

ORIGINAL RESEARCH

Assessment of outcome of hemiarthroplasty for proximal humerus fractures

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ABSTRACT

Background: Proximal humerus fractures (PHFs) are fractures that occur in the upper part of the arm bone (humerus) near the shoulder. The present study was conducted to assess outcome of hemiarthroplasty for proximal humerus fractures. **Materials & Methods:** 84 cases of proximal humerus fractures of both genders were treated with hemiarthroplasty. Those who were treated within 4 weeks of fracture were put in group I and those who underwent HA for fracture non-union, malunion, or avascular necrosis were put in group II. **Results:** Group I had 22 males and 20 females and group II had 19 males and 23 females. Body mass index was 31.2kg/m² and 30.6kg/m², time from fracture to HA was 0.5 weeks and 2.5 weeks, anesthesia time was 310.4 minutes and 325.6 minutes and the length of stay was 5.6 days and 3.4 days in group I and II respectively. The difference was significant (P < 0.05). Neer fracture classification² was seen in 9 in group I, 3 in 13 and 4 in 20 in group I. Vertical tuberosity reduction was high in 23 and 21, anatomic in 10 and 11 and low in 9 and 10. Horizontal tuberosity reduction was seen in 34 and 29, tuberosity resorption was none in 18 and 15, partial in 17 and 19 and complete in 7 and 8 in group I and II respectively. Tuberosity healed was seen in 23 and 24, glenoid erosion was none in 20 and 19, mild in 16 and 14, moderate in 6 and 7 and severe in 0 and 2 respectively. **Conclusion:** Both acute HA for a PHF and delayed HA for fracture sequelae showed no statistically significant differences in outcomes.

Keywords: Proximal humerus fractures, tuberosity, hemiarthroplasty

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INTRODUCTION

Proximal humerus fractures (PHFs) are fractures that occur in the upper part of the arm bone (humerus) near the shoulder. These fractures are common, particularly among older adults with osteoporosis, and can result from falls, direct trauma, or high-energy impacts.^{1,2} Proximal humerus fractures are often classified based on the Neer classification system, which considers the number of fractured parts and the degree of displacement: One-Part Fractures: No significant displacement; bone fragments are not separated by more than 1 cm or angulated by more than 45 degrees. Two-Part Fractures: Involve displacement of one of the four major segments (the humeral head, greater tuberosity, lesser tuberosity, or humeral shaft).³ Three-Part Fractures: Involve displacement of two segments, typically the humeral head and either the greater or lesser tuberosity. Four-Part Fractures: Involve displacement of all three tuberosities and the humeral head. These are the most complex and severe fractures.⁴

Hemiarthroplasty is a surgical procedure commonly used to treat complex proximal humerus fractures,

especially in older patients with poor bone quality or severe fracture patterns.⁵ Hemiarthroplasty is replacement of the humeral head with a prosthesis, used in cases with severe head involvement or poor bone quality.⁶ Even with these advancements, HA might still be useful in cases of acute fractures in young patients with unreconstructable patterns, compromised glenoid bone stock that is not amenable to glenoid component implantation, or sequelae (malunion and post-traumatic avascular necrosis [AVN]) where tuberosity healing is not required but the humeral head is not viable.⁷ The present study was conducted to assess outcome of hemiarthroplasty for proximal humerus fractures.

MATERIALS & METHODS

The present study was conducted on 84 cases of proximal humerus fractures of both genders. All were informed regarding the study and their written consent was obtained.

Data such as name, age, gender etc. was recorded. All patients were treated with hemiarthroplasty. Those who were treated within 4 weeks of fracture were put

in group I and those who underwent HA for fracture non-union, malunion, or avascular necrosis were put in group II. Parameters such as the visual analog scale for pain, range of motion, American Shoulder and Elbow Surgeons (ASES) score, complications, and reoperations etc. were recorded. Postoperative radiographs included a true anteroposterior, scapular

Y view, and an axillary view. These radiographs were taken at approximate intervals of 3 weeks, 6 weeks, 3 months, 6 months, 1 year, 2 years, 5 years, and every 5 years thereafter. Data thus obtained were subjected to statistical analysis. P value < 0.05 was considered significant.

RESULTS

Table I Distribution of patients

Group	Group I	Group II
M:F	22:20	19:23

Table I shows that group I had 22 males and 20 females and group II had 19 males and 23 females.

Table II Assessment of parameters

Parameters	Group I	Group II	P value
Body mass index (kg/m ²)	31.2	30.6	0.74
Time from fracture to HA (weeks)	0.5	2.5	0.01
Anesthesia time (min)	310.4	325.6	0.91
Length of stay (day)	5.6	3.4	0.02

Table II shows that body mass index was 31.2kg/m² and 30.6kg/m², time from fracture to HA was 0.5weeks and 2.5weeks, anesthesia time was 310.4 minutes and 325.6 minutes and the length of stay was 5.6 days and 3.4 days in group I and II respectively. The difference was significant (P< 0.05).

