

Depression and anxiety disorders in patients with carpal tunnel syndrome after surgery – a case control study

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Summary

Purpose: The aim of this study was to evaluate the frequency of depressive and anxiety disorders in patients with carpal tunnel syndrome (CTS) after surgery in comparison with normal individuals. **Materials and methods:** This cross-sectional analytical case-control study conducted on patients who underwent surgery with a diagnosis of carpal tunnel syndrome. In the first group, 35 patients with CTS who underwent surgery were randomly selected and evaluated for anxiety and depression with two standard questionnaires – of CES-D (Center for Epidemiologic Studies Depression) and S-TAI (Spielberger State-Trait Anxiety Inventory). The second group of 35 normal people were randomly selected and examined after matching the age and sex. The data were compared and analyzed using SPSS V.22 software. **Results:** The mean score of Spielberger state and trait anxiety and depression in the case group was higher than the control group ($P < 0.001$ and $P = 0.003$ respectively). In both age groups (< 40 and > 40 years) the level of state and trait anxiety and depression was significantly higher in case than the control group. In women, the level of state and trait anxiety and depression was significantly higher in the case group than in the control group, but in men, only trait anxiety was significant. **Conclusion:** The anxiety and depression disorders were more common in patients undergoing CTS than in normal individuals. Therefore, it is necessary to study the psychological status of these patients in the pre-discharge period and pay attention to its predictors in order to plan appropriate interventions.

Key words

carpal tunnel syndrome – anxiety – depression – surgery

Jokar R., Shokravi M., Baghianimoghadam B., et al. Y. Depression and anxiety disorders in patients with carpal tunnel syndrome after surgery – a case control study. *Acta Chir Plast* 2022; 64(1): 12–17.

Introduction

Carpal tunnel syndrome (CTS) is the most common neuropathy due to nerve entrapment which results in compression of the median nerve in the wrist area [1]. The disease is more prevalent in middle-aged housewives, computer users, carpenters, labors, car mechanics, and truck drivers [2]. Causes of CTS include anatomical causes such as fractures, dislocations, osteophytes of the wrist bones, tumors, cysts, thickened synovium and osteoarthritis, inflammatory or neuropathic causes such as diabetes, alcoholism, pregnancy and mechanical

causes such as repetitive movements of the wrist and fingers and vibration (especially common in workers and computer users) [2–5]. Recent studies have shown that about 2.7% of the population has CTS clinically and electrodiagnostically. The female to male ratio varies from 3 to 1 to 10 to 1 [4]. Patients usually present with numbness, pain, paresthesia at the median nerve distribution (thumb, index, and middle fingers). These symptoms often worsen at night and worsen with repetitive, vigorous hand movements [5]. Symptoms of CTS cause a significant reduction in the

quality of life of patients and therefore the treatment of this disease is very important [6]. The treatments used today include two groups of medical and surgical treatments, of which surgical treatments are the most commonly used as the last resort [7]. At present, there is no information about its prevalence in Iran. However, due to the fact that in many jobs and tasks that are done manually, repetitive hand and finger movements are high, the prevalence of CTS is predicted to be high [8,9]. Psychological problems such as depression and anxiety that occur after pain, can lead

to symptoms or functional impairment in the upper musculoskeletal system [10,11]. Depression is the most common mood disorder worldwide and is one of the leading causes of disability. According to the American Psychological Association, depression is a heterogeneous disorder that is often accompanied by symptoms at the physiological, behavioral, and psychological levels [12]. The overall prevalence of depression in the Iranian society aged 18–70 years is 9.5% [13]. Anxiety disorders are one of the most common classes of mental disorders with a prevalence of 30.5% in women and 19.2% in men [14]. Various studies in Iran have reported the prevalence of mental disorders including anxiety at 30.4% [15].

