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The Relationship Between Fear of Movement, Balance and Fear of Falling in Stroke Patients with Shoulder Pain

Omuz Ağrısı Olan İnme Hastalarında Hareket Korkusu, Denge ve Düşme Korkusu Arasındaki İlişki

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ABSTRACT Objective: Shoulder pain is a common problem after stroke and causes functional limitations in patients. Pain leads to keep away from the movement and physical activities. The aim of this study was to evaluate the fear of movement in stroke patients with shoulder pain and to investigate its relationship with balance and fear of falling. **Material and Methods:** Forty six stroke patients were included in the study and divided into two groups, with and without shoulder pain. Fear of movement was evaluated by the Tampa Scale for Kinesiophobia, functional balance was by the Berg Balance Scale and fear of falling was by the Tinetti's Falls Efficacy Scale. **Results:** The mean age of patients with and without pain were 65.60±11.37 years and 60.56±14.18 years respectively. In the shoulder painful group, it was determined that there was a negative correlation between balance and the fear of movement (r=-0.417; p=0.048) and that there was a positive correlation between the fear of falling and the fear of movement (r=0.429; p=0.041). In the shoulder painless group, there was no significant correlation (p>0.05). There was a statistically significant difference between the kinesiophobia values of two groups (p<0.05). **Conclusion:** When balance problems and falls observed in stroke patients are combined with pain and fear of movement, it becomes important to take into account and evaluate the fear of movement in rehabilitation practices.

Keywords: Hemiplegia; kinesiophobia; balance; falling, pain

ÖZET Amaç: Omuz ağrısı, inme sonrası yaygın görülen bir problemdir ve hastalarda fonksiyonel kısıtlılıklara neden olur. Ağrı, hareketten ve fiziksel aktivitelerden uzak durmaya yol açar. Bu çalışmanın amacı, omuz ağrısı olan inmeli hastalarda hareket korkusunu değerlendirmek, denge ve düşme korkusu ile ilişkisini araştırmaktır. **Gereç ve Yöntemler:** Çalışmaya 46 inme hastası dâhil edildi ve omuz ağrısı olanlar ve olmayanlar olarak 2 gruba ayrıldı. Hareket korkusu Tampa Kinezyofobi Ölçeği ile fonksiyonel denge Berg Denge Ölçeği ile ve düşme korkusu Tinetti Düşme Etkinlik Ölçeği ile değerlendirildi. **Bulgular:** Ağrısı olan ve olmayan hastaların yaş ortalaması sırasıyla 65,60±11,37 yıl ve 60,56±14,18 yıl idi. Omuz ağrılı grupta denge ve hareket korkusu arasında negatif (r=-0,417; p=0,048), düşme korkusu ile hareket korkusu arasında pozitif (r=0,429; p=0,041) korelasyon olduğu belirlendi. Omuz ağrısı olmayan grupta anlamlı korelasyon yoktu (p>0,05). İki grubun hareket korkusu değerleri arasında istatistiksel olarak anlamlı fark vardı (p<0,05). **Sonuç:** İnme hastalarında görülen denge problemleri ve düşmeler, ağrı ve hareket korkusu ile birleştiğinde, rehabilitasyon uygulamalarında hareket korkusunun dikkate alınması ve değerlendirilmesi önem kazanmaktadır.

Anahtar Kelimeler: Hemipleji; kinezyofobi; denge; düşme, ağrı

Shoulder pain is one of the most common problems after stroke and causes functional limitations in patients, such as somatosensorial problems, decrease in motor function and range of motion.[1,2] Although its cause is not clear, it is reported that it may be due to many factors such as glenohumeral subluxation, rotator cuff tears and impingement, bicipital tendinitis, range of motion of shoulder, reduced motor function, and complex regional pain syndrome (CRPS). Upper limb weakness and sensory problems, spasticity and right hemispheric lesions have been also defined as pain-related risk factors.[3,4] Studies suggest

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that patients with shoulder pain also have proprioceptive deficits in the shoulder, coordination problems in the trunk and lower extremities.[5,6] It has been stated that these proprioceptive deficits will lead to abnormal proprioception affecting central control in the entire muscle chain.[5] It has also been shown that painful shoulder pathologies affect body stability. [7]

