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Sleep Position in Patients With Carpal Tunnel Syndrome

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Background: Carpal tunnel syndrome is one of the most common entrapment neuropathy. Recent studies suggest that this syndrome may be more frequent in some specific sleep positions.

Objectives: The aim of this study was evaluation of sleep position in patients with carpal tunnel syndrome.

Patients and Methods: This cross-sectional study was conducted on 220 patients with carpal tunnel syndrome. The diagnosis was confirmed with electromyography. The sleep position in the patients was assessed via the questionnaire. The sleep position of the patients was compared with the sleep position of 320 healthy persons. The χ^2 test was used for statistical analysis.

Results: Carpal tunnel syndrome was more frequent in women. About two thirds of the patients had moderate to severe carpal tunnel syndrome. The prevalence of carpal tunnel syndrome was more frequent in patients who slept on their sides than who slept in other positions ($P < 0.01$). There was no significant relationship between the severity of carpal tunnel syndrome and sleep position.

Conclusions: Our study showed that carpal tunnel syndrome was more frequent in some sleep positions, however, no significant relationship was found between the sleep position and the severity of this syndrome.

Keywords: Carpal tunnel syndrome; Position; Sleep

1. Background

Carpal tunnel syndrome (CTS) is one of the most common entrapment neuropathy in the world. About 10% of general population is involved with this syndrome. The main symptoms are pain and paresthesia and weakness may be seen at the distal wrist in some patients [1, 2]. This disease is more frequent in women and clinical diagnosis will be confirmed by electromyography [3-6]. The main causes are obesity, pregnancy, diabetes, thyroid disorders and wrist deformities. In addition to these factors, it seems that some other factors may be having a role in CTS pathophysiology [7-10]. Among them, sleep position is noted in the recent studies. At now, all published articles have showed that the symptoms of CTS are more severe at night [11, 12]. According to this finding, McCabe et al. in a review article assessed the relation between CTS and sleep and observed that all researches point to worsening of symptoms during sleep but they could not find any factor that might explain this finding. Then, the authors hypothesized that sleep position may be have a role in CTS [13]. Also, Jensen et al. found that there is a relationship between bilateral sleeping position and CTS [14]. McCabe and Xue in another study observed that the incidence of this syndrome is significantly higher in the patients who sleep on their left or right side compared to the patients who sleep on other positions [15]. McCabe et al. retested their study on patients with this syndrome but with control group and obtained the same results [16].

2. Objectives

Because this issue is new and studies in this area are limited and also relationship between the severity of this syndrome and sleep positions was not assessed in the previous researches, the present study was designed.

3. Patients and Methods

In this cross-sectional study, 220 patients with CTS were evaluated in 2011. The patients selected from Besat clinic and a private health center in Kerman. Everyone with identified cause of CTS (obesity, pregnancy, diabetes, thyroid disorders, rheumatic diseases and wrist deformities) excluded from the study. It should be noted that all these cases were evaluated in every patient. The assessment of obesity was based on BMI and the patients with BMI ≥ 30 were excluded from the study [17]. Diagnosis of CTS was confirmed by electromyography and patients were excluded from the study if there were any changes in electromyography except the changes compatible with CTS.

The severity of the disease was categorized in the following conditions; mild: sensory peck latency > 3.6 ms

and motor onset latency ≤ 4.1, moderate: both sensory and motor are involved, (sensory peck latency ≥ 3.6 ms and motor latency > 4.1) but the waves have not disappeared, sever: sensory or motor waves have disappeared [18]. The sleep positions of the patients were recorded through interviews with the patients and were categorized into following groups: (a) sleeping on the right side, (b) sleeping on the left side, (c) sleeping on supine, (d) sleeping on the prone, (e) others. Also, patients with following conditions were excluded from our study: (I) if they could not identify their sleeping position, (II) if they had any certain underlying sleep disorder, (III) if they were alcohol or opium addict or drug consumer. In this study 320 healthy persons were evaluated as the control group. They were selected from the patients' relatives. These individuals had the same age and sex as the patients. Sample size was determined as 220 patients and 320 healthy with 5% alpha, 10% beta and also, power of study was 90% [16]. Participation in the study was voluntary and the research was approved by the ethics committee of Kerman University. To analyze the data, SPSS-21 software and χ^2 test were used.