Studies conducted so far about depression in CTS patients around the world are usually descriptive cross-sectional studies. In Iran, there is no analytical study to examine the rate of depression in these patients, and in the world during 2018 and 2019, limited analytical studies have been done in this field [16]. In patients with CTS, exacerbation of neuropathic pain, especially at night, can lead to sleep disturbance, decreased sleep quality, and an effect on patients' mood and, consequently, quality of life. In order to treat neuropathic pain better, it seems necessary to consider parameters such as depression and anxiety [17]. The aim of this study was to evaluate the frequency of depressive and anxiety disorders in patients with CTS after surgery in comparison with normal individuals to determine the role of depression and anxiety in response to treatment of patients with CTS.

Materials and methods

This cross-sectional analytical case-control study conducted after approval of the institutional Ethics Committee between 2019 and 2020 on patients with CTS which were operated at the hospitals of Babol University of Medical Sciences, Babol, Iran.

Patients who underwent surgery with a diagnosis of CTS were included in the study. Patients with diabetes, kidney failure leading to dialysis, thyroid disease, pregnancy, patients receiving medication with a diagnosis of psychiatric illness, patients who did not want to participate in the study, and patients with a history of previous wrist fractures were excluded from the study.

The data collected by extracting information from the file or interviewing patients with CTS. The diagnosis of CTS was made based on a complaint of paresthesia in the sensory area of the median nerve and the confirmation of clinical examinations including Durkan compression test, Phalen test and Tinel sign or atrophy of thenar muscles that were confirmed by nerve conduction velocity (NCV).

Questionnaires were completed by the patient with the help of the researcher. Factors such as: body mass index, job status, average daily hours of computer use, history of steroid use, family history, heart failure, smoking, alcohol consumption, use of oral contraceptives, simultaneous involvement of cervical nerve roots (radiculopathy), rheumatic diseases and other related soft tissue diseases, and associated nerve lesions such as ulnar neuropathy in the same wrist were evaluated.

The sample size was calculated 35 cases for each group based on the following formula:

$$N = \frac{(Z_{1-\frac{\alpha}{2}} + Z_{2-\beta})^2 [P_1(1-P_1) + P_2(1-P_2)]}{(P_1 - P_2)^2}$$

In the first group, 35 patients with CTS who were diagnosed with CTS during clinical examination based on NCV results and underwent surgery were randomly selected and evaluated for anxiety and depression with the two standard questionnaires:

- Center for Epidemiologic Studies Depression (CES-D): this self-assessment questionnaire consists of 20 four-

-choice questions (almost never = 1, sometimes = 2, often = 3, and almost always = 4), and each question shows a mental state. The validity and reliability of the Persian version of this questionnaire has been confirmed in the study of Malakouti et al [18].

- Spielberger State-Trait Anxiety Inventory (S-TAI): This scale was developed by Spielberger [19] and contains 40 items in two forms of state (current or present feeling) and trait (general feeling) anxiety. The answers to this questionnaire in both forms are four-choices. In the state form, the answers are on a four-point scale: not at all (1), somewhat (2), moderately so (3), very much so (4), and in the trait form on a four-point scale: almost never (score 1), Sometimes (score 2), often (score 3) and almost always (score 4) are set. The validity and reliability of the Persian version of this questionnaire has been confirmed in the study of Panahi Shahri et al [20].

The second group of 35 normal people were randomly selected and examined after matching age and sex.

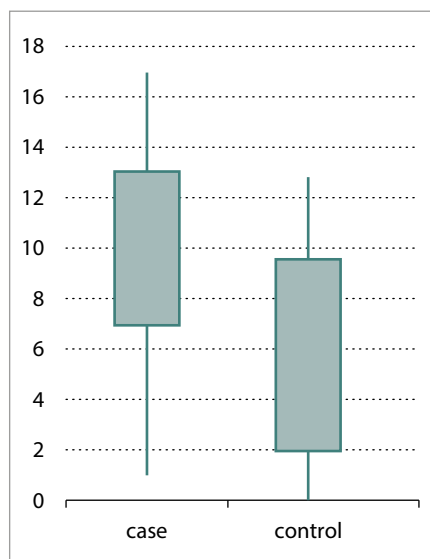
The results of the two groups were compared. Also, among the first group (patients), the results of surgery were compared with the rate of depression and anxiety. Data were analyzed using SPSS V.22 software. Chi-square and Mann-Whitney tests were used. P-values < 0.05 were considered significant.

