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Research Article

Comparison of Conservative and Arthroplasty Treatment for 3 or 4 Part Proximal Humerus Fractures in the Elderly

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Abstract

Aim: Proximal humerus fractures are common injuries in the elderly population. This study hypothesizes that arthroplasty is not superior to conservative treatment in the management of multi-part proximal humerus fractures in elderly patients.
Material and Method: Patients aged 65 and above with 3–4-part proximal humerus fractures, treated either conservatively or with arthroplasty, were included in the study. The minimum follow-up period was set at 12 months. Functional evaluations of the patients were performed using the Quick Disabilities of Arm, Shoulder and Hand (Q-DASH) scoring system. Statistical analysis comparing the two groups was conducted using the SPSS software. The mean values of numerical data were analyzed using the Mann-Whitney U test, while categorical data were compared using the Chi-square test. A significant level of 0.05 was considered.
Results: A total of 67 patients who received adequate clinical follow-up were included in the study (50 conservative 17 arthroplasty). The average age of the patients was 76.12 years, with 9 male and 58 female patients. The average follow-up period was 22.61 months (range: 12-82). There were no statistically significant differences in age, gender, side, follow-up period, and fracture type distribution between the two groups. However, a significant difference in Q-DASH scores was observed ($p<0.05$).
Conclusion: In the treatment of proximal humerus fractures, even when they are multi-part fractures, conservative treatment should may be the first choice. We think that the early results of conservative treatment are better than arthroplasty.

Keywords: Proximal humerus fracture, conservative treatment, shoulder arthroplasty

INTRODUCTION

Proximal humerus fractures represent a frequent occurrence among the elderly and pose considerable dilemmas in determining the most appropriate course of treatment (1,2). Given the functional impairment and diminished quality of life associated with these fractures, especially those categorized as 3- or 4-part fractures, selecting the optimal treatment approach remains a subject of ongoing discussion among orthopedic specialists (1,2).

Traditionally, conservative management, including sling immobilization, early motion exercises, and physical therapy, has been the preferred approach for managing proximal humerus fractures in the elderly (1). This conservative approach aims to achieve fracture healing, pain relief, and restoration of shoulder function without the need for surgical intervention. However, recent advances in surgical techniques and implant designs have led to the increased utilization of arthroplasty as an alternative treatment modality (2,3).

Arthroplasty, encompassing both hemiarthroplasty and reverse shoulder arthroplasty (RSA), offers the potential benefits of immediate stability, anatomical alignment, and improved functional outcomes (3). This surgical intervention replaces the damaged or fractured proximal humerus with an artificial joint, thus providing structural support and facilitating early rehabilitation (4). Despite the growing popularity of arthroplasty, the optimal treatment strategy for elderly patients with 3- or 4-part proximal humerus fractures remains a subject of ongoing investigation.

By comparing the outcomes of conservative management

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and arthroplasty, we seek to shed light on the relative efficacy, functional outcomes, and complications associated with each approach. The aim of our study is to contribute to the ongoing discussion surrounding the treatment of 3- or 4-part proximal humerus fractures in the elderly population (5).

MATERIAL AND METHOD

After obtaining ethical approval from the institutional review board, patients with proximal humerus fractures who were treated conservatively or with arthroplasty between 2011 and 2019 at our clinic were included in the study. Three or four-part displaced fractures were identified using direct radiographs and computed tomography images (according to Neer classification, types III and IV) (2). Patients aged 65 and above at the time of fracture occurrence were enrolled in the study. Patients under 65 years old, those with pathological fractures, those who could not be clinically followed, non-displaced or two-part fractures, those treated with plates, screws, or K-wires, patients with inadequate clinical follow-up or significant cognitive impairment, and those with advanced systemic conditions were excluded from the study. Patients who underwent surgery within 1 month after the fracture occurred were included in this study. Arthroplasty patients who underwent later sequelae after bone union were not included in the study. Reverse shoulder arthroplasty was preferred for patients with no additional health problems and better bone quality, and hemiarthroplasty was preferred for patients who were older and had lower expectations.

