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Clinical outcomes of conservative versus surgical treatment for patients with proximal humeral fracture before physiotherapy

G. KUS[1], A. ZENGIN ALPOZGEN[2], F. GUNGOR[3], A. RAZAK OZDINCLER[4], S. ALTUN[5]

[1]Mustafa Kemal University, Faculty of Health Sciences, Department of Physiotherapy and Rehabilitation, Hatay, Turkey; [2]Istanbul University-Cerrahpasa, Faculty of Health Sciences, Department of Physiotherapy and Rehabilitation, Istanbul, Turkey; [3]Istanbul University-Cerrahpasa, Institute of Graduate Studies, Department of Physiotherapy and Rehabilitation, Istanbul, Turkey; [4]Fenerbahce University, Faculty of Health Sciences, Department of Physiotherapy and Rehabilitation, Istanbul, Turkey; [5]Department of Orthopedics and Traumatology, Bakırköy Dr. Sadi Konuk Training and Research Hospital, Istanbul, Turkey.

Correspondence at: Gamze Kuş, Mustafa Kemal University, Tayfur Sökmen Kampüsü, 31060, Hatay, Turkey, Email: gamze_ftr@hotmail.com

Fear of movement, pain, and loss of shoulder function are the most common problems irrespective of their approach to management after proximal humeral fracture (PHF). However, it has been unclear whether there could be differences between both treatments in early clinical outcomes. It can help physiotherapists to guide in choosing treatment approaches. This study aimed to compare kinesiophobia, pain, range of motion (ROM), shoulder function, and Quality of life (QoL) in patients treated with either conservative (CT) versus surgical (ST) after PHF. In addition, it aimed to determine correlations between fear of movement and seconder outcome measures. This cross-sectional study enrolled the patients having 5-6 weeks (being permitted active movement) after being treated either CT or ST and receiving no physical therapy. Pain, passive and active ROMs, shoulder function, fear of movement, and QoL were evaluated. 42 patients were recruited. Kinesiophobia scores were similar (p=0.55) and moderate in both groups. There was a significant difference in degrees of shoulder active flexion, active and passive abduction in favor of the CT group (p=0.05, p=0.02, p=0.04, respectively). However, there was no difference between groups regarding the remaining clinical outcomes. Furthermore, kinesiophobia showed a moderate negative correlation with energy/fatigue, social functioning, and general health. These findings showed that patients treated surgically did not have more kinesiophobia, less function, and QoL before starting physiotherapy, despite having soft tissue damage and different types of fractures. However, surgically treated patients had significantly less range of motion.

Keywords: fractures, disability evaluation, musculoskeletal conditions, outcomes, assessment/measurement.

INTRODUCTION

Proximal humerus fractures (PHF) are one of the most common fractures and debilitating conditions in older adults, resulting in pain, and significant loss of range of motion (ROM) and function, irrespective of their mode of management[1,2]. The management of PHF remains a significant challenge in orthopedics. The acute treatment options for PHF are numerous and are typically guided by the fracture pattern and functional demands of the patients. The most commonly used methods are non-operative management with a sling or surgical fixation[3]. Although non-surgical treatment is a reasonable treatment option for the majority of humerus fractures, there is an increasing interest in surgical intervention[4]. Overall, patients with PHP had conservative or surgical treatment, depending on depends on a variety of underlying factors related to the patient, the fracture, and the surgeon.

Surgical incisions in operative management and prolonged immobilization in non-operative treatment are common causes of kinesiophobia, pain, stiffness, and loss of shoulder function[5]. Therefore, whether the choice is made to have surgical intervention or nonoperative care, physiotherapy and exercises play a significant role to return them to their optimal level of function[6]. The pain is usually severe, debilitating, and aggravated through shoulder movement. Therefore, patients tend to avoid movement and protect the shoulder, which may result in kinesiophobia. Pirinçci et al. revealed that kinesiophobia in painful shoulder pathologies causes limitations in the daily life activities of the patients and decreases their quality of life[7]. Jayakumar et al. reported that kinesiophobia was one of the strongest predictors of functional limitation and recovery from a PHF was enhanced by overcoming fears of movement or reinjury within a week after injury[8]. There are a number of studies comparing outcome

measures after surgical fixation versus conservative management of PHFs[9,10]. However kinesiophobia has not been investigated. Prolonged immobilization in conservative treatment (CT), soft tissue damage, and complex fracture in surgical treatment (ST) may cause fear of movement, but which either could lead to more kinesiophobia has been unclear. This issue can be important for defining the exercise program. In addition, identifying the effect of CT and ST on pain, range of motion (ROM), shoulder function, and quality of life (QoL) in people with PHF can be potentially valuable to optimize rehabilitation.

