Research Article

THE EFFECT OF HEMIPLEGIC SHOULDER PAIN ON BALANCE, UPPER EXTREMITY FUNCTIONALITY, DESCRIPTIVE DATA OF PARTICIPANTS AND QUALITY OF LIFE

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Abstract

Aim: The aim of our study is to examine the relationship between hemiplegic shoulder pain and balance, functionality, and quality of life.

Method: This is a cross-sectional study. Forty-eight patients (n = 22 females, n = 26 males) with post-stroke hemiplegic shoulder pain were included in the study. The Mcgill-Melzack Pain Questionnaire to evaluate the shoulder pain of the patient, the Berg Balance Scale (BBS) for balance assessment, Upper Extremity Fugl Meyer Assesment (UA-FMA) for upper extremity function assessment, and the Short Form-36 (SF-36) to assess the quality of life scale was used. The questionnaires were applied to each patient once.

Findings: After evaluation, there was no significant relationship between Mcgill-Melzack Pain Questionnaire and BDI (p=0.290). There was a negative and significant relationship between Mcgill-Melzack Pain Questionnaire and UA-FMA (p=0.009). There was also no significant relationship between SF-36 subscores and pain (p>0.05).

Results: There is a negative relationship between hemiplegic shoulder pain and upper extremity functionality. As pain increases, functionality decreases.

Keywords: Hemiplegic shoulder pain, balance, upper extremity functionality, quality of life

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Hemiplejik Omuz Ağrısının Denge, Üst Ekstremite Fonksiyonelliği, Katılımcıların Tanımlayıcı Verileri ve Yaşam Kalitesi Üzerindeki Etkisi

Öz

Amaç: Bizim çalışmamızın amacı hemiplejik omuz ağrısı ile denge, fonksiyonellik ve yaşam kalitesi arasındaki ilişkiyi incelemektir.

Yöntem: Bu çalışma kesitsel bir çalışmadır. Çalışmaya inme sonrası hemiplejik omuz ağrısı bulunan 48 hasta (n=22 kadın n=26 erkek) dahil edildi. Hastaların omuz ağrısını değerlendirmek için Mcgill- Melzack Ağrı Anketi, denge değerlendirmesi için Berg Denge Ölçeği (BDÖ), üst ekstremite fonksiyonu değerlendirmesi için Upper Extremity Fugl Meyer Assesment (UA-FMA) ve yaşam kalitesini değerlendirmek için Short Form- 36 (SF-36) ölçeği kullanıldı. Anketler her hastaya bir kez uygulandı.

Bulgular: Değerlendirme sonrasında Mcgill-Melzack Ağrı Anketi ve BDÖ arasında anlamlı bir ilişki çıkmamıştır (p=0.290). Mcgill-Melzack Ağrı Anketi ve UA-FMA arasında negatif ve anlamlı bir ilişki çıkmıştır (p=0.009). Ayrıca SF-36 alt skorları ve ağrı arasında anlamlı bir ilişki çıkmamıştır (p>0.05).

Sonuç: Hemiplejik Omuz Ağrısı ve üst ekstremite fonksiyonelliği arasında negatif bir ilişki mevcuttur, ağrı arttıkça fonksiyonellik azalmaktadır.

Anahtar Kelimeler: Hemiplejik omuz ağrısı, denge, üst ekstremite fonksiyonelliği, yaşam kalitesi

1. INTRODUCTION

Stroke, one of the most important etiologies of hemiplegia, is one of the most common neurological diseases (Bartels, 2004). Complications that occur after stroke other than neurological problems also cause functional disability (Mesci ve Mesci, 2014). The shoulder pain is one of the most common complications of hemiplegia (Chae et al., 2007). The incidence of Hemiplegic Shoulder Pain (HSP) ranges from 5% to 84% in the population (Ancliffe, 1991; Bartels, 2004). Many researchers state that the quality of life is worse in individuals with HSP (Chae et al., 2007), in these cases there is insufficient motor development (Gamble et al., 2002; Roy et al., 1994) and they show lower functionality after treatment (Barlak vd, 2009; Demirci vd., 2007). In a study conducted, researchers emphasized that individuals with hemiplegic shoulder pain after stroke had more motor function losses (Roy et al., 1994). On the contrary, there are studies in the literature claiming that there is no relationship between hemiplegic shoulder pain and motor function loss (Joynt, 1992; Zorowitz, 2001). Impaired upper extremity functions after stroke leads to failure of trunk control and consequently loss of balance (Teasell et al., 2009; Turner-Stokes & Jackson, 2002). There are many studies in the literature examining the relationship between upper extremity functions and balance in hemiplegia (Acar ve Karatas, 2010; Lee et al., 2004) . However, among these studies, no study examining the relationship between hemiplegic shoulder pain and balance was found.