The sense of fear against pain may develop in a patient who has experienced persistent, recurrent and uncontrollable pain. The fear of pain causes patient to keep away from movement and physical activities, so the patient may avoid activities such as work, leisure time, and family activities to minimize the discomfort he/she has.[8] The fear of excessive, irrational, and debilitating physical movement and activity caused by feeling vulnerable to painful injury is also defined as kinesiophobia (fear of movement). Individuals with fear-avoidance define pain as a sign of harmful bodily processes and any physical activity that causes pain.[9,10]

Pain and balance disorders observed in stroke patients can trigger the fear of falling, and the fear of falling can trigger the fear of movement. The vicious circle formed in this way can cause immobility in stroke patients. However, according to our knowledge, there is not many studies about the fear of movement in stroke patients. Accordingly, the aim of this study was to evaluate the fear of movement in stroke patients with shoulder pain and to investigate its relationship with balance and the fear of falling. Our hypothesis is that shoulder pain, which is common in stroke patients, affects balance and fear of falling.

MATERIAL AND METHODS

The patients who were admitted to Kırıkkale University Faculty of Medicine Department of Physical Therapy between August 2018 and March 2019 with a diagnosis of stroke and volunteered to participate in the study were included in this study. The study was approved by Kırıkkale University, Non-interventional Research Ethics Committee (date: 27.06.2018, no: 2018.06.24). The research was conducted in accordance with the Helsinki Declaration principles.

With respect to the inclusion criteria for the study, the patients who volunteered to participate in the study, were between 45-75 years of age, had no problem in communication, had ≥24 points from Mini Mental State Examination (MMSE), could independently walk 6 meters (with assistive devices if any) and had a shoulder pain score of ≥4 according to the Visual Analogue Scale were determined.[11,12] The patients who were unstable in terms of vital signs, had coronary heart disease and other neurological conditions, open wound on the bottom of the feet, pathological conditions affecting the lower limb sensation (such as diabetic peripheral neuropathy...) were not included in the study. Seventy five patients with a diagnosis of stroke (29 were without pain and 46 were with pain) were evaluated in the study. From the shoulder painful group; 7 patients were excluded from the study because of refusing to participate, 16 patients were excluded because they did not meet the inclusion criteria (4 patients were under 45 years of age, 3 patients having cooperation problems, and 9 patients could not walk 6 meters independently). Eventually, the study was completed with 23 patients with shoulder pain. From the shoulder painless group, 6 patients were excluded because they did not meet the inclusion criteria (2 patients were under 45 years of age and 4 patients could not walk 6 meters independently) and the study was completed with 23 patients without shoulder pain (Figure 1).

All patients included in the study were provided with detailed information about the aim and methodology of the study, and their approval was received for participation in the study. Age, gender, height, weight, dominant and effected side, type of stroke, and pain severity (as <4 and ≥4) of patients were first recorded. While cognitive functions of the patients participating in the study were evaluated by the MMSE, fear of movement was evaluated by the Tampa Scale for Kinesiophobia (TSK), functional balance was evaluated by the Berg Balance Scale (BBS), and fear of falling was evaluated by the Tinetti's Falls Efficacy Scale (FES).

Mini-Mental State Examination: It was first published by Folstein et al. in 1975. It consists of 11 items collected under 5 main headings including orientation, memory, attention and calculation, recall and language, and the total score is evaluated over 30 points.[13]