This study aimed to compare kinesiophobia, pain, range of motion (ROM), shoulder function, and (QoL) in patients treated with either the conservative or surgical after PHF. In addition, it aimed to determine correlations between fear of movement and seconder outcome measures for patients with PHF the clinical outcomes.

PATIENTS AND METHODS

This study was a cross-sectional study and was conducted in accordance with the Declaration of Helsinki. The protocol of this study was registered to a clinical trial database (NCT04786639) and the ethical approval to conduct was granted by the Clinical Researches Ethics Committee of the authors institution. All patients signed an informed consent form to participate.

This study was conducted at Istanbul University-Cerrahpasa, Faculty of Health Sciences, Department of Physiotherapy and Rehabilitation between March 2021 and May 2021. The patients were introduced to us by a clinician working in a training and research hospital's department of orthopedics and traumatology

PHF patients with sling immobilization (having callus formation on radiography) or having open reduction with deltopectoral incision and with post-op 5-6 weeks were enrolled. In addition, patients with over 18 years age and without receiving any physiotherapy rehabilitation sessions were included. Patients with malunion tuberculum majus, advanced osteoporosis, avascular necrosis of the humeral head, presence of neurological and rheumatologic disease, recurrent infection, and open wound-incision in the region were excluded. The outcome assessors were blinded to treatment allocation, and patients were encouraged not to reveal their treatment group. A total of 50 PHF patients were evaluated for this study.

Overall, outcome measures were assessed after an average of 5-6 weeks, as active range of motion was allowed after six weeks[6].

The Tampa Scale for Kinesiophobia (TSK) was used for evaluating fear of movement. The TSK is a 11 item questionnaire used to assess the subjective rating of fear of movement[11]. It is self-administered and the score varies between 11 and 44. High scores indicate an increasing degree of kinesiophobia.

Pain scores of the patients at night, at rest, and during movement were measured using visual analogue scale (VAS, 0-10 mm; 0 indicates no pain and 10 indicates severe pain)[12].

Passive and active shoulder ROM (flexion, extension, abduction, ER and İR) were measured by using a digital goniometer (Baseline Evaluation Instrument®, Fabrication Enterprises, Inc.) There is inter- and intra-rater reliability between digital goniometer and universal goniometer[13,14]. The ROM scores were recorded in the supine position according to standard protocol[15].

For shoulder function, the disabilities of the arm, shoulder and hand (DASH) questionnaire was used for measuring self-rated upper-extremity disability and symptoms[16]. The main part of the DASH-FS consists of 30 questions; assess the patient's difficulty during their daily activities, pain, social function, work, sleep and self-confidence. Each question is scored from 1 (no difficulty) to 5 (unable). The scale score ranging is from 0 (no disability) to 100 (most severe disability).

The QoL was assessed by using 36-Item Short Form Survey (SF-36)[17]. The SF-36 has eight subscales: vitality, physical functioning (PF), bodily pain (BP), general health (GH), role of physical health (RPH), Emotional well-being (EB) social role functioning (SF) and mental health (MH) and range from 0 – 100 and higher scores show less disability.

Statistical Analysis

In the data analysis of the study, "Statistical Package for Social Sciences" (SPSS) Version 21.0 (SPSS inc., Chicago, IL, USA) statistical program was used. In all analyzes, $p < 0.05$ values were considered statistically significant.

The normality of data distribution was assessed using the Shapiro-Wilks test. Non-parametric tests were chosen to analyze because of the non-normal data distribution. The groups were compared with the "Mann Whitney U" test in terms of demographic and clinical features. The chi-square test for categorical variables and spearman rank correlation for the relationship between variables were used.

RESULTS

A total of 50 PHF patients were evaluated, but eight of those were excluded because they did not meet the eligibility criteria. The CT group including Seventeen PHF patients were compared the ST group including 25 PHF patients. When comparing the demographic characteristics of groups, there was no statistically significant difference in age, height, body weight, Body Mass Index (BMI), gender, affected side and smoking habit between groups, except Neer classification (Table I).

When comparing the outcome measures in both groups, TSK scores were similar and there was no significant difference between groups. Although VAS scores were lower in the CT group, no difference was found between groups (Table II). All ROM scores were better in the CT group but there was a significant difference only in the active shoulder flexion, active and passive shoulder abduction degrees in favor of the CT group (respectively p=0.05, p=0.02, p=0.04) (Table II). DASH score was worse in the ST group, but there was no significant difference between the groups (Table II). Similarly, no significant difference was found between the groups in terms of any subscales of SF-36 (Table III).