Hemiplegic shoulder pain and changes in shoulder muscle tone negatively affect upper extremity function, participation in activities of daily living, and quality of life (Iosa et al., 2012; Nakayama et al., 1994). However, there are not enough studies in the literature that examine these parameters in patients with HSP. Therefore, in this study, we aimed to evaluate upper extremity functions, balance and quality of life in patients with HSP.

2. METHOD

2.1. Purpose of the Study

The aim of our study is to examine the relationship between hemiplegic shoulder pain and balance, functionality, and quality of life.

2.2. Study Group

Forty-eight cases who were diagnosed with hemiplegic shoulder pain and met the inclusion criteria in the outpatient clinic of Istanbul Physical Medicine and Rehabilitation Training and Research Hospital between March 2020 and August 2020 were prospectively included in the study. The study was approved by the local ethics committee (Protocol no: 20.07.2019/136) and registered in the ClinicalTrial.gov website (registration number: NCT04292613). The study was conducted in accordance with the Helsinki Declaration. A written informed consent was obtained from each patient.

Inclusion criteria for the study; It was between the ages of 40-75years, with right or left hemiplegia, no mental problem, being cooperative, and upper extremity stage 1-5 according to Brunnstrom staging. The patients who did not meet the research criteria, did not want to be evaluated, had another orthopedic shoulder problem and had a recent surgery were excluded from the study.

2.3. Data Collection Tools

Berg Balance Scale (BBS): BBS was used to evaluate balance. The scale is a commonly used scale in hemiplegic patients. In the scale, there are items that test the maintaining balance of individuals in 14 different positions. Scoring between 0 and 4 is made for each test. 0 points indicate that the movement is not possible, 4 points indicates normal movement. 0-20 points indicate that the person is in a wheelchair, 21-40 points indicate that the person has a risk of falling, and 41-56 points indicate that the person can walk in balance with little support (Miyata et al., 2022). The Turkish validity and reliability of the scale in patients with stroke has been established (Şahin vd., 2013).

McGill Melzack Pain questionnaire: Pain intensity was assessed with the McGill Melzack Pain questionnaire. The questionnaire was developed by Melzack in 1971 (Melzack, 1975). Turkish validity and reliability were made by Kuğuoğlu et al. (Kuğuluoğlu ve Aslan, 2003). The scale consists of 4 parts that evaluate the location, severity, characteristic of pain and the relationship of pain with time. The minimum score on the scale is 0 and the maximum score is 112. Increasing the scale score means that the pain intensity increases.

Upper Extremite Fugl-Meyer Assessment (UE-FMA): Functional assessment defines a person's abilities and limitations. The UA-FMA scale was used to evaluate functionality in the study. The scale evaluates power, coordination, hypertonia and synergy patterns. Scoring is made under the headings of arm (0-36

points), wrist (0-10 points), hand (0-14 points), speed and coordination (0-6 points). The minimum score is 0 and the maximum score is 66. Increasing scale score means increasing functions (Fugl-Meyer et al., 1975).

Short Form 36 (SF36) Quality of Life Survey: The decrease in the daily life activities of hemiplegic patients negatively affects the patients' quality of life. SF36 scale was used to determine the quality of life in the study. The scale consists of 36 questions and 8 subsections. The questions in 2 parts are yes / no and the others are Likert type answers. Scale gives separate points for 8 different sub-scales instead of giving a single score. While 0 indicates poor health, 100 indicates good health (Carr et al., 1996). The scale has Turkish validity and reliability (Ünalan vd., 2001).