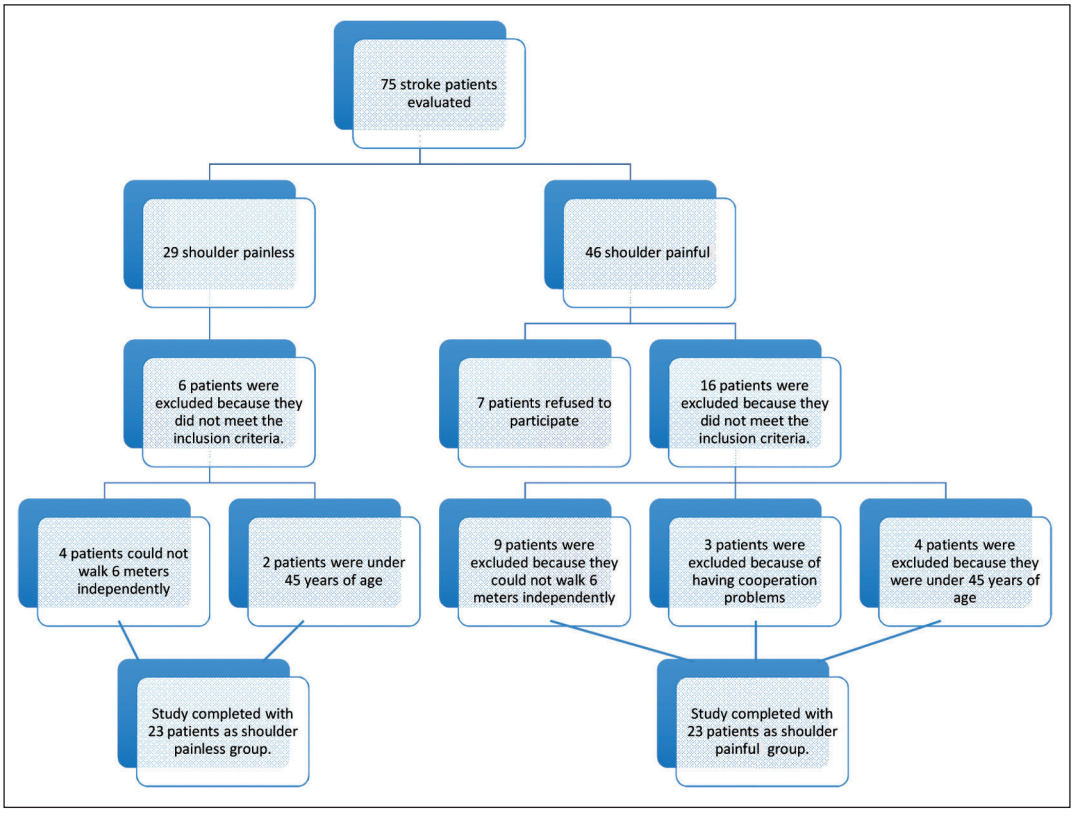

FIGURE 1: Flowchart of recruitment for the participants.

Tampa Scale for Kinesiophobia*:* The presence of kinesiophobia in stroke patients was investigated using the TSK. The TSK is a 17-item checklist. 4-point Likert scoring (1= Strongly disagree, 4= Totally agree) is used in the scale. A total score is calculated after reversing items 4, 8, 12 and 16. Individuals get a total score between 17-68. High score of the scale indicates high kinesiophobia. It is recommended to use the total score in the studies. The Turkish validity and reliability studies of the TSK were performed.[14]

Berg Balance Scale: It is a 14-item scale evaluating the patient's ability to maintain balance while performing various functional movements. The Turkish validity and reliability study in stroke patients was performed by Şahin et al. in 2013.[15] The functions of standing up while sitting, standing without support, sitting without support, sitting while standing, transfers, standing with eyes closed, standing with legs united, stretching forward while standing, picking up an object on the floor, looking back by turning, turning by 360 degrees, standing on a stool on a healthy side, standing on one foot ahead and standing on one foot are evaluated. Each item is scored between 0-4, and 0 means the inability to fulfill the task while 4 means that the task has been fulfilled successfully. The total score of the test takes values between 0-56.

Tinetti's Falls Efficacy Scale: It is a 10-item scale and evaluates perceived self-efficacy in preventing falls during basic daily living activities. These items are going into and getting out of the bed, sitting on the chair and standing up, bathing or having a shower, dressing and undressing, reaching the shelves, walking inside the house, answering the door or phone, preparing meals without lifting heavy objects and doing simple shopping. Individuals give a score between 0 (very safe) and 10 (not safe) for each question, and a total score of 0 to 100 is obtained when all points are added.[16]

STATISTICAL ANALYSIS

Statistical analyses were performed using SPSS version 15 software. The compliance of the variables with the normal distribution was checked with the vi-

sual (histogram and probability graphics) and Shapiro-Wilk tests. Socio-demographic characteristics of patients were analyzed by descriptive statistics. The variables obtained from the measurements were presented as percentage (%), arithmetic mean±standard deviation (X±SD). When comparing groups, Independent-Samples T test was used. The correlations were analyzed by Pearson's correlation analysis. $p<0.05$ was considered statistically significant. For post-hoc power analysis G*Power program (version 3.0.10 Universität Düsseldorf, Düsseldorf, Germany) was used. In the post-hoc power analysis, when the statistical significance of alpha was 5% and the confidence interval was taken as 95%, the power (1-β) of the study was found to be 75%. The primary outcome was determined as TSK. Effect size was found 0.69.

