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Original Article

Satisfactory Functional Outcomes Can Be Achieved with Conservative Treatment of Proximal Humerus Fractures in the Elderly

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ABSTRACT

Objective: Although surgical treatment is the preferred option for fractures affecting joints and requiring early movement, conservative treatment represents a viable alternative for individuals unsuitable for surgery due to the increased risks of comorbidities associated with advanced age. The objective of this study was to analyze the clinical functional results and patient satisfaction of proximal humerus fractures (PHFs) that were followed conservatively in our clinic.

Methods: This single-center, retrospective, observational study investigated 48 elderly patients treated conservatively for PHFs. The following variables were investigated: age, gender, fracture side, and Neer classification. The American Shoulder and Elbow Surgeons Shoulder Score (ASES), which provides information about pain level and functional results, was determined and analyzed at the last outpatient clinic control. Furthermore, a subjective satisfaction scale was devised, comprising a 5-point scale (from 1—completely unsatisfied to 5—completely satisfied) for the assessment of patient satisfaction.

Results: The median age was 77.5 years (range: 65-97). The median total ASES scores were 76.6 (range: 45-96.6). A total of 68.8% of the patients were satisfied from the treatment. A significant difference was identified between fracture type and total ASES scores at the final follow-up ($P = .038$) (Table 2). Subsequent post-hoc analyses revealed a significant distinction in total ASES scores between type 2 and type 4 fractures ($P = .012$).

Conclusion: Our findings suggest that geriatric patients with PHFs can achieve favorable results through the implementation of an appropriate conservative treatment plan. As expected, an increase in fragmentation levels has been linked to a decline in clinical outcomes.

Keywords: Proximal humerus fractures, elderly, geriatric patients, ASES score

INTRODUCTION

Proximal humerus fractures (PHFs) constitute between 4% and 6% of all adult fractures and are typically caused by low-energy injuries. Fractures of this region occur with low-energy trauma in the elderly, whereas those in younger individuals are caused by higher-energy trauma. The rising number of individuals in the aging population is contributing to an increase in the incidence of PHFs, which represent the third most common osteoporotic fracture in the elderly, following vertebral compression fractures and distal radius fractures.[1-4]

Although surgical treatment is the preferred option for osteoporotic fractures affecting joints and requiring early movement, conservative treatment represents a viable alternative for individuals unsuitable for surgery due to the increased risks of comorbidities associated with advanced age. Previously, conservative treatment for Neer type 1 and type 2 fractures and surgical treatment for type 3 and

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4 fractures were the most commonly accepted treatment options. However, the recent increase in the elderly population has prompted the exploration of surgical treatment alternatives. Consequently, the indications for conservative treatment have been expanded to include patients with lower functional expectations and higher surgical risk.[5-7]

The objective of this study was to analyze the clinical functional results and patient satisfaction of PHFs that were followed conservatively in our clinic. The aim is to provide insight into the potential safety of conservative treatment, which is less interventional and less costly, for these fractures.

MATERIALS AND METHODS

Study Population and Data Collection

This single-center, retrospective, observational study included patients who underwent conservative treatment after a proximal humerus fracture at the study clinic, following Ankara Bilkent City Hospital Clinical Research Ethics Committee approval (number: E1-22-2545, date: 06/04/2022). Written and verbal informed consent was obtained from the patients who agreed to take part in the study. The study period spanned from May 2019 to March 2023. Patients presenting with Neer type 2, 3, and 4 PHFs, diagnosed and treated by our clinic, were included if they met the inclusion criteria: patients with acceptable reduction criteria or patients where surgery had been recommended but not performed due to comorbidities, cases with a minimum follow-up of 6 months, and cases whose direct radiographs and computed tomography scans were taken at the time of trauma and outpatient clinic records are available in our clinical archive. Conversely, patients who underwent surgical intervention at the initial evaluation or during follow-ups, patients with isolated tuberculum major or other Neer type 1 fractures, patients with pathological fractures, refractures, open fractures, neuromuscular diseases, concurrent fractures of the same extremity, and patients who were lost to follow-up were excluded from the study. In accordance with the established inclusion and exclusion criteria, the study included 48 patients.