In the conservative treatment group, patients were followed with a shoulder-arm sling for three weeks. All patients in this group had declined surgical intervention despite being recommended due to fracture displacement. Reduction with simple traction was attempted in fracture-dislocation patients. In case of non-reduction, surgical treatment was recommended to the patients, but patients who did not accept were followed in the conservative group. Fracture union evaluation was performed using direct radiographs after the follow-up period. Elbow and wrist movements were initiated by removing the shoulder-arm sling. Shoulder movements were initiated after removing the sling (Figure 1).

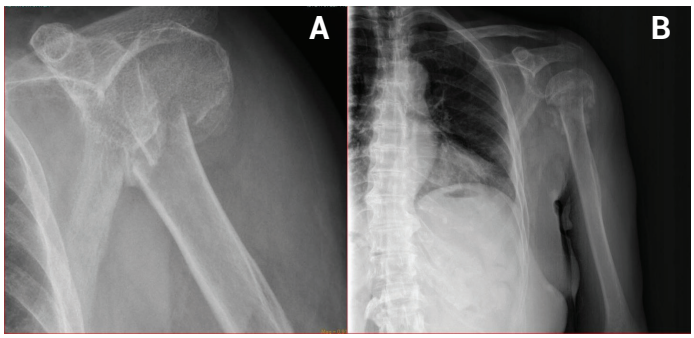

Figure 1. A. Four-part proximal humerus fracture, at the time of presentation **B.** At the end of the conservative treatment of the same patient

Surgical procedures of patients who underwent arthroplasty were performed by the authors who contributed to the article. Patients who underwent arthroplasty were operated on under general anesthesia in the beach chair position. The procedure was performed through a deltopectoral incision. Tubercle fragments were secured with 5-0 Ethicon sutures. The humeral head was excised, and the humerus was reamed. Although cement was used only in some reverse shoulder prostheses, it was not used in hemiarthroplasty patients. For patients who received reverse shoulder prostheses, glenoid reaming was performed. The glenoid component was placed and fixed with 3-4 locking screws. A glenosphere was inserted, a reverse polyethylene cup was placed on the humeral component, and joint reduction was performed. Once stability was achieved, tubercles were anatomically reduced and fixed in place using sutures passed through the prosthesis or the humerus. Prophylactic antibiotics were administered for 48 hours postoperatively. Deep vein thrombosis prophylaxis was initiated with subcutaneous enoxaparin sodium 0.4 cc for 10 days. Patients were followed with a shoulder-arm sling for two weeks. Elbow and hand movements were initiated immediately after surgery. Pendulum exercises were initiated, followed by gentle passive movements based on the patient's tolerance. Depending on the patient's condition, active movements were introduced from the second week to the first month, and patients were followed with the assistance of the physiotherapy unit (Figure 2).

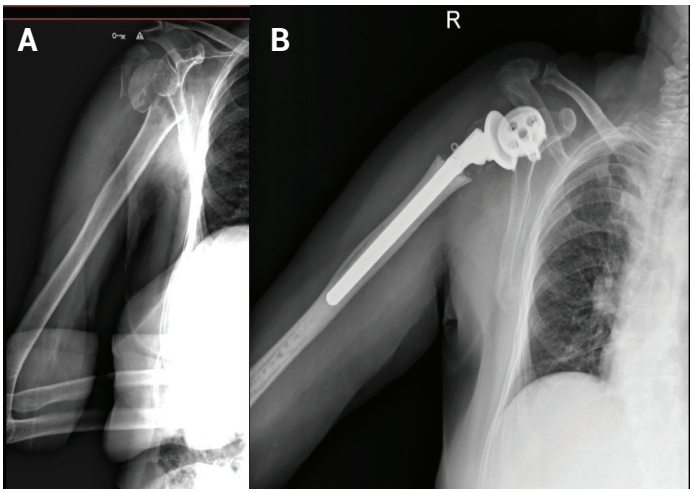

Figure 2. A. Four-part proximal humerus fracture, preoperative x-ray **B.** Post operative x-ray of the patient. The treatment was reverse shoulder arthroplasty

The clinical evaluation of patients was performed using the Quick Disabilities of Arm Shoulder and Hand (Q-DASH) scoring system. Q-DASH scoring was routinely applied after the first year after surgery. Some of the patients had their scores evaluated at outpatient clinic controls, and some of them were called by phone. The application of the scores was done by the physiotherapists working in our clinic, both in the outpatient clinic and by phone call.