When analyzing the relationship between kinesiophobia and other clinical outcome measurements, the kinesiophobia showed moderate negative correlation with energy/fatigue, social functioning and general health (rho =-0.319, p=0.004; rho= -0.383, p=0.01; rho= -0.495, p= 0.001, respectively). However, there was no correlation between kinesiophobia and remaining clinical outcomes (Table IV and V).

DISCUSSION

Considering 5-6 weeks after PHF, the reduction in some of the ROM degrees were significantly less in patients with the ST comparison with the CT, except other clinical outcomes. The kinesiophobia showed a significant negative correlation with some subscales of QoL (energy/fatigue, social functioning and general health).

TSK has not been specifically validated in patients with shoulder fractures. Therefore, existing TSK data should be interpreted carefully. The recovery from a PHF is significantly influenced by fear of movement within a week after injury. It was reported, the mean score of TSK-11 after PHF, was 28.6±6.3 in the first week, then the score decreased to 24.9±8.1 in the 2-4th week, and to 20.7±10.2 in the 6-9 months[8]. In our study, evaluations of patients were made 5-6 weeks after injury, and our TSK-11 scores in both groups were in line with the mean scores reported by Jayakumar et al. In addition, when the groups were compared, no significant difference was found between groups. This may be due to the decrease in the influence of kinesiophobia on recovery from a PHF in the following weeks. Moreover, because pain intensity is reported as a very predictive factor on kinesophobia[7,18]. The similar main pain scores in both groups may be the reason for

Table I. — Comparison of demographic characteristics of groups

		CT group	ST group	p
		Mean±SD	**Mean±SD**	
Age(year)		51.65±17.29	59.64±9.43	0.12[a]
Height(m)		164.71±9.57	166.12±9.38	0.69[a]
Weight(kg)		77.17±11.24	82.20±12.53	0.14[a]
BMI(Kg/m^2)		28.48±3.70	29.89±4.85	0.22[a]
		n	**n**	
Gender(female/male)		9/8	16/9	0.47[b]
Affected side(right/left)		9/8	14/11	0.84[b]
Smoke(yes/no)		4/13	6/19	1.00[c]
Neer classification of fracture	**0**	-	5	0.009[b]
	2	12	8	
	3	13	4	

p[a]: Mann-Whitney U ; p[b]: Pearson chi-square test ; p[c]: Fisher's Exact test. CT: Conservative treatment; ST: Surgical treatment; BMI: Body Mass Index.

Table II. — Comparison of kinesiophobia, pain intensity, range of shoulder motion and function scores of groups

	CT group **Mean±SD**	ST group **Mean±SD**	**p**
Kinesiophobia	25.7(5,72)	25.4(4,43)	0.55
VAS-movement	4.47±2.03	5.36±2.64	0.17
VAS-rest	1.82±2.42	2.58±2.99	0.53
VAS-night	3.94±3.15	4.2±3,5	0.72
Shoulder ROM(°)			
Active flexion	110.6±23.19	96.09±32.16	**0.05***
Passive flexion	133.6±19.53	118.36±23.10	**0.02***
Active abduction	81.51±19.83	67.28±17.69	**0.04***
Passive abduction	108.09±20.67	92.3±20.81	0.23
Active IR	50.17±12.91	48,8 ±14.83	0.87
Passive IR	65.01±11.83	62.58±14.6	0.82
Active ER	27.4±16.67	25.61±18.12	0.62
Passive ER	42.73±18.49	33.82±14.66	0.14
DASH	60.74±21.20	64.69±20.21	0.57

* Significant at 0.05 level, Mann-Whitney test. CT: Conservative treatment; ST: Surgical treatment; VAS: Visual Analogue Scale; ROM: Range of Motion; IR: Internal Rotation; ER: External Rotation; DASH: Disabilities of the Arm, Shoulder, and Hand questionnaire.

Table III. — Comparison of quality of life scores of groups

SF-36 subscales	CT group **Mean±SD**	ST group **Mean±SD**	**p**
PF	52.94±24.04	62±19.94	0.22
RPH	14.7±33.14	19±32.5	0.46
REP	37.24±40.62	37.32±37.66	0.85
Vitality	47.05±16.39	51.8±22.49	0.41
EB	57.41±18.75	59.36±18.42	0.62
SF	54.41±31.54	54.5±34.96	0.95
BP	39.41±24.83	35.2±27.19	0.34
GH	58.82±19.08	61.8±20.25	0.51
MH	41.17±29.23	30±20.41	0.21

Significant at 0.05 level**.** CT: Conservative treatment; ST: Surgical treatment; PF: Physical functioning; RPH: Role limitations due to physical health; REP: Role limitations due to emotional problems; EB: Emotional well-being; SF: Social functioning; BP: Body pain; GH: General health; HC: Health change.

the lack of difference between the groups in terms of TSK scores.