MAIN POINTS

- The prevailing opinion for the treatment of proximal humerus fractures in the elderly is in favor of conservative treatment, as this approach is believed to minimize complications and facilitate the achievement of satisfactory outcomes.
- Despite the relatively lower American Shoulder and Elbow Surgeons Shoulder Score (ASES) scores after conservative treatment, higher satisfaction rates can be achieved in elderly PHFs, possibly related to the decreasing expectations of patients with increasing age. Therefore, even minimal functional outcomes can lead to high satisfaction in the elderly patient population.
- Increase in fragmentation is associated with a decrease in clinical outcomes in proximal humerus fractures.

Treatment Protocol

All patients were followed up with a Velpeau bandage after closed reduction. After 4-6 weeks of follow-up with the bandage, passive shoulder range of motion exercises were initiated, and active shoulder range of motion exercises were started from weeks 8 to 10, as possible as tolerated. Strength exercises were started at week 12. All patients were called for follow-up visits at regular intervals (third week, sixth week, eighth week, twelfth week, sixth month, first year). At each follow-up visit, the level of patient satisfaction was evaluated.

Functional Evaluation

The following variables were investigated: age, gender, fracture side, and Neer classification.[8] The classification of all fractures was conducted using both x-ray and computed tomography images. The American Shoulder and Elbow Surgeons Shoulder Score (ASES), which provides information about pain level and functional results, was determined and analyzed at the last outpatient clinic control.[1,9,10] Furthermore, the patient was queried regarding their satisfaction with the treatment. To this end, a subjective satisfaction scale was devised, comprising a 5-point scale (1—completely unsatisfied, 2—unsatisfied, 3—could be better, 4—satisfied, 5—completely satisfied) for the assessment of patient satisfaction. As previously stated, patient satisfaction was queried at each follow-up visit; however, only the satisfaction score at the final visit was subjected to evaluation.

Statistical Analysis

The statistical analysis was conducted using the IBM® SPSS Corp.; Armonk, NY, USA Statistics software, version 21.0. The conformity of the data to a normal distribution was evaluated using both visual and analytical methods. The visual methods employed were histograms and probability plots, while the analytical method was the Kolmogorov–Smirnov test. The results of these tests indicated that the data were skewed. The Kruskal–Wallis test was employed for group analysis, while the Mann–Whitney *U* test was used for pairwise comparisons and post-hoc analysis. Descriptive statistics were defined using the median (interquartile range) and minimum-maximum value. A *P*-value of less than .05 was considered statistically significant.

RESULTS

A total of 48 patients were evaluated, of whom 34 were female (70.8%) and 14 were male (29.2%). The median age was 77.5 (17) years (range: 65-97). With a median outpatient follow-up of 15 (19) months (range: 6-33), the median pain, activity, and total ASES scores were 40 (10) (range: 30-50), 36.6 (24.2) (range: 10-50), and 76.6 (26.6) (range: 45-96.6), respectively. A total of 68.8% of the patients were satisfied from the treatment (Table 1).

A significant difference was identified between fracture type and total ASES scores at the final follow-up ($P = .038$) (Table 2). Subsequent post-hoc analyses revealed a significant distinction in total ASES scores between type 2 and type 4 fractures ($P = .012$) (Table 3).

DISCUSSION

Geriatric PHFs represent a significant area of orthopedic practice, given the growing prevalence of the aging population. In contrast to their younger counterparts, surgical treatment for early mobilization may not always yield optimal results in this age group, considering both surgical tolerance and compliance with postoperative rehabilitation are limited. This highlights the importance of conservative treatment in geriatric PHFs. The most significant finding of our study was the high level of patient satisfaction (68.8%) observed in the geriatric population. Additionally, the ASES scores utilized for pain and functional assessment of patients demonstrated comparable outcomes to those reported in the surgical treatment literature.

