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ORIGINAL ARTICLE / ÖZGÜN ARAŞTIRMA

Levels of endocrine hormones and lipids in male patients with carpal tunnel syndrome

Karpal tünel sendromlu erkek hastalarda endokrin hormon ve lipid seviyeleri

Hülya Uzkeser[1], Saliha Karatay[2], Meltem Alkan Melikoğlu[1]

[1]Dept. of Physical Medicine and Rehabilitation, Erzurum Research and Training Hospital, Erzurum, Turkey

[2]Dept. of Physical Medicine and Rehabilitation, Medical Faculty, Ataturk University, Erzurum, Turkey

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ABSTRACT

Objectives: This study was performed to evaluate the relationship between endocrine hormones, lipid levels and clinical parameters in male patients with carpal tunnel syndrome (CTS).

Materials and methods: Fifteen male patients with CTS and 16 healthy controls were included in the study. Serum free T3, free T4, thyroid-stimulating hormone (TSH), free testosterone, dehydroepiandrosterone sulfate, triglyceride and total cholesterol levels were analyzed. Symptom severity and hand function were assessed using the Boston Carpal Tunnel Questionnaire in clinical examination.

Results: Serum free T3, free T4, TSH, free testosterone, dehydroepiandrosterone sulfate, triglyceride and total cholesterol levels were similar between CTS patients and controls (p> 0.05). Also, there was no statistically significant correlation between laboratory parameters and clinical characteristics in patients with CTS (p> 0.05).

Conclusion: The serum free T3, free T4, TSH, free testosterone, dehydroepiandrosterone sulfate, triglyceride and total cholesterol levels seem within normal range in male CTS patients. Further studies are needed to investigate association endocrine factors, lipid levels such as triglyceride and total cholesterol with CTS in male and female patients.

Key words: Carpal tunnel syndrome, thyroid hormone, testosterone, lipid levels

ÖZET

Amaç: Bu çalışma karpal tünel sendromlu (KTS) erkek hastalarda endokrin hormon ve lipid düzeyleriyle klinik özellikler arasındaki ilişkiyi belirlemek amacıyla düzenlendi.

Gereç ve yöntem: Çalışmaya 15 erkek KTS hastası ve 16 sağlıklı kontrol dahil edildi. Serum serbest T3, serbest T4, tiroid stimüle edici hormon (TSH), serbest testosteron, dehidroepiandrosteron sülfat, trigliserid ve total kolesterol düzeyleri analiz edildi. Klinik değerlendirmede semptom şiddeti ve el fonksiyonları Boston Karpal Tünel Anketi ile belirlendi.

Bulgular: Karpal tünel sendromu hastalarında serum serbest T3, serbest T4, TSH, serbest testosteron, dehidroepiandrosteron sülfat, trigliserid ve total kolesterol değerleri kontrollerle benzer düzeylerdeydi (p> 0.05). KTS hastalarında klinik özellikler ile laboratuar parametreleri arasında da istatistiksel olarak anlamlı bir korelasyon yoktu (p> 0.05).

Sonuç: Karpal tünel sendromu olan erkek hastalarda serum serbest T3, serbest T4, TSH, serbest testosteron, dehidroepiandrosteron sülfat, trigliserid ve total kolesterol düzeyleri normal aralıkta görülmektedir. Kadın ve erkek hastalarda total kolesterol ve trigliserid gibi lipid düzeyleri ve endokrin faktörler ile KTS arasındaki ilişkiyi araştıracak yeni çalışmaların yapılması gerekmektedir.

Anahtar kelimeler: Karpal tünel sendromu, tiroid hormonu, testosteron, lipid düzeyleri

INTRODUCTION

Carpal tunnel syndrome (CTS) is the most common peripheral compressive neuropathy in the developing countries.[1] The chronic mechanical compression and ischemic damage occur due to entrapment of the median nerve at the level of the carpal tunnel.[2] Serious diseases and conditions, such as rheumatoid arthritis, collagen tissue diseases, Colles frac-

Yazışma Adresi /Correspondence: Dr. Hülya Uzkeser, Erzurum Research and Trainig Hospital, Department of Physical Medicine and Rehabilitation, 25240 Erzurum, Turkey Email: drhulyauzkeser@hotmail.com

ture, hemodialysis, and thyroid diseases may play a role developing CTS.

On the other hand, there is a complex relationship between the central nervous system and the endocrine system. Especially, hypothalamus plays an important role on coordination of autonomic functions by neuronal and hormonal pathways. It was reported that CTS might occur in somatotrop adenomas.[3]

In addition, thyroid hormones contribute to development of the central nervous system on the perinatal period and thyroid deficiency results with mental retardation. Also, thyroid hormones are necessary for normal functions of brain on adults. Therefore, hypothyroidism of adults may cause depression, dementia, polyneuropathy and CTS.[4]

However, hypercholesterolemia is associated with fibrogenesis in various organs and in peripheral nerves.[5] There is few study about association with CTS and lipid levels.[5,6] Therefore we investigated relationship between lipid levels and CTS.