RESULTS

A total of 46 stroke patients were included in the study, 23 (8 female, 15 male) in the shoulder painful group and 23 (10 female, 13 male) in the shoulder painless group. The mean age of the patients in the shoulder painful group was 65.60±11.37 years and that of the shoulder painless group was 60.56±14.18 years. Demographic information of stroke patients such as age, height, weight, dominant side, affected side and type of stroke is presented in Table 1.

In the shoulder painful group, it was determined that there was a negative correlation between balance and the fear of movement ($r=-0.417$; $p=0.048$) and that there was a positive correlation between the fear of falling and the fear of movement ($r=0.429$; $p=0.041$). In the shoulder painless group, there was no significant correlation between fear of movement, fear of falling and balance ($p>0.05$). There was a statistically significant difference between kinesiophobia values of the two groups and the fear of movement was higher in the shoulder painful group ($p<0.05$). The mean results of tests are presented in Table 2 and the values of correlation analysis are presented in Table 3.

DISCUSSION

The results of our study showed that there was more fear of movement in the shoulder painful group and the fear of movement in stroke patients with shoulder pain was negatively correlated with balance and positively correlated with fear of falling. Shoulder pain is

TABLE 1: Demoghraphic characteristics of participants.

	Shoulder painful group (n:23)	Shoulder painless group (n: 23)	p value
	X±SD	X±SD	
Age (year)	65.60±11.37	60.56±14.18	0.190
Height (cm)	161.60±20.37	165.82±9.78	0.376
Weight (kg)	79.78±21.65	77±14.53	0.611
	n (%)	n (%)	
Gender			
Female	8 (34.8)	10 (43.5)	
Male	15 (65.2)	13 (56.5)	
Dominant Side			
Right	22 (95.7)	19 (82.6)	
Left	1 (4.3)	4(17.4)	
Type of Stroke			
Ischemic	20 (87)	20 (87)	
Haemorrhagic	3 (13)	3 (13)	
Affected Side			
Right	9 (39.1)	11 (47.8)	
Left	14 (60.9)	12 (52.2)	

SD: Standard deviation; *p<0.05.

TABLE 2: The results of fear of movement, balance and fear of falling evaluations.

	Shoulder painful group (n:23)	Shoulder painless group (n:23)	p value
Scales	X±SD	X±SD	
TSK	44.26±8.97	39.08±5.51	0.023*
BBS	32.60±14.27	34.60±15.19	0.648
FES	55.30±21.69	51.78±24.15	0.606

SD: Standard deviation; TSK: Tampa Scale for Kinesiophobia; BBS: Berg Balance Scale; FES: Tinetti's Falls Efficacy Scale; *p<0.05.

TABLE 3: Correlation coefficients between fear of movement, balance and fear of falling.

		BBS	FES
Shoulder Painful Group (n:23)	TSK	r= -0.417*	r=0.429*
		p= 0.048*	p= 0.041*
Shoulder Painless Group (n:23)	TSK	r= -0.231	r= 0.362
		p= 0.290	p= 0.090

TSK: Tampa Scale for Kinesiophobia; BBS: Berg Balance Scale; FES: Tinetti's Falls Efficacy Scale; *p<0.05

a common symptom that emerges after stroke and may appear in every period. Although the mechanisms that cause shoulder pain have not been fully understood, it can involve many factors. Patients restrict their upper limb functions as a result of pain, and their functional independence is also reduced when compared to patients without pain.[17] Furthermore, pain also plays a role in decreased ability to maintain balance.[18] The prevention and treatment of shoulder pain in hemiplegic adults are essential for the patient's independence because pain prevents patients from performing upper limb movements, which slows down functional recovery.[19] Furthermore, shoulder pain has also been demonstrated to decrease the quality of life.[20]