In the existing literature, several patient-reported outcome measurements are frequently employed for the assessment of functional outcomes following PHFs. In our study, the ASES score was used to assess pain and functional scores. Our mean ASES score, independent of fracture type, was calculated to be 76.6 (range: 45-96.6). As expected, lower functional scores were observed in higher Neer type fractures ($P = .038$). Post-hoc analyses revealed that the difference between the groups was mainly due to Neer type 4 fractures (Table 3) ($P = .012$ and $P = .161$). Despite the relatively lower ASES scores, we observed high satisfaction rates among elderly PHFs. In our study, patient satisfaction was subjectively assessed as a separate parameter, independent of the ASES score. After questioning, only 7 patients (14.6%) reported dissatisfaction; 8 patients (16.7%) said "it could have been better"; and 33 patients (68.8%) said they were satisfied with the treatment. We hypothesize that the reason for the high patient satisfaction rate despite relatively lower ASES scores can be explained by the decreasing

Table 1. Demographic Profile of the Patients

		Elder Proximal Humerus Fractures (n = 48)	Frequency (%)
Gender	Female	34	70.8
	Male	14	29.2
Side	Right	36	75
	Left	12	25
Age (years)		77.5 (17) (range: 65-97)	
Fracture Neer classification	Type 2	6	12.5
	Type 3	26	54.2
	Type 4	16	33.3
Follow-up (months)		15 (19) (range: 6-33)	
ASES pain score		40 (10) (range: 30-50)	
ASES activity score		36.6 (24.2) (range: 10-50)	
Total ASES score		76.6 (26.6) (range: 45-96.6)	
Patient satisfaction	Completely unsatisfied	4	8.3
	Unsatisfied	3	6.3
	Could be better	8	16.7
	Satisfied	7	14.6
	Completely satisfied	26	54.2

n, number of patients.
Categorical variables were descripted as frequency (percentage) whereas "Age, ASES scores, and Follow-up" parameters were descripted as median (interquartile range) (minimum-maximum value).

Table 2. Distribution of Functional Scores and Satisfaction Scores According to Fracture Types

		Neer Type 2 Fractures (n = 6)	Neer Type 3 Fractures (n = 26)	Neer Type 4 Fractures (n = 16)	*P*
ASES	Pain score	45 (5) (range: 40-45)	40 (10) (range: 30-50)	37.5 (9) (range: 35-45)	.157
	Activity score	43.3 (13.4) (range: 36.6-50)	36.6 (17.5) (range: 10-50)	26.65 (27.8) (range: 10-50)	.103
	Total score	88.3 (18.4) (range: 76.6-95)	76.6 (27.1) (range: 51.6-96.6)	67.5 (26.1) (range: 45-90)	***.038***
Patient satisfaction	1	0	1 (3.8%)	3 (18.8%)	.407
	2	0	2 (7.7%)	1 (6.3%)	
	3	0	4 (15.4%)	4 (25%)	
	4	2 (33.3%)	3 (11.5%)	2 (12.5%)	
	5	4 (66.7%)	16 (61.5%)	6 (37.5%)	

n, number of patients; *P,* statistical significance value.
Categorical variables were descripted as frequency (percentage) whereas "ASES scores" parameters were descripted as median (interquartile range) (minimum-maximum value).

expectations of patients with increasing age. Patients' functional expectations and their hopes of being completely cured decrease severely with advanced age. Therefore, even minimal functional outcomes can lead to high satisfaction rates in this patient population. The favorable outcomes observed in elderly PHFs, which is reported in the literature, can be attributed to this hypothesis.[11,12]

