



Hypohidrosis and Dermatological Manifestations as Guides for the Severity of Carpal Tunnel Syndrome

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Abstract

Introduction: Carpal tunnel syndrome (CTS) is a common entrapment neuropathy. Some of skin findings and hypohidrosis were reported which associated with CTS. Our aims are to detect the incidence of hypohidrosis and accompanying skin manifestations in patients with CTS; and to investigate potential relations among the severity of CTS and the accompanying skin manifestations/hypohidrosis.

Methods: Thirty-four patients with carpal tunnel syndrome were enrolled into the study. The severity of CTS was divided into three categories: mild, moderate and severe. The patients were examined to detect skin findings due to CTS. Starch iodine test was applied to measure hypo- or hyperhidrosis.

Results: Of the 34 patients, 29 patients (85.3%) had CTS bilaterally. 63 hands with CTS were evaluated. Skin manifestations were detected on 36 of the hands (57.1%) with CTS. The most common skin findings were contact dermatitis, painful swelling on fingers and xerosis. Hypohidrosis was detected on 16 hands (47%) with CTS. Hypohidrosis is statistically more common on the hands with moderate or severe CTS ($p=0.000$).

Discussion and Conclusion: Hypohidrosis is a common findings of CTS and it is associated with severe disease. Presence of suspicious skin findings and hypohidrosis on hand fingers, CTS should be kept in mind.

Keywords: Carpal tunnel syndrome; dermatology; hypohidrosis.

Carpal tunnel syndrome (CTS) is a common entrapment neuropathy which is caused by the compression of the median nerve. Numbness and tingling along the dermatome innervated by the median nerve are common symptoms of CTS^[1]. Albeit more rare, CTS may also manifest itself dermatologically, in the form of blistering, painless ulceration on the fingertips, fingertip necrosis, nail discoloration, contact dermatitis, Raynaud phenomenon or even autoamputation^[2-5]. Hypohidrosis is yet another condition reported in conjunction with CTS^[6]. However, incidence rates of the accompanying skin findings and hypo-

hidrosis in patients with CTS are still unknown. Our aims in this study are (i) to separately obtain the incidence rate of hypohidrosis and accompanying skin manifestations, in patients suffering from CTS; and (ii) to investigate potential relations among the severity of CTS and the accompanying skin manifestations/hypohidrosis.

Materials and Methods

Thirty-four patients with carpal tunnel syndrome were enrolled into the study. The patients were diagnosed with CTS

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by a physical therapy and rehabilitation specialist via examination and electromyographic findings. A local ethics committee approval was obtained. Patients who were younger than 18 years of age or who had dermatological or systemic diseases which might lead to hypo- or hyperhidrosis were excluded.

Demographic characteristics such as age, gender and duration of the disease were recorded. The severity of CTS was divided into three categories: mild, moderate and severe. Severity of the disease was determined by electromyographic findings. In the first step, all the patients' hand(s) (most of the patients had bilateral CTS) were examined by a dermatologist to detect skin findings due to CTS on first, second and third fingers. In the second step, starch iodine test was applied by a dermatologist to measure hypo- or hyperhidrosis on the affected areas and the photographs of the affected hands were taken. First, second and third fingers were compared with fourth and fifth fingers. Statistical analyses were performed with SPSS software version 22.0. Mean, standard deviation, minimum, maximum, frequency and ratio values were used for the determination of data. Chi-squared test, Fisher's exact test, Kolmogorov-Smirnov test and Mann-Whitney U test were used for analyzing all data and $p < 0.05$ was accepted statistically significant.

Results

Of the 34 patients, 33 were female (97.1%) and 1 was male (2.9%). The mean age of the patients was 55.2 ± 12.3 . The mean duration of disease was 34.9 ± 35.3 months. 29 patients (85.3%) had CTS bilaterally, i.e., on both hands. As a result, 63 hands with CTS were evaluated in total. 28 hands (44.4%) had mild CTS, 21 hands (33.3%) had moderate CTS and 14 hands (22.2%) had severe CTS. Skin manifestations were detected on 36 of the hands (57.1%) with CTS. The observed skin manifestations are summarized on the Table 1.