CTS is more frequent in women and the ratio women-men varies from 5.7 to 1.4 according to different prevalence studies.[7] Investigating to endocrine factors on CTS studies had generally conducted in female patients. However, there is limited information about this topic in men. Therefore, this study was performed to evaluate the relationship between endocrine hormones and CTS clinical parameters in male patients.

MATERIALS AND METHODS

Fifteen male patients with CTS that admitted to Physical Medicine and Rehabilitation outpatient clinic were included in the study. Patients were excluded in the presence of other known disease like diabetes, polyneuropathy or endocrine disease. Only idiopathic CTS with duration symptoms more than one year were included the study. Gold Standard for diagnosis of CTS is performing clinical examination and electrophysiological study with together. Patients with CTS were diagnosed using clinical and standard electrophysiological criteria.[8]

Electrophysiologic study is performed by the same person and all the tests are done in similar temperature conditions. Electrophysiological studies were performed by EMG device (Medelec Teca Premerie Plus vE05, 1995). Nerve conduction studies were made with surface stimulator and recording electrodes at 25°C controlled room temperature and over 30°C hand skin temperatures. Stimulations with 0.1-0.2 ms were given as supramaximal by bipolar electrodes. Ring electrodes in sensory nerve conduction studies, surface square electrodes in motor nerve conduction studies were used.

Sensory nerve action potentials (SNAP) were assessed as antidromic. Sensory nerve conduction studies, 14 cm distance between 2nd finger and wrist for median nerve, 12 cm distance between 5th finger and wrist for ulnar nerve, 14 cm distance between 4th finger and wrist for ulnar-median nerves comparisons were performed on both hands of all patients. Measurements were made on thenar and hypothenar regions by stimulating from wrist median and ulnar nerves of both hands in motor nerve conduction studies. Distance between stimulation place and recording electrode was 6-8 cm. Sensorial conduction velocities (SCV), motor conduction velocities (MCV), SNAP, compound muscle action potentials (CMAP), distal sensory latencies (DSL) and distal motor latencies (DML) of median and ulnar nerves on both hands were measured. Also, with stimulations in equal distances from 4th finger, median and ulnar sensory peak latencies, amplitudes and conduction velocities were determined. Needle electromyography (EMG) was applied on abductor pollicis brevis muscle by using a monopolar needle electrode. Cases of severe CTS with evidence of denervation on EMG and thenar atrophy were not included into this study. All measurements were made by the same neurophysiologist with the standardized method. CTS was diagnosed in occurrence of one or more criteria below in electrophysiological investigations:

1) SCV for median nerve < 40 m/s

2) Median nerve DML from the wrist to abductor pollicis brevis > 4.2 msec

3) DSL difference between the median and ulnar nerves > 0.5 ms.

Symptom severity and hand function were assessed using the Boston Carpal Tunnel Questionnaire in clinical examination. The Boston Carpal Tunnel Questionnaire symptom severity scale and functional status scale were separately calculated in the study 9. Boston Questionnaire is a self-administered questionnaire which assesses the sever-

ity of symptoms and the functional status of CTS. The symptom severity scale (SSS) consists of 11 questions and the functional status scale (FSS) includes 8 questions. In both the overall results are calculated mean of the number of questions for each one. SSS assess the symptoms with respect to severity, frequency, time and type. FSS assess the effect of CTS on daily living. So, a higher score defines worse symptoms or dysfunctions. Sezgin et al in 2006 were found valid and reliable to the Turkish version of Boston Carpal Tunnel Questionnaire.[10]

The control group was formed by 16 male healthy volunteers without any evidence of diseases, matched in age with CTS patients. The height and weight of all subjects were recorded and body mass index (BMI) was calculated as weight (kg)/ height (m^2).

Laboratory examinations were applied to all patients and control subjects. Serum free T3, free T4, thyroid-stimulating hormone (TSH), free testosterone, dehydroepiandrosterone sulfate, triglyceride and total cholesterol levels were measured by fasting blood at morning. Demographic data and laboratory values were compared between the groups.

Statistical Analysis

Statistical analysis was performed with the Statistical Package for the Social Sciences for Windows (version 11.0, Chicago, IL, USA). Statistical analyses were undertaken using the Mann–Whitney U test and Pearson correlation test. A p value of less than 0.05 was accepted as statistically significant.

RESULTS

The demographic, clinical and laboratory characteristics of patients and healthy controls are shown in Table 1. There was not a significant difference for demographic factors between two groups ($p>0.05$). Also, we did not find statistically significant difference for serum free T3, free T4, TSH, free testosterone, dehydroepiandrosterone sulfate, triglyceride and total cholesterol levels between patients with CTS and healthy controls (Table 2). No significant correlations were observed between laboratory parameters and clinical characteristics in patients with CTS (Table 3). Also, we did not found significant correlation between laboratory parameters and electrophysiological parameters.