4. Results

In this study, 220 patients and 320 healthy persons were evaluated. In patients group, 67 (30.5%) were male and the rest were female. In control group, 94 (29.4%) were male and the others were female, the age range of both groups was from 20 to 70 years. The mean age of patients was 46 ± 9.4 years and the mean age of control group was 41.3 ± 8.7 years.

There was no significant difference in terms of age and sex between two groups. Regarding severity of the disease, 64 (29.1%) patients had mild, 95 (43.2%) patients had moderate and 61 (27.7%) patients had severe CTS. CTS was in 122 (55.5%) patients in right side and in 44 (20%) patients in left side and in 54 (24.5%) patients in both sides. Comparison of sleep positions between two groups (Table 1) showed that there was a significant difference (P = 0.04). Also, comparison of affected side of the patients and the sleep position (Table 2) showed a significant difference between sleeping on left and right sides and the side affected with the disease (P = 0.0001). According to Table 3, there is no significant relationship between severity of carpal tunnel syndrome and sleep position (P = 0.07).

Table 1. Frequency of Sleep Positions in the Patients and Control Groups [a]

	Right Side	Left Side	Others	Supine	Prone	Total
Patients	68 (41)	31 (18.7)	17 (10.2)	36 (21.7)	14 (8.4)	166 (100)
Control	75 (23.4)	61 (19.1)	24 (7.5)	116 (36.2)	44 (13.8)	320 (100)
P Value	0.04	0.35	0.059	0.063	0.087	

[a] Data are presented as No. (%).

Table 2. Frequency of Sleep Positions According to the Involved Hand [a,b]

	Right side	Left Side	Others	Supine	Prone	Total
Right-side CTS	63 (51.6)	10 (8.2)	13 (10.7)	26 (21.3)	10 (8.2)	122 (100)
Left-side CTS	5 (11.4)	21 (47.7)	4 (9.1)	10 (22.7)	4 (9.1)	44 (100)
P Value	0.001	0.032	0.075	0.095	0.0121	

[a] Abbreviations: CTS, Carpal tunnel syndrome.
[b] Data are presented as No. (%).

Table 3. Frequency of Intensity of the Disease According to the Sleep Positions [a]

Sleep position	Intensity of the Disease			
	Mild	Moderate	Severe	P Value
Right side	18 (34)	33 (50.8)	17 (35.4)	0.07
Left side	7 (13.2)	13 (20)	11 (22.9)	0.062
Others	8 (15.1)	7 (10.7)	2 (4.2)	0.078
Supine	12 (22.6)	10 (15.4)	14 (29.2)	0.086
Prone	8 (15.1)	2 (3.1)	4 (8.3)	0.068

[a] Data are presented as No. (%).

5. Discussion

The results of our study showed that sleep position in patients with CTS differ with normal population and the prevalence of CTS is higher in persons who sleep on their left or right sides than persons who sleep on other positions. Our findings are as same as McCabe et al. study in America in 2010. In this case-control study, a significant relationship was found between sleeping on either sides and the prevalence of CTS. Moreover, the findings of this study showed this relationship is stronger in men compared to the women [16].

There is not any case-control researches in this filed except, McCabe and Xue study and our study and both of them showed a significant relationship between sleeping on either sides and the prevalence of CTS. Also, this study showed that the prevalence of CTS is higher in the individuals who sleep on their sides than the individuals who sleep on other positions [15]. It is not clear why individuals who sleep on their left or right sides are more prone to CTS. We know that CTS is strongly dependent on the morphology of the wrist [19]. It seems that sleeping on either side's increases extension or flections of the wrist. Therefore, these sleep positions increases pressure on the median nerve and ultimately increases prevalence of the disease [16, 20].