Table 1. Distribution of skin findings on the hands with CTS

Skin findings	n (%)
Contact dermatitis	9 (25)
Painful swelling on fingers	9 (25)
Xerosis	4 (11.1)
Longitudinal furrows on the nails	3 (8.3)
Atrophy	2 (5.5)
Onychomycosis	2 (5.5)
Painful swelling on fingers and erythema	2 (5.5)
Paronychia	2 (5.5)
Verruca vulgaris	2 (5.5)
Discoloration on the nail plates	1 (2.8)

Hypohidrosis was detected on 16 hands (47%) with CTS. Of the 16 hands, 9 hands (56.25%) had moderate CTS and 7 hands (43.75%) had severe CTS. Hypohidrosis is statistically more common on the hands with moderate or severe CTS ($p = 0.000$) (Fig. 1). The group with hypohidrosis and the group without hypohidrosis were similar in terms of duration of disease and accompanying skin findings ($p > 0.05$) (Table 2).

Discussion

Carpal tunnel syndrome occurs due to compression of the median nerve throughout the carpal tunnel. As a result of this compression, ischemia and mechanical trauma, dysfunctional epidural blood flow and axonal transport may occur; which consequently induces symptoms such as numbness and tingling in the distribution of the median nerve, weakness and/or atrophy of the thenar musculature. Median nerve compression also leads to autonomic dysfunction. In patients with CTS swelling, erythema and tempera-



Figure 1. Presence of hypohidrosis on the first and second finger on the left hand with severe CTS, absence of hypohidrosis on the first and second finger on the right hand with mild CTS.

Table 2. Distribution of association of hypohidrosis with duration of disease, severity of disease and accompanying skin findings.

	Hypohidrosis		p
	Absent	Present	
Duration of disease (month)	34.7 ± 37.9	35.2 ± 30.7	0.627m
Severity of disease (%)			
Mild	28 (59.5)	0	0.000^{x2}
Moderate	12 (25.5)	9 (56.25)	
Severe	7 (14.9)	7 (43.75)	
Accompanying skin findings (%)			
Present	27 (57.5)	9 (56.25)	0.919x2
Absent	20 (42.5)	7 (43.75)	

m: Mann-Whitney U test; ^{x2}: Chi-squared test.

ture increase can occur due to autonomic dysfunction^[7]. In our study the most common skin manifestation of CTS was painful swelling on fingers. Nerve fiber compression can lead to pain on the affected nerve distribution. Erythema was detected in only two patients with CTS in our study.

Atrophy and xerosis may occur because of the digital microcirculatory disorder. Atrophy was detected in two patients with CTS in our study^[8]. Lack of sweating may facilitate xerosis^[2]. Xerosis leads to increased risk of hand eczema and contact sensitization^[9]. In addition, peripheral sensitive and autonomic fibers are responsible to release some of neuropeptides such as vasoactive intestinal polypeptides, substance p, calcitonin-related peptide. These peptides play an important role in pathogenesis of skin inflammation^[2]. These pathogenic mechanisms can be cause contact dermatitis in patients with CTS. Contact dermatitis was one of the most common skin finding in patients with CTS in our study. Fingernail changes such as nail plate thickening, dark brown discoloration, transverse furrows, Beau's lines, cuticle changes were reported as the causes of the CTS in the literature. In our study, longitudinal furrows on the nails were detected in three patients, paronychia were detected in two patients and dark brown in color on the fingernails in one patient with CTS. Digital microcirculatory defect can cause digital ischemia which consequently induced acute periungual inflammation^[10]. This issue can be responsible for the nail changes. Sensory dysfunction can lead to mechanic injury therefore this issue may play a role occurring the nail changes. In our study verruca vulgaris and onychomycosis were detected in 2 hands. These findings were not thought to be associated with CTS.

Median nerve compression also leads to autonomic dysfunction. This issue can cause hypohidrosis on the affected areas. Therefore digital microcirculatory disorder may play role pathogenesis of hypohidrosis in patients with CTS^[7]. In our study, hypohidrosis were detected in 16 hands (47%) and hypohidrosis is statistically more common on the hands with moderate or severe CTS. Hypohidrosis seems to be associated with severity of disease in patient with CTS. In conclusion, CTS is one of the most common entrapment neuropathy which has accompanying with skin lesions. Detailed dermatological examination of the hands is important to recognize the clue of the disease. Recognizing specific skin findings due to CTS is important for dermatologist because early diagnosis is important to prevent from irreversible deformities and bone lesions also it is important for treatment of accompanying dermatological disease. On

the other hand, hypohidrosis is a common findings of CTS and it is associated with severe disease. Starch iodine test is an easy and cheap instrument to detect hypohidrosis. In the presence of suspicious skin findings and hypohidrosis on hand fingers, CTS should be kept in mind by dermatologists.

The study has some limitations. The study was performed with limited number of the patients therefore detailed statistically analysis couldn't be done for each dermatological finding and severity of the CTS. There was not a control group in the study. A control group can be helpful to distinguish non-specific skin lesions from the specific skin lesions.

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