Statistical analysis involved using mean and median values for numerical data and rates/percentages for

categorical data. The Shapiro-Wilk test was used to assess the normality of the numerical data distribution. Parametric tests were employed to compare two groups when the data followed a normal distribution, and nonparametric tests were used when the data did not follow a normal distribution. The chi-square test was used for the evaluation of categorical data. Fisher's exact test was used when the observed table value was less than 5. A significance level of $p<0.05$ was considered statistically significant.

RESULTS

A total of 131 patients were treated for proximal humerus fractures classified as three or four-part fractures. Among them, 27 patients were treated with plates and screws. Due to differences in the age distribution of patients treated with plates and screws, they were excluded from the study. The remaining 104 patients were treated with either conservative or arthroplasty methods. Out of the 104 patients, 67 patients were included in the study after excluding those who could not be clinically followed, had several reasons for mortality, or lacked sufficient cognitive ability for functional scoring. Among these patients, 50 were treated conservatively, and 17 underwent arthroplasty (Table 1). Among the patients who underwent arthroplasty, four received hemiarthroplasty, and 13 received reverse shoulder prosthesis.

The average age of the patients was 76.12 (range: 65-87) years. There were nine male patients (13.4%) and 58 female patients (86.6%). Treatment was performed on the right side in 42 patients (62.7%) and on the left side in 25 patients (37.3%). The average follow-up period was 22.61 months (range: 12-82). Fracture-dislocations were observed in 14 patients, three-part fractures in 22 patients, and four-part fractures in 31 patients. The statistical analysis showed no significant differences between the two groups in terms of age, gender, side, follow-up period, and fracture type distribution ($p>0.05$) (Table 1). The average Q-DASH scores of the patients were 21.68 (range: 0-70.45). The average Q-DASH score was 15.59 for patients treated conservatively, while it was 39.57 for those who underwent arthroplasty. There was a statistically significant difference between the two groups ($p<0.05$, Mann Whitney U test) (Table 1).

There were two complications after arthroplasty; one periprosthetic fracture and the other was a dislocation. There was no infection in our series. We did not have any patients in the conservatively treated group with nonunion, infection, or additional instability.

Table 1. Statistical comparison of general demographic values and clinical score (Quick Disabilities of Arm, Shoulder, and Hand; Q-DASH)

		Conservative		Arthroplasty		All		p value
Number of patients		50	75%	17	25%	67		-
Mean age (years)		76.12	+/- 6.79	76.12	+/-4.76	76.12		0.954
Gender	Male	6	12.0%	3	17.6%	9	13.4%	0.682
	Female	44	88.0%	14	82.4%	58	86.6%	
Side	Right	32	64.0%	10	41.2%	42	62.7%	0.703
	Left	18	36.0%	7	58.8%	25	37.3%	
Mean follow-up time (months)		23.74	+/- 17.17	19.29	+/- 4.31	22.61		0.608
Fracture type	Fractured dislocation	8	16.0%	6	35.3%	14	20.9%	0.157
	Three parts	16	32.0%	6	35.3%	22	32.8%	
	Four parts	26	52.0%	5	29.4%	31	46.3%	
Mean Q-DASH score		15.59	+/- 11.95	39.57	+/- 15.20			<0.001

DISCUSSION

The optimal treatment strategy for elderly patients with 3- or 4-part proximal humerus fractures remains a subject of ongoing investigation. Proximal humerus fractures in the elderly population can have a substantial impact on functional capacity and quality of life. Traditionally, conservative management has been the preferred approach, aiming to achieve fracture healing, pain relief, and restoration of shoulder function without surgical intervention (1). The main finding of this study shows that there is a statistically significant difference between conservative treatment and arthroplasty treatment. The Q-DASH scores of the patients who underwent conservative treatment were found to be lower than the patients who underwent arthroplasty. This result shows that conservative treatment provides better clinical outcomes.