Results

In the first group, 35 patients with CTS who were diagnosed with CTS during clinical examination based on NCV results and underwent surgery were randomly selected and evaluated for anxiety and depression with the two mentioned standard questionnaires.

The mean total age of patients was 40.19 ± 10.01 years, with a minimum age of 26 and a maximum age of 76 years.

Among 75 patients studied, 22 (31.4%) were male and 48 (68.6%) were female.



Graph 1. Box diagram, mean and dispersion of depression score in case and control groups.

None of the patients had a history of steroid use, history of thyroid disease, heart failure, renal failure leading to dialysis and rheumatic diseases, and did not report smoking or alcohol use.

The mean age of patients in the case and control groups was 41.60 ± 12.30 and 38.77 ± 6.90 years, respectively; no significant difference was seen between the two groups ($P = 0.77$). The average body mass index and duration of computer use did not differ between the two groups.

Based on the results of Tab. 1, it was concluded that the mean score of Spielberger state and trait anxiety in the case group was higher than in the control group and the difference between the two groups was significant ($P < 0.001$). Also, the mean score of depression in the case group was significantly higher than the control group and this difference was reported to be significant ($P = 0.003$) (Tab.1 and Graph 1).

A comparative study of the level of state anxiety between the two groups found that 83.3% of the subjects with severe state anxiety were in the case group while only 16.7% of them were in the control group ($P < 0.001$).

A comparative study of latent anxiety levels between the two groups found

Tab. 1. Comparison of the main variables of anxiety and depression among study groups.

Variable	Patient group mean (SD)	Control group mean (SD)	P-value*
state anxiety	45.57 (6.24)	37.77 (6.9)	< 0.001
trait anxiety	41.66 (4.69)	29.4 (7.94)	< 0.001
depression	10.54 (6.38)	6.11 (4.12)	0.003

*Mann-Whitney test, SD – standard deviation

Tab. 2. Comparison of state and trait anxiety levels between the two groups by age and gender of patients.

Age	State anxiety	Patients (%)	Controls (%)	P-value*
< 40	mild	1 (4.8)	4 (17.4)	0.007
	medium to low	4 (19)	13 (65.5)	
	medium to high	13 (61.9)	5 (21.7)	
	fairly intense	3 (14.3)	1 (4.3)	
> 40	mild	0	5 (41.7)	< 0.001
	medium to low	2 (14.3)	6 (75)	
	medium to high	10 (71.4)	1 (8.3)	
	fairly intense	2 (14.3)	0	
Age	Trait anxiety	Patients (%)	Controls (%)	P-value*
< 40	mild	0	18 (78.3)	< 0.001
	medium to low	13 (61.9)	1 (4.3)	
	medium to high	8 (38.1)	4 (17.4)	
> 40	mild	0	10 (83.3)	< 0.001
	medium to low	6 (41.9)	1 (8.3)	
	medium to high	8 (57.1)	1 (8.3)	
	fairly intense	0	0	
Gender	State anxiety	Patients (%)	Controls (%)	P-value*
male	mild	0	2 (16.7)	0.4
	medium to low	3 (30)	6 (50)	
	medium to high	6 (60)	3 (25)	
female	mild	1 (4)	7 (30.4)	< 0.001
	medium to low	3 (12)	13 (56.5)	
	medium to high	17 (68)	3 (13)	
	fairly intense	4 (16)	0	
Gender	Trait anxiety	Patients (%)	Controls (%)	P-value*
male	mild	0	10 (83.3)	< 0.001
	medium to low	8 (80)	1 (8.3)	
	medium to high	2 (20)	1 (8.3)	
female	mild	0	18 (78.3)	< 0.001
	medium to low	11 (44)	1 (4.3)	
	medium to high	14 (56)	4 (17.4)	

*Chi-Square test

Tab. 3. Comparison of depression score between patients in the two groups based on the age and gender of patients.