Table 1. The demographic and clinical characteristics of carpal tunnel syndrome patients and healthy controls (mean ± SD)

	CTS	Controls	p
Age (years)	47.13 ± 10.40	40.88 ± 9.28	ns
BMI	29.15 ± 5.25	27.18 ± 3.38	ns
Disease duration (year)	3.33 ± 4.78	-	
Symptom severity scale	23.67 ± 5.58	-	
Functional status scale	11.6 ± 4.53	-	

CTS: Carpal tunnel syndrome, BMI: Body mass index, ns: not significant

Table 2. The laboratory analysis of carpal tunnel syndrome patients and healthy controls (mean ± SD)

	CTS	Controls	p
Free T3 (pg/ml)	2.42 ± 0.21	2.44 ± 0.23	ns
Free T4 (ng/dl)	2.36 ± 3.58	1.02 ± 0.21	ns
TSH (μIU/ml)	1.22 ± 1.76	1.30 ± 1.23	ns
Free testosterone (ng/dl)	0.63 ±0.36	0.69 ± 0.31	ns
Dehydroepiandrosterone sulfate (μg/dl)	104.96±31.93	108.79±51.14	ns
Triglyceride (mg/dl)	136.87±57.14	152.13±66.56	ns
Total cholesterol (mg/dl)	201.6±44.76	172.81±52.99	ns

CTS: Carpal tunnel syndrome, TSH: thyroid-stimulating hormone, ns: not significant

Table 3. The results of Pearson correlation test between laboratory parameters and Boston Carpal Tunnel Questionnaire in patients with carpal tunnel syndrome

	SSS r	FSS r	p
Free T3 (pg/ml)	0.4	0.5	ns
Free T4 (ng/dl)	0.06	-0.1	ns
TSH (μIU/ml)	0.1	-0.03	ns
Free testosterone (ng/dl)	0.01	0.3	ns
Dehydroepiandrosterone sulfate (μg/dl)	-0.1	0.1	ns
Triglyceride (mg/dl)	-0.4	-0.1	ns
Total cholesterol (mg/dl)	-0.1	-0.1	ns

TSH: thyroid-stimulating hormone, SSS: Symptom Severity Scale, FSS: Functional Status Scale, ns: not significant

DISCUSSION

Carpal tunnel stndrome is entrapment of the median nevre in the carpal tunnel region. It's clinical symptoms are characterized by pain, numbness and tingling in the hands.[11] The prevalence of certain diseases and conditions such as diabetes mellitus, thyroid diseases, rheumatoid arthritis, pregnancy and obesity are higher in CTS patients than in the general population.[11,12]

Female gender, increased BMI and increased wrist ratio represent important risk factors for developing CTS.[13] The accumulation of fat tissue and synovial thickening in obese people compressed the median nerve in the carpal canal.[13] Some other pathophysiologic mechanisms may cause to this process. Becker et al found that the association between female gender and CTS is greater in diabetic patients, and they also found female gender and obesity were the strongest independent risk factors for CTS.[14] Kouyoumdjian et al conclude that CTS cases have a significant correlation with higher BMI when compared to controls subjects; however, higher BMI does not represent a statistically significant increasing risk for more severe CTS.[15] In contrast to the above-mentioned studies we did not find a difference for BMI values, serum triglyceride and total cholesterol levels between healthy controls and CTS patients.

Some studies reported gender-related differences between female and male patients with CTS.[7,16,17] In women, using combined oral contraceptives, bilateral oophorectomy and pregnancy have been determined to be associated with CTS.[18-20] Padua et al.[16] showed that the mean age was higher in men but the duration of symptoms was shorter than women. In addition, male patients with CTS had more severe electrophysiological damage but they reported fewer symptoms compared with women. Mondelli et al also reported that the duration of symptoms was shorter in men and Boston Carpal Tunnel Questionnaire scores were higher in women than in men.[7] However, we did not find a study investigating serum testosterone and dehydroepiandrosterone sulfate levels in female or male patients with CTS. In our study, serum testosterone and dehydroepiandrosterone sulfate levels were similar in healthy controls and patients with CTS.

On the other hand, hypothyroidism has an important influence on central and peripheral nervous system. The patients with hypothyroidism have complaint such as paresthesia, myalgia and muscle weakness.[21] A number of studies reported that hypothyroidism is associated with an increased risk of peripheral neuropathy[22]. CTS is the most common neuropathy associated with hypothyroidism.[22,23] Hypothyroidism may cause to development of CTS leading alterations of fluid balance and peripheral tissue edema[11]. We did not find a trial evaluating serum T3, T4 and TSH values in male patients with CTS in literature. However, there was not a difference for serum free T3, free T4 and TSH levels between two groups in our study.

However, our study has two limitations. The number of patients that included the study was small and other limitation was wide age range of participants.

In conclusion, endocrine factors such as, free T3, free T4, TSH, free testosterone, dehydroepiandrosterone sulfate and lipid levels like triglyceride and total cholesterol, may not association with CTS in male patients. But further studies are needed to investigate association between endocrine factors and CTS levels in male and female patients.

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