While pain occurs due to prolonged immobilization during CT, it occurs due to soft tissue damage and the followed by scar tissue during ST[6,19]. This study demonstrated that, in both groups, pain scores during movement and at night were moderate intensity, although pain at rest was mild intensity. Similarly, in literature, patients with CT had moderate pain. However patients with ST had moderate to severe pain in literature[6]. The reason of difference could be that Monticone et al., unlike this study, evaluated pain level after post-op first week[20]. In addition, no significant difference was found between the groups in this study, although pain scores were lower in patients who had CT. Similarly, Launoen et al. that showed

Table IV. — Relationship between kinesiophobia, pain intensity and range of shoulder motion scores

Correlated Variables	Kinesiophobia	
	rho	P value
Pain		
VAS-movement	0.138	0.38
VAS-rest	0.238	0.12
VAS-night	0.225	0.15
Shoulder ROM(°)		
Active flexion	-0.215	0.17
Passive flexion	-0.254	0.10
Active abduction	-0.068	0.67
Passive abduction	-0.072	0.65
Active İR	-0.052	0.74
Passive İR	-0.049	0.75
Active ER	-0.160	0.31
Passive ER	-0.110	0.48

The correlation was tested using Spearman's correlation coefficient analysis. VAS: Visual Analogue Scale; ROM: Range of Motion; İR: İnternal Rotation; ER: External Rotation.

Table V. — Relationship between kinesiophobia, function and quality of life

Correlated Variables	Kinesiophobia	
	rho	P value
Function		
DASH	0.149	0.34
SF-36		
PF	-0.256	0.10
RPH	-0.185	0.24
REP	-0.238	0.12
Vitality	**-0.319**	**0.04**
EB	-0.289	0.06
SF	**-0.383**	**0.01**
BP	-0.067	0.67
GH	**-0.495**	**0.001**
MH	-0.203	0.19

The correlation was tested using Spearman's correlation coefficient analysis. DASH: Disabilities of the Arm, Shoulder, and Hand questionnaire; PF: Physical functioning; RPH: Role limitations due to physical health; REP: Role limitations due to emotional problems; EB: Emotional well-being; SF: Social functioning; BP: Body pain; GH: General health; HC: Health change.

that there was no statistically differences at baseline pain scores in both groups[21]. In the light of our results, we concluded that the pain intensity was similar both treatment approaches.

Clinical studies reported that reduction ROM is inevitable regardless of the treatment after PHF[19]. This study demonstrated that patients with ST had a greater limited in ROM. However, patients with CT had significant difference in terms of active shoulder abduction, active and passive shoulder flexion degrees. The scar tissue resulting from healing of the deltoid creates tension, as deltopectoral approach surgery causes soft tissue damage, the local blood supply loss and disruption of the integrity of the deltoid. Hence, abduction and flexion angle degrees may have been found to be lower in patients with ST. Considering 5-6 weeks after femur proksimal fracture, we concluded that there is less loss of ROM in patients with ST.

The results of conservative and surgical treatment in people with displaced 2-part fractures of the PHF was reported that DASH scores were similar in both groups[21]. Our study showed that DASH scores in both groups were quite high, indicating a poor baseline functional status[22]. Patients were similar in terms of shoulder function in surgical treatment and conservative treatment groups. The fact that kinesiophobia is the strongest predictor of functional limitations[8]. Explains the similarity in functional states of both groups, although the active and passive shoulder flexion and active shoulder abduction ROMs were better in favor of in the CT group. The inability to transfer this advantage to the functional use of the shoulder reveals the necessity of overcoming kinesiophobia.

The subscales scores of QoL were very low in both groups, suggesting that both treatment groups had poor QoL at baseline. The CT and ST groups were similar in all parameters of QoL. We think that the similarity of kinesiophobia, pain and functional status in both groups may have resulted in parallel physical and cognitive role restrictions in the patients, and therefore, there was no difference in QoL.

The main limitation of this study is the small sample size. In addition, most patients in this study were women. Therefore, our findings may not be generalized for the entire population of PHF patients. Further studies with larger sample sizes are required to investigate differences between both treatments of PHF regarding clinical outcomes before physiotherapy to guide physiotherapeutic techniques to assist patients to overcome clinical issues, especially kinesiophobia.

CONCLUSIONS

Both groups had moderate levels of fear of movement, and there was no difference between the groups before physiotherapy. These findings showed that surgical patients, despite having soft tissue damage and different types of fracture, did not have more kinesiophobia, less function, and QoL compared to conservative treatment before beginning physiotherapy. However, surgically treated patients had significantly less range of motion. According to this study's findings, we can offer that similar physiotherapy approaches, except for improving shoulder ROM, may be delivered after CT and ST group in patients with PHP.

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