Age	Patients mean (SD)	Controls mean (SD)	P-value*
< 40	10.33 (7.15)	6 (3.89)	0.04
> 40	10.86 (5.26)	6.33 (4.69)	0.03
Gender	Patients mean (SD)	Controls mean (SD)	P-value*
male	8.8 (6.54)	6.25 (4.77)	0.53
female	11.24 (6.31)	6.04 (3.85)	0.003

*Mann-Whitney test, SD – standard deviation

that 76.2% of people with moderate to high anxiety were in the case group while only 23.8% of these patients were in the control group.

The mean score of depression in the case group was significantly higher than the control group ($P = 0.003$) (Tab. 1).

Compared by age, in patients both under and over 40 years, the level of state and trait anxiety is significantly different between the case and control groups and is higher in the case group than the control group (Tab. 2).

In women, the level of state anxiety is significantly different between the case and control groups and in the case group is more than the control group, but in men in the control group is less and there is no significant difference. However, the level of trait anxiety in both men and women is significantly different between the case and control groups and is higher in the case than the control group (Tab. 2).

In the study of depression score between the two groups by age of patients, it was found that in patients both under 40 and over 40 years, the depression score in the case group is higher than the control group and this difference is reported to be significant (Tab. 3).

In the study of depression score between the two groups by gender of patients, it was found that only in women the depression score in the case group is higher than the control group and this

difference was reported to be significant while in men the difference was not significant (Tab. 3).

Discussion

Since the symptoms of CTS leading to surgery are severe and affect patients' daily activities such as driving, holding the phone or holding objects [21], it is expected that patients experience some levels of anxiety. On the other hand, following the prolongation of symptoms, a person loses the ability to do simple things. Hence, it can also lead to some level of depression.

In a study, Shin et al found that depression, anxiety, and pain were more common in patients with CTS and were associated with more severe symptoms [22]. In a study by Khan et al, the level of anxiety and depression in patients with CTS was high and prompt treatment of a psychological complication was important in the symptomatic management of CTS [23]. Anxiety is one of the most common psychological responses of patients to physical illnesses and is considered as a predictable reaction to illness and surgical experience as a threat to the integrity of the body and the normal course of life [24]. On the other hand, depression is one of the psychological consequences in patients undergoing surgery that can affect the recovery process. Patients with depression are reluctant to pursue rehabilitation

programs and are often socially isolated, have little tolerance for medication, and do not follow the recommendations for exercise [25].

Jerosch-Herold et al stated that the severity of CTS symptoms reported by the patient was significantly associated with anxiety and depression [26]. A study by Mathis et al concluded that anxiety disorder may be a disorder associated with CTS, and treating these psychological problems with the physical aspects of CTS increases a patient's chances of achieving successful treatment outcomes [27].

In a prospective study by Hobby et al, there was a significant association between psychological disorders, severity of symptoms, and disability [28]. In the results obtained in the study of Atalay et al, the Beck depression criterion was significantly more prominent in patients with advanced CTS compared to patients with mild CTS [29]. Pogorzelski et al emphasize that emotional or psychological disorders appear to be associated with CTS symptoms and pain, and they increase the severity of CTS [16].

The study of McCallum et al is similar to the present study in terms of the main purpose, but in the context of the findings, there was no difference between the two groups in terms of the anxiety in their study. At the same time, as in our study, depression was higher in patients with CTS than in healthy individuals [30]. The reason for this difference can be cultural, social and economic differences in Iran compared to other countries.

Contrary to the results of the present study, we can mention the study of Kho et al. They concluded that depression, with or without anxiety, was not a factor in delaying return to work [31]. This can be due to differences in the characteristics of the study population.

One of the strengths of the present survey has been the study of anxiety as a subset of state and trait anxiety, which has led to significant results. State anxiety is a transient emotional state, and

trait anxiety is a relatively stable personality feature [32]. In this study, 83.3% of the subjects with severe state anxiety were in the case group. Also 76.2% of people with moderate to high trait anxiety were in this group. According to the results of this study, patients with CTS may be at higher risk for developing anxiety disorder.