2.4. Data Collection

Information such as age, gender, occupation, education, marital status, hemiplegic shoulder side, time of onset of hemiplegic shoulder pain and whether they had received physical therapy before were questioned. In addition to this demographic information, the McGill Melzack Pain questionnaire to question the pain of the patients, the Upper Extremite Fugl-Meyer Assessment (UE-FMA) scale to evaluate the upper extremity functions, the Berg Balance Scale (BBS) to evaluate their balance and the Short Form 36 (SF-36) to evaluate the quality of life scale was used. The effect of hemiplegic shoulder pain on upper extremity functions and quality of life was examined.

2.5. Analysis of Data

The sample size of the study was evaluated using "Power and Simple Size". Calculations were found at 95% confidence interval, taking the UA-FMA as the minimum clinical significance value of 5.25 (Page et al., 2012) and the standard deviation as 12.6, 95% power (level 5%) and 0.05 significance. level (α level 0.05) to detect the difference. According to the measurements made, 48 patients were included in the study.

Statistical analysis of the data of the patients was performed using Statistical Package for Social Sciences (SPSS) Version 21.0 (SPSS inc., Chicago, IL, USA). The variables of the statistical analysis were defined with mean, standard deviation (SD), confidence interval (CI) and percentage values. "Shapiro Wilk Test" was used to determine the normality of data distributions. Parametric tests were used for normally distributed data and nonparametric tests were used for tests that were not normally distributed. Descriptive statistics were used to determine the demographic characteristics of the participants. Pearson Correlation Coefficient was used to evaluate the relationship between pain and other parameters.

3. RESULTS

Descriptive data of the participants are shown in Table 1.

Table 1: Descriptive Data of Patients

Descriptive data	n	%	Mean+SD
Demographic features			
Male/female;	26/22	54,2/45,8	
Age (year)	48		28,33+4,57
BMI (kg/m^2)	48		64,44+ 10,268
Hemiplegic side			
Right	22	45,8	
Left	26	54,2	
Dominant side			
Right	36	75	
Left	12	25	
PTR treatment			
Yes	22	45,8	
No	26	54,2	
Duration of illness			
0-3 month	23	47,9	
4-7 month	13	27,1	
8-11 month	0	0	
12 and oner month	12	25	

SD: Standart Deviation PTR: Physical Therapy and Rehabilitation BMI: Body Mass Index

A total of 48 people, 22 women (45.8%) and 26 men (54.2%), were included in the study. The average age of the participants was 64.44 ± 10.26 years. The Body Mass Index (BMI) average of the participants was 28.33 ± 4.57kg / m2. Twenty-two (45.8%) of the participants had right hemiplegia, 26 (54.2%) had left hemiplegia. Of the 36 participants, 75% was the right shoulder as the dominant side, and 25% was the left shoulder as the dominant side. Twenty-two of the participants (45.8%) had previously received physiotherapy and rehabilitation and 26 (54.2%) did not receive physiotherapy and rehabilitation as treatment before. Of the participants, 23 cases (47.9%) complained of shoulder pain between 0-3 months, 13 cases (27%) between 4-7 months, and 12 cases (25%) for 12 months or more.

No significant relationship was observed between the descriptive parameters of the participants and the level of shoulder pain (Table 2).

Tablo 2. Relationship Between Descriptive Data of Patients and Shoulder Pain

Hemiplegic Shoulder Pain	n	Mean+SD	p
Sex			
Male	26	62,38±11,30	0.824
Female	22	61,40±18,61	
Hemiplegic side			
Right	22	61,13±12,47	0.736
Left	26	62,38±16,95	
Dominant side			
Right	36	62,77±16,24	0.505
Left	12	59,41±10,18	
PTR treatment			
Yes	22	58,63±15,96	0.161
No	26	64,73±13,68	
Duration of illness			
0-3 month	23	62,39±13,20	0.942
4-7 month	13	61,75±15,26	
12 and oner month	12	60,58±19,04	

(SD: Standart Deviation PTR: Physical Therapy and Rehabilitation, p= significance coefficientp<0.05)*

Participants' mean shoulder pain scores in the McGill-Melzack Pain Questionnaire were 61.93 ± 14.93. The pain severity level of the patients was moderate. The average BBS score of the participants is 17.81 ± 17.84. The balance of the patients was found to be inadequate. The mean score of the patients FUGL MEYER upper extremity function score was 24.35 ± 21.18. SF-36 subcategory score averages of the patients, respectively; The physical component score was 25.14 ± 9.59 and the mental component score was 34.85 ± 15.49. Average scores for the sub-parameters of the SF-36 scale are shown in Table 3.