Also, it should be noted that the symptoms are worse at night. Then, undoubtedly, there are some factors at night that stimulate the median nerve (maybe one of them is sleep position) [13, 21]. The exacerbation of symptoms at night is reported in 77% to 80% of the patients [21, 22] and most of the patients with mild to moderate syndrome were healed by wearing splint at nights [23, 24].

Then some aspects of CTS patophysiologyis related to night. The reason of exacerbation of symptoms at night may be due to redistribution of fluids in the upper parts of the body. Wearing splint may also reduce this edema. As a result, it helps improve symptoms of the disease (or improve the CTS in some individuals) [13].

It also should be noted that individuals change their positions during sleep at nights several times; however, one of the sleep positions is more prevalent than other positions among most of the people [25]. In our study, the relationship between the severity of CTS and various sleep positions was also examined. We found no significant relationship between these variables. We also did not find similar study conducted in this area. Accordingly, we can conclude that all sleeping positions can cause carpal tunnel syndrome with any intensity. Also, prevalence of CTS was higher in the women compared to the men in our study. These finding is as same as published studies [15]. A recent meta analyzes suggested that the prevalence of carpal tunnel syndrome is twice as common in female but , it should be noted that this finding was not right in the studies in which specific populations were considered, such as individuals who work with computer [26, 27]. Wrist Ratio is the ratio of height of the wrist to the width of the wrist. This value of this ratio in the patients with CTS is higher than healthy persons. The value of this ratio is also higher in women than men. This is one of the reasons for higher prevalence of CTS in women. In our study, most of patients had CTS on right side. This finding is consistent with those obtained in many studies [28, 29].

It seems that higher frequency of right-handed individuals than left-handed individuals and the higher frequency of performing physical activities with the right hand than left hand in all societies are the reason for higher prevalence of this syndrome in right hand [29-31]. In this study, this disorder was most common in patients aged 40 to 60 years old. This data is also, as same as many researches. However, some studies showed that prevalence of CTS increases with age [26, 27]. In our study, we did not find a relationship between prevalence of CTS and increased age. We excluded the individuals who had diabetes and obesity from our study and it may be have Influence on our findings because prevalence of diabetes and obesity increase with age and we deleted them from our study. Some studies suggested that the pathophysiology of the disease is different at various ages [14].

In our study, about one-third of patients had mild CTS while the rest of the patients were diagnosed with moderate to severe CTS. In a study in Korea, two thirds of the patients had mild CTS and the others had moderate to severe CTS [32]. It seems that patients in Iran refer to doctor for specialized treatment of the disease very late (in comparison with study in Korea). Although clinical symptoms of the disease had a direct relationship with electromyography findings [33] but it should be noted that this relationship is not always true because some patients with mild symptoms might show severe CTS in electromyography [34]. In our study, most of the healthy individuals in the control group (42.5%) slept on their left or right sides. In one study, it was observed that 58.8% of Canadian students and 32.4% of Japanese students slept on their sides while 40.5% of Japanese students slept on their backs and 30.5% of the Canadian students slept on their backs. The sleep position is a habit of sleeping in adults, which may be imposed to them in childhood [21]. In our study, 59.7% of the patients slept on their right sides. This finding was consistent with a study in America [16]. Recent studies showed sleep positions affect quality of life [21]. The limitation of our study was that we did not investigate snoring in the patients. Studies show that 6 to 27% of the patients have snoring during sleep [35]. This cause sleep disorders; as a result, it may affect the results. In conclusion, our findings indicated that prevalence of CTS is higher in the individuals who sleep on their sides. However, no relationship was found between sleep positions and the severity of CTS.

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Authors' Contributions

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