One of the aims of the present study was to evaluate the level of anxiety and depression in the case and control groups based on the age groups under 40 and over 40 years. The results showed that state and trait anxiety and depression were higher in the case group than the control group and this was obtained regardless of the age of the patients. In general, psychological problems, especially anxiety and depression experienced by patients during the recovery process are visible at any age and are among the limitations affecting the expected postoperative outcomes such as improving the quality of life of patients. Considering that anxiety and depression cause adverse effects on expected outcomes after surgery, supporting patients and controlling their anxiety and depression levels is the responsibility of patients' families. This leads to long-term family involvement and it takes a lot of time and cost.

Many studies have shown that about 10% of adult women and 1% of adult men have CTS [33]. This indicates a higher prevalence of the disease in women than men. Similarly to other studies, the incidence of CTS in women was 2.5 times higher than that of men. In the study of Lam et al, the ratio of women to men was 2 : 1. Perhaps the specific type of activities that Iranian women do in their homes is one of the reasons for the increasing incidence of women with CTS [34]. However, McDiarmid's study showed that men and women with the same job responsibilities had the same incidence of CTS. This study denies the role of gender in the development of CTS and concludes that

the reason for the higher prevalence of CTS in women is the type of activities that women do more [35].

The results of this study showed that the level of state anxiety and depression was higher in the women of case group than in the control group. Of course, one of the causes could be the higher prevalence of the disease in women, but the important point is that the level of trait anxiety in men of the case group is also seen more. This finding suggests that other factors, such as differences in women's personality characteristics compared to men, can cause depression and state anxiety in women and trait anxiety in men.

Anxiety is an unpleasant, ambiguous, and often anxious feeling that is defined by a sense of doubt about an unknown factor. Studies have shown that women are more likely to develop these disorders than men [36]. Mendes et al stated in their study that depression and anxiety are the most important mental disorders in the world, which are more common among women [37]. In this case, some studies have examined the emotional adaptation of men to women after surgery. Some results indicate that men show better emotional adaptation than women after the onset of physical illness and subsequent surgery [38]. This may have contributed to their lower levels of state anxiety and depression than women in this study.

But high levels of trait anxiety in men with CTS can be a sign of psychological trauma to men. Diagnosis of illness and hospitalization and surgery have caused fear and insecurity in men because it disrupts the integrity of the family structure. Fear of death, doubts about prognosis and treatment, emotional conflicts, worries about economic conditions, change of roles and disruption of daily affairs can cause reactions of shock, anger, frustration and anxiety [39]. Since trait anxiety as defined above is a relatively stable personality characteristic, and given the individual charac-

teristics of men, it seems that high levels of trait anxiety in men with CTS can be expected.

Conclusion

The results of this study showed that anxiety and depression disorders in patients who underwent CTS surgery were more than normal people. Therefore, it is necessary to study the psychological status of these patients in the pre-discharge period and pay attention to its predictors in order to plan appropriate interventions.

Disclosure: The authors have no conflicts of interest to disclose.

All procedures performed in this study involving human participants were in accordance with the Helsinki declaration and its later amendments or comparable ethical standards.

This study has been registered in the research deputy of Babol University of Medical Sciences and has an ethics code from the research deputy of the Ministry of Health and Medical Education of Iran (Registration Code: IR.MUBABOL.HRI.REC.1398.166)

Role of authors: All authors have been actively involved in the planning, preparation, analysis and interpretation of the findings, enactment and processing of the article with the same contribution.

Financial support: This study was financially supported by vice-chancellor of research and technology of Babol University of Medical Sciences.

Acknowledgement: We would like to thank Dr. Arman Masoudi, Assistant Professor of Psychiatry, Babol University of Medical Sciences, who guided us in our study.

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Submitted: 24. 11. 2021

Accepted: 30. 1. 2022