Tablo 3: Pain, Balance, Functionality and Quality of Life Average Score

Scale	Mean+SD	Min	Max
McGill-Melzack	61,93±14,93	21	86
BBS	17,81±17,84	20	54
UA-FMA	24,35±21,18	1	61
SF36 Physical Function	19,06±20,87	0	65
SF36 Physical Role	3,64±8,91	0	25
SF36 Emotional Role	12,49±31,22	0	100
SF36 Energy / Vitality	35,93±20,43	0	75
SF36 Mental health	54,16±18,65	12	100
SF36 Social Function	36,82±26,76	0	87,5
SF36 Pain	31,51±14,95	0	80
SF36 General Health	46,35±15,86	10	85
SF36 PCS	25,14±9,59	7,5	47,5
SF36 MCS	34,85±15,49	7,25	85,13

(BBS: Berg Balance Scale, UA-FMA: Upper Extremity Fugl-Meyer Assesment, PCS: Physical Component Score, MCS: Mental Component Score, SD: Standart Deviation SD: Standart Deviation)

When the relationship between hemiplegic shoulder pain, balance, functionality and quality of life of the cases was examined, only a negative and significant relationship was found between shoulder pain and functionality (p = 0.009). There was no significant relationship between shoulder pain and balance (p = 0.290). There was no significant relationship between shoulder pain and SF-36 FCS and SF-36 MCS (p = 0.515, p = 0.712). The relationship between hemiplegic shoulder pain and SF-36 sub-parameters is shown in Table 4.

Table 4: The Relationship Between Hemiplegic Shoulder Pain, Balance, Functionality and Quality Life

Shoulder Pain / **Clinic Evulation**	**Correlation**	
	r	**p**
Berg Balance Score	-0,156	0,290
UA-FMA	-0,374	0,009*
SF-36 FCS	-0,096	0,515
Sf-36 MCS	-0,055	0,712
SF-36 Physical Function	0,039	0,790
Sf-36 Physical Role	-,038	0,797
SF-36 Emotional Role	-0091	0,538
SF-36 Energy / Vitality	-0,105	0,477
SF-36 Mental health	0,129	0,382
SF-36 Social Function	0,223	0,127
SF-36 Pain	0,090	0,543
SF-36 General Health	0,118	0,425

(UA-FMA: Upper Extremity Fugl-Meyer Assesment, PCS: Physical Component Score, MCS: Mental Component Score, r= correlation coefficient, p= significance coefficientp<0.05)*

When the relationship between parameters other than pain was examined, a positive and significant relationship was found between balance and functionality (p = 0.007). A positive and significant relationship was also observed between balance and SF-36 sub-parameters (PCS, physical function, physical role difficulty, energy, emotional health) (p = 0.000, p = 0.000, p = 0.002, p = 0.015, p = 0.014 respectively) (Table 5).

Table 5: The Relationship Between Balance and Other Parameters

Scale	Correlation	
	r	p
BBS / UA-FMA	0,383	0,007
BBS / SF-36 PCS	0,720	0,000
BBS / SF-36 Physical Function	0,814	0,000
BBS / SF-36 Physical Role	0,442	0,002
BBS / SF-36 Energy / Vitality	0,350	0,015
BBS / SF-36 Mental health	0,352	0,014

(*BBS: Berg Balance Scale, UA-FMA: PCS: Upper Extremity Fugl-Meyer Assesment Physical Component Score, r= correlation coefficient, p= significance coefficientp*<0.05)*

4. CONCLUSION AND DISCUSSION

As a result of our study, there was no significant relationship between hemiplegic shoulder pain and balance and quality of life. Also a negative and significant relationship was found between hemiplegic shoulder pain and upper extremity functionality. We conclude that as pain increases, functionality decreases in patients with hemiplegic shoulder pain.