Despite ongoing debate in the literature regarding the optimal treatment of PHFs, the prevailing opinion is in favor of conservative treatment, considering this approach is believed to minimize complications and facilitate the attainment of satisfactory outcomes. Furthermore, several authors have stated that orthopedic surgeons are prone to treat elder PHFs conservatively in recent years.[13,14] Our findings, functional scores, and high patient satisfaction rates are in accordance with those reported in the existing literature. In 2019, Çaliskan and Doğan compared PHFs treated surgically and conservatively regardless of age factors and reported no significant difference in postoperative ASES scores between surgical and conservative groups in Neer type 2, 3, and 4 fractures.[1] In their study, they reported a mean ASES score of 93.2 in surgically treated Neer type 2 PHFs, 67.2 for type 3 fractures, and 77.8 for type 4 fractures.[1] In 2020, Gracitelli et al.[15] analyzed the 12-month follow-up results of PHFs in patients over 60 years of age and reported a mean ASES score of 77.7. Akyürek et al.[16] reported an ASES score of 90.2 in the surgical group in PHFs, which they analyzed independently of age in valgus-impacted fractures. Roddy and Kandemir reported a minimum ASES score of 63.3 (mean: 98.3, range: 63.3-100) in 26 surgically treated patients with a minimum follow-up of 2 years, but 4 of these patients developed avascular necrosis.[17] Furthermore, we have observed that functional scores decrease with an increasing number of fracture fragments in our study, and this finding is also consistent with the literature. In their aforementioned study, Çaliskan and Doğan reported an ASES score of 82.3 for 2-part fractures, 85.9 for 3-part fractures, and 70.3 for 4-part fractures after conservative follow-up in age-independent PHFs.[1] This may be explained by the fact that conservative management and rehabilitation of fractures with fewer fragments is easier and their union potential is higher.

Table 3. Post-hoc Analysis of ASES Scores According to Fracture Types and Statistical Significance (*P*) Values Between Groups

Total ASES Score	Neer Type 2 Fractures (n = 6)	Neer Type 3 Fractures (n = 26)	Neer Type 4 Fractures (n = 16)
Neer type 2 fractures (n = 6)	N/A	.098	***.012***
Neer type 3 fractures (n = 26)	.098	N/A	.161
Neer type 4 fractures (n = 16)	***.012***	.161	N/A

n, number of patients; *P,* statistical significance value.

The main limitation of our study is that the results were not compared with a control group. In a population over 65 years of age, the effectiveness of conservative treatment can be demonstrated more objectively with randomized trials that compare the results with a control group in which surgical treatment is used. On the other hand, we tried to overcome this limitation by comparing the results of the studies available in the literature with our own results. Another important limitation is that we

only performed subjective functional analyses and did not include objective functional analyses (muscle strength and range of motion), but it is not easy to perform these measurements in this age population. In addition, as mentioned above, especially in older patients, expectations of shoulder motion are quite low, and maximum patient satisfaction can be achieved with minimal functional results. The small number of patients and the limited follow-up period are also important limitations. Last but not least, it was not possible to perform a detailed comorbidity analysis in the present study. However, it should be noted that age is not the sole risk factor in this age group, and it is inevitable that detailed comorbidities will have an effect on the results. It may be possible to obtain more objective results in future by conducting prospective randomized studies, although this would be challenging in this age group.

In conclusion, conservative treatment appears to be a viable alternative, especially in multisegment fractures of the proximal humerus and in older patients. The superior satisfaction rate observed in the elderly in our study may be attributed to the declining expectations associated with advancing age. Conversely, an increase in fragmentation levels has been linked to a decline in clinical outcomes. Our findings suggest that geriatric patients with PHFs can achieve favorable results through the implementation of an appropriate conservative treatment plan.

Data Availability Statement: The data that support the findings of this study are available on request from the corresponding author.

Ethics Committee Approval: This study was approved by Ankara Bilkent City Hospital Clinical Research Ethics Committee (Decision number: E1-22-2545, date: 06/04/2022).

Informed Consent: Written and verbal informed consent was obtained from the patients who agreed to take part in the study.

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