Table III Assessment of preoperative and postoperative radiographic characteristics

Parameters	Variables	Group I	Group II	P value
Neer fracture classification	2	9	-	0.81
	3	13	-	
	4	20	-	
Vertical tuberosity reduction	High	23	21	0.73
	Anatomic	10	11	
	Low	9	10	
Horizontal tuberosity reduction	Yes	34	29	0.01
	No	8	13	
Tuberosity resorption	None	18	15	0.05
	Partial	17	19	
	Complete	7	8	
Tuberosity healed	Yes	23	24	0.94
	No	19	18	
Glenoid erosion	None	20	19	0.17
	Mild	16	14	
	Moderate	6	7	
	Severe	0	2	

Table III shows that Neer fracture classification 2 was seen in 9 in group I, 3 in 13 and 4 in 20 in group I. Vertical tuberosity reduction was high in 23 and 21, anatomic in 10 and 11 and low in 9 and 10. Horizontal tuberosity reduction was seen in 34 and 29, tuberosity resorption was none in 18 and 15, partial in 17 and 19 and complete in 7 and 8 in group I and II respectively. Tuberosity healed was seen in 23 and 24, glenoid erosion was none in 20 and 19, mild in 16 and 14, moderate in 6 and 7 and severe in 0 and 2 respectively.

DISCUSSION

The operational management of PHFs remains challenging due to the lack of a single standard for selecting different surgical procedures and the variety of management tactics.^{8,9} It is unclear how well HA performs in an acute vs delayed situation, while it may be useful in some unreconstructible fracture patterns and their aftereffects.^{10,11} The present study was conducted to assess outcome of hemiarthroplasty for proximal humerus fractures.

We found that group I had 22 males and 20 females and group II had 19 males and 23 females. Marigi et al¹² evaluated the outcomes of HA when used in acute fractures and fracture sequelae. 122 primary HA performed for either acute PHFs or fracture sequelae were identified. Of these, 70 (57.4%) HA were performed within 4 weeks of the injury, whereas 52 (42.6%) underwent HA for fracture non-union, malunion, or avascular necrosis. The minimum follow-up period was 2 years. Outcomes included the

visual analog scale for pain, range of motion, American Shoulder and Elbow Surgeons (ASES) score, complications, and reoperations inclusive of revision surgery. Cumulative incidence analysis was used to report implant survivorship with death as a competing risk. Results: The mean follow-up time after HA was 4.8 years (range, 2-15 years) with no differences between groups. Cohort comparisons demonstrated an older age (67.8 vs. 60.1), lower rate of previous procedure (4.3% vs. 51.9%; $P < .001$), lower bone graft use (28.6% vs. 59.6%; $P < .001$), and a longer length of stay (5.9 vs. 3.0 days; $P < .001$) in the acute HA group. Additionally, no differences were observed between the acute and sequelae cohort in pain (2.0 vs. 2.5), forward elevation (98 vs. 93), external rotation (30 vs. 23), internal rotation score (4.0 vs. 4.5), satisfaction, ASES scores (64.4 vs. 57.1), complications (27.1% vs. 28.8%), or reoperations. When comparing acute fractures and sequelae, the 15-year complication rates were 32.4% and 43.3%, respectively, with 15-year reoperation rates of 13.7% and 24%, respectively.

We found that body mass index was 31.2kg/m² and 30.6kg/m², time from fracture to HA was 0.5weeks and 2.5weeks, anesthesia time was 310.4 minutes and 325.6 minutes and the length of stay was 5.6 days and 3.4 days in group I and II respectively. Gallinet et al¹³ in their study determined the clinical and radiological outcomes, the complications, reoperations and revisions of RSA and to compare them with those of HA. The functional outcome (Constant score) after RSA is significantly better and more reproducible than the one obtained after HA. RSA provides significantly better active range of motion in forward flexion and abduction than HA. Conversely, active internal and external rotation are worse after RSA than HA. Reattachment of the tuberosities around the RSA improves the rotation ability. Even if the tuberosities do not heal, the functional outcomes are satisfactory after RSA but not HA due to a major functional deficit. The tuberosity healing rate around the RSA does not decline with age, contrary to HA where age is a negative factor. The overall complication rate is higher after RSA than HA; however, the reoperation rate is equal. The revision rate for implant change is higher after HA.

We observed that Neer fracture classification² was seen in 9 in group I, 3 in 13 and 4 in 20 in group I. Vertical tuberosity reduction was high in 23 and 21, anatomic in 10 and 11 and low in 9 and 10. Horizontal tuberosity reduction was seen in 34 and 29, tuberosity resorption was none in 18 and 15, partial in 17 and 19 and complete in 7 and 8 in group I and II respectively. Tuberosity healed was seen in 23 and 24, glenoid erosion was none in 20 and 19, mild in 16 and 14, moderate in 6 and 7 and severe in 0 and 2 respectively. Shukla et al¹⁴ compared outcomes between hemiarthroplasty and reverse shoulder arthroplasty for the treatment of proximal humeral fractures. The analysis included 1 Level I study, 1

Level II study, 3 Level III studies, and 2 Level IV studies. Reverse shoulder arthroplasty was more favorable than hemiarthroplasty in forward elevation ($P < .001$), abduction ($P < .001$), tuberosity healing ($P = .002$), Constant score ($P < .001$), American Shoulder and Elbow Surgeons score ($P < .001$), and Disabilities of the Arm, Shoulder and Hand score ($P = .001$). Only external rotation ($P = .85$) was not in favor of reverse shoulder arthroplasty. The available literature suggests that reverse shoulder arthroplasty performed to address complex proximal humeral fractures might result in more favorable clinical outcomes than hemiarthroplasty performed for the same indication.

The shortcoming of the study is small sample size.

CONCLUSION

Authors found that both acute HA for a PHF and delayed HA for fracture sequelae showed no statistically significant differences in outcomes.

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