Hemiplegic shoulder pain is one of the 4 most common symptoms encountered by individuals after stroke (Kumar, 2019). Some prospective studies have shown that approximately one third of individuals with a stroke experience shoulder pain within the first 6 months, and 65% continue to experience this pain even after a few months (Adey-Wakeling et al., 2016; Lindgren et al., 2007; Paolucci et al., 2016). In a prospective study in which 152 patients were examined, it was found that 40% of the patients complained of shoulder pain in the first 6 months (Gamble et al., 2002). The duration of complaints of shoulder pain in the patients in our study was 0-3 months in 23 patients, 4-7 months in 13, and 12 months and above in 12 patients. Similar to the literature, 75% of the individuals experiencing HSP in our study complained of shoulder pain within the first 6 months.

In studies reviewed in the literature, the prevalence of stroke varies by gender, and the prevalence of men is higher (Huang et al., 2017; Kizil vd., 2009). In a study examining the relationship between daily use of the upper and lower extremities and functional recovery in stroke patients, 41 (68%) of 60 patients

were male and 19 (32%) were female (Rand & Eng, 2012). In our study, there were 26 men (54.2%) and 22 women (45.8%), and our results are similar to the literature.

Another risk factor for hemiplegia is age. With increasing age, the possibility of individuals to experience hemiplegia increases and while it is 5% for individuals aged 55-59years, the incidence increases to 25% between the ages of 80-84 years (Çakçı ve MD, 2004). In a study conducted with 55 patients in the literature, it was stated that the mean age was 66.00 ± 15.00 years (Higgins et al., 2005). In another study on hemiplegic shoulder pain, the mean age of 38 hemiplegic patients was 60.00 ± 13.94 years (Kizil vd., 2009). In another study investigating the effect of electrical stimulation on hemiplegic shoulder pain, the mean age was 61.00 ± 10.00 years (Chuang et al., 2017). In our study, the mean age of the patients was 64.44 ± 10.26years and generally similar to the literature.

In studies examining the relationship between HSP and the affected body side in the literature, results vary (Huang et al., 2017; Joynt, 1992; Kizil vd., 2009). A study reported that HSP was more common in patients with left hemiplegia (Joynt, 1992). In a study investigating HSP and its causes, 20 (53%) of 38 patients were reported to have right hemiplegia and 47% of 18 patients had left hemiplegia (Kizil et al., 2009). In a study examining the effect of kinezyotape on HSP, 12 of 21 patients were left and 9 were right hemiplegia (Huang et al., 2017). In our study, 22 of the patients were 45.8% right hemiplegia, 26 54.2% left hemiplegia.

Pain is an important disability that affects people's functions and daily life activities. There are conflicting results in the literature regarding the relationship between hemiplegic shoulder pain and functionality (Kong et al., 2004; Paci et al., 2007; Wanklyn et al., 1996). Many researchers have stated that HSP causes a decrease in the functionality (Barlak vd., 2009; Lindgren et al., 2007; Paci et al., 2007; Roy et al., 1994). Lindgren et al. reported that Bartel score values, which evaluate arm motor functions and functionality of patients with HSP, were low (Lindgren et al., 2007). Pacı et al. evaluated therelationship between HSP and motor functions in 107 patients with stroke. As a result, they emphasized that there is a relationship between HSP and the UA-FMA score, which evaluates upper extremity functionality, and that individuals with high pain have less functional capacity (Paci et al., 2007). In the study of Barlak et al. there was no difference between the pre-treatment functionality of patients with HSP compared to those without. However, it was reported that the Functional Independence Scale (FIM) was worse in patients with HSP after treatment compared to the other group (Barlak vd., 2009). Wanklyn et al. highlighted that 108 individuals with HSP had extensive activity limitations (Wanklyn et al., 1996). In another study conducted on patients with stroke, it was reported that patients with shoulder pain before treatment had lower upper extremity functionality than patients without shoulder pain (Mesci ve Mesci, 2014). Contrary to all these studies, there are studies suggesting

