were used to assess the clinical parameters of CTS revealed a significant correlation in the positive direction between the SSAS, HAI-18, BAI, BDI scores and the VAS, BCTQ symptom severity scale, and BCTQ functional capacity scale scores ($p < 0.001$ for all). The correlation between the scales which were used to assess the psychiatric parameters and the scales which were used to assess the clinical parameters of CTS is shown in Table-3.

Table 3. Correlation analysis of between clinical scales

		SSAS	HAI-18	BAI	BDI	VAS	BCTQ symptom severity scale	BCTQ function status score
SSAS	r		0.460**	0.673**	0.472**	0.338**	0.432**	0.534**
HAI-18	r	0.460**		0.561**	0.656**	0.413**	0.437**	0.407**
BAI	r	0.673**	0.561**		0.679**	0.518**	0.651**	0.586**
BDI	r	0.472**	0.656**	0.679**		0.460**	0.556**	0.487**

r: correlation coefficient, SSAS: Somatosensory Amplification Scale, HAI-18:Health Anxiety Scale-18, BAI: Beck Anxiety Inventory, BDI: Beck Depression Inventory, BCTQ: Boston Carpal Tunnel Syndrome Questionnaire. **p<0.05, **p<0.001*

DISCUSSION

In this study, somatosensory amplification, health anxiety and anxiety levels of the patients with CTS symptoms but with no EMG findings and of the healthy control subjects were compared with the scores that the patients and healthy control subjects obtained from the SSAS, HAI-18, BAI and BDI, and with each other. SSAS, HAI-18, BAI and BDI scores obtained by the patients were significantly higher than those scores obtained by the healthy control subjects. The primary aim of this study is to demonstrate the levels of health anxiety and somatosensory amplification in CTS patients with no electrophysiological involvement.

In many studies conducted with CTS patients, it has been demonstrated that the severity of symptoms indicated by the patient was related to his/her depression and anxiety levels[22-24]. The results of these studies suggested that psychological disorders contribute significantly to the clinical presentation of CTS. In parallel with the results of these studies, Coskun et Al. have determined a positive correlation between the VAS scores with BDI scores[5]. There are also studies available in the literature in which a relationship has been demonstrated between chronic pain and depression[25]. A large-scale study revealed that the CTS patients with no electrodiagnostic evidence had poor mental health and that their mental health were not different from the CTS patients with electrodiagnostic evidence[26]. In comparison, the results of this study support the results of the studies referred to above. Anxiety and depression levels of the patients were found to be significantly higher than those of the healthy control subjects. A moderate positive correlation was found between the VAS, BCTQ symptom severity scale, and the BCTQ functional capacity scale scores, through which the clinical manifestations of the CTS were assessed, and the BAI and BDI scores, through which anxiety and depression levels were assessed. These results suggest that the physicians should take into account the fact that there may be severe functional involvement in patients and this may be related to mood, even if the involvement of the median nerve could not be demonstrated electrophysiologically. On the other hand, there are also studies in the literature which suggested that there is no relationship between the symptom severity indicated by the CTS patients and their depression and anxiety levels[27-28].

Somatization is a common clinical manifestation that has been known for a long time[29]. Barsky et al.[30] put forward the hypothesis of somatosensory amplification as a central predisposing factor to explain somatization. According to this hypothesis, somatizing individuals tend to perceive their normal bodily sensations in an intense, harmful, and

disturbing way[30]. An individual with health anxiety perceives him/herself as having a serious illness even though he/she does not have a physical illness, and interprets this situation in a negative way as if this perceived illness would have led to bad consequences[31]. In this study, HAI-18 and SSAS scores obtained by the CTS patients with clinical manifestation but with no EMG findings were found to be significantly higher than the HAI-18 and SSAS scores that the healthy control subjects have obtained. These results indicated that the said patient group had high levels of health anxiety and somatosensory amplification. In comparison, in another study available in the literature the CTS patients were divided into groups based on their EMG findings as normal, mild, moderate or severe, however no significant difference was found between these groups in terms of BDI, VAS, and the disabilities of the arm, shoulder and hand (DASH) questionnaire scores[5]. In this study, only BDI was used for psychological assessment.

The psychological mood of the patients affect the way they express the severity of their complaints in the anamnesis. Normal conduction findings can be detected in many patients as a result of EMG, which aims to objectively assess the patients that express neuropathic pain. In some of these patients, the level of anxiety they feel in general, the level of anxiety they feel about their health, and the level of somatization may be quite explicit and exaggerated[32]. The correlation analysis of the levels of anxiety, health anxiety, and somatosensory amplification of the patients with the scales used to assess the clinical parameters of CTS revealed a significant correlation in the positive direction between SSAS, HAI-18, BAI and BDI and VAS, BCTQ symptom severity scale, and BCTQ functional capacity scale scores. These results suggest that the anxiety, health anxiety, and somatosensory amplification characteristics observed in the said patient group can be generalized.

The most important limitation of this study was its cross-sectional design and small sample size. In addition, data consisting of larger samples should be evaluated in terms of age and gender groups. Another limitation was that the individuals in the patient and control groups were not subjected to a scale, such as the Structured Clinical Interview for DSM-5 (SCID-5-CV and PD). Psychiatric examinations of the participants were evaluated by a psychiatrist according to DSM-5 diagnostic criteria.

This study is the first study in which the anxiety, health anxiety and somatosensory amplification levels of CTS patients with clinical manifestation but with no EMG evidence were investigated. As a result of this study, it was determined that the patient group referred to above showed higher anxiety, health anxiety and somatosensory amplification characteristics, and that these characteristics were correlated with the scores obtained from the scales used to assess the clinical parameters of CTS. It seems critical to ensure that the patients with such clinical manifestation are examined by psychiatrists so that they can be assessed in terms of anxiety disorders, depressive disorders and somatoform disorders. Such an intervention would contribute to the patient's clinical manifestation and reduce the losses suffered in terms of workload and finances as a result of CTS. Large-scale studies, including the patient groups with longitudinal and EMG findings are needed to be carried out to confirm the results of this study.

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