However, recent advances in surgical techniques and implant designs have led to the increased utilization of arthroplasty as an alternative treatment modality (6). Arthroplasty offers potential benefits such as immediate stability, anatomical alignment, and improved functional outcomes (3,6). Studies have shown that arthroplasty can provide structural support and facilitate early rehabilitation by replacing the damaged or fractured proximal humerus with an artificial joint (4). Due to the elevated risk of osteoporosis, bone defects, graft requirements, and osteonecrosis, arthroplasty is preferred over internal fixation (7). In these studies, the risk of osteonecrosis in proximal humerus fractures in elderly and osteoporotic patients has been reported to be between 16% and 22% (8-10). Additionally, poor outcomes have been reported

due to tuberosity displacement and improper positioning of the humeral head (2,7,11). However, some studies have shown that a significant portion of patients with radiological avascular necrosis are minimally symptomatic or asymptomatic (2,11). In elderly patients with poor expectations, tuberosity displacement or varus-valgus angulation may have fewer clinical implications (2,11). Some authors have recommended arthroplasty for 3- or 4-part proximal humerus fractures in the elderly (12). While hemiarthroplasty was preferred in previous years, reverse shoulder arthroplasty is currently more favored (13). In our study, the arthroplasty group, we observed unfavorable outcomes.

Nevertheless, in recent years, there has been an increase in publications reporting that conservative treatment yields fewer complications and better clinical outcomes, particularly in elderly patients with poor bone quality, low expectations, and additional comorbidities (2,11). Postoperative complications such as instability (2-31%), infection (1-15%), scapular notching (44-96%), glenoid loosening (5-38%), tubercular malposition (50%) and anesthesia-related complications are frequently observed after arthroplasty (2,14). However, these issues are not seen in patients undergoing conservative management. Avascular necrosis, malunion, and nonunion, which may occur in conservatively managed patients, are not as common in this age group. Therefore, recent publications have begun reporting better outcomes in conservatively treated proximal humerus fractures, especially in elderly patients (15-18). Our patient group also achieved statistically better clinical outcomes in the conservative group ($p<0.05$).

Our study aimed to compare the outcomes of conservative management and arthroplasty treatment for elderly patients with 3- or 4-part proximal humerus fractures. It is crucial to consider patient-specific factors when selecting the optimal treatment approach. Age, fracture displacement, bone quality, comorbidities, and patient expectations should all be considered (19,20). By evaluating these factors and their impact on treatment outcomes, our study provides a comprehensive assessment of the benefits and risks associated with conservative and arthroplasty treatment options for elderly patients with 3- or 4-part proximal humerus fractures. In our analysis, we found no significant differences in age, gender, side, follow-up period, and fracture type distribution between the conservative management and arthroplasty groups ($p>0.05$). However, there was a statistically significant difference in the average Q-DASH scores between the two groups ($p<0.05$, Mann Whitney U test). The conservative treatment group had lower Q-DASH scores (15.59) compared to the arthroplasty group (39.57), indicating better functional outcomes in the conservative management group (3,15,16).

While arthroplasty may offer immediate stability and anatomical alignment, it is important to consider the potential complications associated with surgery, such as infection, implant failure, and limited implant longevity (4). On the other hand, conservative management aims to avoid surgical intervention and its associated risks. Our findings support the notion that conservative management can achieve satisfactory functional outcomes for elderly patients with 3- or 4-part proximal humerus fractures (1,15-18).

This study has limitations. Retrospective studies rely on existing medical records, and there may be variations in the documentation and availability of information, potentially impacting the accuracy and completeness of the data analyzed. The sample size was relatively small. The decision to choose between conservative and arthroplasty treatments was not randomized but based on individual patient factors and preferences. Among the patients who underwent arthroplasty, some patients had hemiarthroplasty, and some had reverse shoulder arthroplasty. Further research with larger sample sizes and multi-center studies would be beneficial to validate our findings and provide more robust evidence for treatment decision-making in this patient population. Q-DASH scoring is subjective rather than objective scoring. It is a patient dependent score. It does not look at data such as joint range of motion and muscle strength. This issue should be taken into consideration when evaluating Q-DASH scoring. Our follow-up period was not sufficient for the development of posttraumatic arthrosis in the conservatively treated group.

CONCLUSION

In conclusion, our study adds to the ongoing discussion surrounding the treatment of 3- or 4-part proximal humerus fractures in elderly patients. Based on our findings, conservative management can offer satisfactory functional outcomes for elderly patients, while arthroplasty may be considered in select cases where immediate stability and anatomical alignment are crucial. Clinical judgment and patient preferences should guide treatment decisions, considering individual patient factors. Future research should aim to further clarify the optimal treatment strategy by addressing the limitations of our study and conducting larger-scale investigations.

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