that there is no relationship between HSP and functionality(Chae et al., 2007; Gamble et al., 2002; Kong et al., 2004). In the study of Kong et al., no relationship was found between pain and functionality in patients with HSP (Kong et al., 2004). Similarly, Gamble et al. reported that there is no relationship between shoulder pain and functionality in patients with hemiplegia (Gamble et al., 2002). In another study in which 61 patients with HSP were evaluated, the mean FMA score of UA-FMA values of the patients was found to be 18.71 ± 2.6, but no significant relationship was found between pain and upper extremity functionality (Chae et al., 2007). The mean values of UA-FMA of the patients in our study were (Chuang et al., 2017; Melzack, 1975; Miyata et al., 2022; Ünalan vd., 2001). We think that this may be due to the higher motor levels of the patients in our study. In addition, in our study, a significant relationship was found between upper limb functionality and HSP pain, similar to the literature in general.

Having a good functional capacity and activity level is very important for the sustainability of the balance. In the literature, the existence of a relationship between balance and functionality has been reported (Çakçı ve MD, 2004). In a study, it is emphasized that the decrease in upper extremity functions causes balance problems and causes fall risk (Gamble et al., 2002). In one of the studies on this subject, it is stated that normal arm oscillations have a positive effect on balance (Eke-Okoro et al., 1997). In another study, it was reported that 26 hemiplegic patients with shoulder subluxation achieved a significant improvement in the Berg Balance Score (BDS) after shoulder sling use (Acar ve Karatas, 2010). In the same study, the pre-treatment BDS value of the patients was 29.8 ± 17.3. In our study, the mean BDS value of the patients was 17.81 ± 17.84. We think that the reason for the low BDS values in our study is the low number of patients. Similar to the literature, there is a positive and significant relationship between the functionality and balance status of the patients in our study.

In our study, there is a significant relationship between upper extremity functionality and pain. Likewise, a significant relationship was found between upper extremity functionality and balance. However, contrary to these results and what we expected in the hypothesis of our study, there is no significant relationship between shoulder pain and balance. We think that this is due to the insufficient number of patients. In the literature, although there are studies comparing pain and functionality, functionality and balance in HSP patients, there is no study comparing pain and balance. This is one of the original aspects of our study.

The World Health Organization defines health-related quality of life as a state of physical, mental and social well-being without any illness (WHO, 1994). Post-stroke pain, decreased upper extremity functionality, and disability rate are closely related to quality of life One study of patients with HSP found that patients' quality of life was currently poor at 1-year follow-up after acute stroke (Adey-

Wakeling et al., 2016). In another study in the literature, the quality of life of 61 patients with HSP was evaluated with the Short Pain Inventory. The results of the study revealed a significant relationship between pain and quality of life. In a study evaluating the effect of shoulder pain on quality of life and other parameters in stroke patients, 20 patients with shoulder pain were compared with 20 patients without shoulder pain. There was only a significant difference in the pain sub-score between the SF-36 sub-parameters before and after treatment between both groups (Lindgren et al., 2007). Similarly, another study evaluated chronic pain and quality of life in stroke patients, most of whom had HSP. In this study evaluating the quality of life with the SF-36, a significant difference was found only between chronic pain and the pain score, which is one of the SF-36 sub-parameters (Kong et al., 2004). In our study, similar to the literature, quality of life was evaluated with SF-36 and no significant relationship was found between pain and SF-36 sub-scores. We think that this may be due to the different duration of illness in the two studies. In the mentioned study, only individuals who had hemiplegic shoulder pain for 6 months or more were evaluated.

The limitations of our study; pain and functionality have been subjectively questioned. In addition, it is a limitation that the quality of life questionnaire we use is not specific to the disease. Another limitation is that we did not evaluate upper extremity spasticity in our study.

As a result of our study, a relationship was found between HSP and functionality, but no relationship was found between HSP, balance and quality of life. There are limited number of studies examining the effect of hemiplegic shoulder pain on parameters such as functionality, balance and quality of life. Our study contributes to the literature with this aspect. Large-scale studies are needed on this subject.

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Conflict of İnterest

The authors have no conflicts of interest to declare.

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