Falling is a problem that is most frequently seen after stroke and affect the daily life of the patient.[21] The sensory, motor, and cognitive problems and balance problems that occur after stroke lead to mobility deficits in the patient.[22,23]As a result of this, the fear of falling observed in patients is inevitable.[24] This fear leads to avoidance of the activities that they can actually do, and the loss of confidence in balance and mobility.[23,25,26] The concept of self-efficacy is also important in the evaluation of the fear of falling. Self-efficacy refers to an individual's perception of abilities within a particular area of activity. The individuals with low self-efficacy in an activity, avoid performing the activity.[16] Belgen et al. showed that the history of falling was associated with falls self-efficacy and balance in stroke patients.[27] Kim et al. investigated the factors associated with falls in stroke patients and showed the relationship between falls self-efficacy and balance.[28] In our study, we observed that the fear of falling and self-efficacy increased as balance decreased. In other words, patients with poor balance actually consider the activity as unsafe and have a fear of falling and this can lead to fear of movement. The results of our study support this idea, showing that as the fear of movement increases, the fear of falling increases and the balance gets worse. In the studies, it has been argued that the patients with fear of pain change their movements to preventing pain.[29] Furthermore kinesiophobia is an important component of chronic pain and is significantly associated with the severity of pain and poorly perceived health status.[30] In a study, the fear of movement was evaluated in a patient with CRPS after stroke, and cognitive behavioral therapy was applied.[31] It was observed that kinesiophobia decreased in the patient with decreased severity of pain after treatment, and it was argued that this change occurred by causing gradual changes in cognition and disease behavior through modifying inadequate and dysfunctional thoughts and changing the mood. Karos et al. examined the effect of pain on motor behavior by administering painful stimuli dur-

ing movement in healthy individuals and showed that the fear of pain changed movements and turned them into avoidance behavior.[32] Our study with stroke patients supports the literature and has shown that shoulder pain may lead to the fear of movement and that the fear of movement is associated with balance and the fear of falling. Jo et al., evaluated stroke patients with the FES, TSK-13, and Activity-Specific Balance Confidence Scale (ABC) and examined their correlation, too.[33] The results showed that TSK had a weak correlation with FES and a moderate correlation with ABC. When they analyzed stroke patients with pain in any part of their body, they showed that TSK was not related to FES but significantly related to ABC. They also stated that the kinesiophobia values were high in the group with pain but this result was not significant, pain could contribute to kinesiophobia. In our study, we evaluated patients with pain only upper extremity, around the shoulder. We found that the TSK correlated with FES and BBS. There was also a significant difference between the two groups in terms of kinesiophobia. Therefore, we think that kinesiophobia should be taken into consideration in stroke patients with pain.

As a limitation of our study, we included only those reporting pain of 4 and above. In future studies, we recommend evaluating those with different pain severity and investigating the relationship between pain and balance and falling. We included all patients in our study regardless of the time elapsed after the stroke. These results can be analyzed by evaluating patients in the acute and chronic periods separately. Even the patients with right and left hemisphere affected can be evaluated separately and different results can be obtained. In addition, the power of our study was calculated as 75% so power can be increased with more patients in future studies.

CONCLUSION

When balance problems and falls observed in stroke patients are combined with pain, patients can consider the activities as unsafe. When it is considered that all of these may also lead to the fear of movement, it becomes important to evaluate and take the fear of movement into account in rehabilitation practice.

Source of Finance

During this study, no financial or spiritual support was received neither from any pharmaceutical company that has a direct connection with the research subject, nor from a company that provides or produces medical instruments and materials which may negatively affect the evaluation process of this study.

Conflict of Interest

No conflicts of interest between the authors and / or family members of the scientific and medical committee members or members of the potential conflicts of interest, counseling, expertise, working conditions, share holding and similar situations in any firm.

Authorship Contributions

Idea/Concept: *Meral Sertel, Eylem Tütün Yümin;* ***Design:*** *Cevher Savcun Demirci, Saniye Aydoğan Arslan;* ***Control/Supervision:*** *Meral Sertel, Eylem Tütün Yümin, Birol Önal;* ***Data Collection and/or Processing:*** *Müyesser Aras, Birol Önal;* ***Analysis and/or Interpretation:*** *Saniye Aydoğan Arslan, Cevher Savcun Demirci;* ***Literature Review:*** *Birol Önal, Cevher Savcun Demirci, Eylem Tütün Yümin;* ***Writing the Article:*** *Cevher Savcun Demirci, Meral Sertel;* ***Critical Review:*** *Cevher Savcun Demirci, Meral Sertel, Saniye Aydoğan Arslan;* ***References and Fundings:*** *Müyesser Aras;* ***Materials:*** *Müyesser Aras.*

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