

Functional Outcome of Patients with Fractures of the Proximal Humerus Treated with Shoulder Hemiarthroplasty: A Short-Term Prospective Outcome Analysis

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Abstract:

Background: Our study is planned to evaluate the functional outcome of patients with proximal humerus fractures managed with shoulder hemiarthroplasty in view of range of movement, possible returns of basic functions around the shoulder girdle, radiological outcome, and resultant remaining disability in the course of healing and after completion of healing.

Methodology: 21 patients with proximal humerus fractures were managed with shoulder hemiarthroplasty. All of them have completed a mean follow up of 6 months and was evaluated using the Constant Murley Scoring System.

Results: The most common mode of injury was road traffic accidents which accounts for 66.67% of total cases followed by domestic slip and fall. There was a male (57.38%) to female (47.62%) ratio of 1.1:1. There was a side predilection of right to left of 61.91% to 38.09%. According to Neer's classification, 28.57% had 3 part and 71.43% had 4-part fracture. As per Constant and Murley scoring, 47.61% of patients had good to excellent score and 38.1% had moderate score. The mean Constant score was found to be lower in patients with 4-part fractures as compared to those with 3-part fractures. Improvement of painless range of movement occurred in 80.95% patient. The most frequent complication in our patients was infection, which occurred in 3(14.2%) of the total cases.

Conclusion: Comminuted proximal humerus fractures especially in the elderly, pose a significant challenge to osteosynthesis. Herein comes the economically feasible replacement option of hemiarthroplasty. This treatment modality allows early mobilization and reasonably good functional outcomes in such patients.

Keywords: Proximal humerus fracture, shoulder hemiarthroplasty, Constant score.

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Introduction

A fracture of the humerus that occurs at or close to the surgical neck is referred to as a proximal humerus fracture and affect 2.4% of women over the age of 75 years.¹ Adults are more likely to suffer from this fracture than any other which occurs around the shoulder girdle², and it is becoming more common. In older persons, more specifically those over 65, it is the third most frequent fracture, with hip fractures and distal radius fractures coming in first and second, respectively.³

Age and gender have an impact on the frequency of proximal humeral fractures. Between 20 and 29-year-old males and females, the frequency is 7.5 and 9.1 per lakh people annually.⁴ 85 percent of these fractures have minor displacement and are treated conservatively to achieve satisfactory functional outcomes. The remaining 15% of these fractures are displaced and unstable.⁵ Surgery is used to treat the

remaining patients using a variety of methods, including plate osteosynthesis, hemiarthroplasty, total arthroplasty, and reverse total arthroplasty. Young and active elderly individuals require surgical treatment to restore articular congruity and provide stable fixation, paving the path for early mobilization and hence favorable functional outcomes.

Surgical fixation (closed reduction with percutaneous pinning, open reduction and internal fixation with locking plates, intramedullary nailing, tension band wiring / cerclage wire, arthroplasty) is used to treat 2/3/4-part fractures (Neer's classification of proximal humerus fractures)[11,12,13]. Even now, there is no treatment option that can be considered the gold standard for these fractures, but the reverse total shoulder arthroplasty has been found to offer the

best functional results, albeit being expensive in a developing country such as India. There are, however, very few prospective studies that describe the adverse effects of the treatment or evaluate the effectiveness of this procedure. This study was planned to evaluate the outcome of proximal humerus fractures managed with shoulder hemiarthroplasty, after approval by the Institutional Ethical Board.

Methodology

All consecutive cases with proximal humerus fractures managed with shoulder hemiarthroplasty attending the Department of Orthopaedics, Government Medical College, Thiruvananthapuram were included in the study until the sample size of 21 was attained. (Sample size was calculated by taking the standard deviation of Comprehensive Fracture Stem and absolute precision as 0.3). All patients were assessed for any post-operative complications and for Constant Murley Scoring System which is a grading method for evaluating results consisting of four components: pain, strength, activities of daily living and range of motion. Institutional Ethical clearance was taken. Individual informed consent was taken from every study participant before the study.

Results

21 patients were treated with shoulder hemiarthroplasty fracture of shoulder.

Socio – Demographic Characteristics

The mean age of the 21 patients under study was 65.24. 15 patients were above the age of 60, suggesting a strong correlation of proximal humerus fractures with age related osteoporosis and of the 21 participants, the male to female ratio was 1.1:1 (11:10).

Characteristics of Injury Pre-Operative

In our study, the mechanism of injury is due to domestic fall 7 (33.33%) and road traffic accident 14 (66.67%). Out of 21 participants, it was seen that 13 (61.91%) cases had fracture on the right (dominant) side and 8 (38.09%) cases had fracture on the left (non-dominant) side.

According to Neer's classification, 6 (28.57%) cases had 3-part fractures and 15(71.43%) had 4-part fractures. The fractures were associated with shoulder dislocation in 9 (42.86%) cases. 42.86% patients (9) had other bony injuries in addition to proximal humerus fractures.

Table 1: Distribution of Study Participants Based On Socio Demographic Factors (N = 21)

AGE		
Determinants	Frequency	Percentage
45-60	6	28.57
61 – 75	13	61.9
>75	2	9.52
Total	21	100.0
GENDER		
Male	11	57.38
Female	10	47.62
Total	21	100

Table 2: Distribution Of Study Participants Based on characteristics of injury (N = 21)

SIDE AFFECTED		
Determinants	Frequency	Percentage
Left	8	38.09
Right	13	61.91
Total	21	100.0
MODE OF INJURY		
Domestic Fall	7	33.33
RTA	14	66.67
Total	21	100.0
NEER'S CLASSIFICATION		
3 Part Fracture	6	28.57
4 Part Fracture	15	71.43
Total	21	100
SHOULDER DISLOCATION		
Present	9	42.86
Absent	12	57.14
Total	21	100.0
OTHER BONY INJURY		
Present	9	42.86
Absent	12	57.14
Total	50	100.0

Post-Operative Characteristics

Out of 21 participants in this study, the majority 18 (85.71%) of them had no complications at all, whereas 3 (14.29%) had infection. Only 2 (9.52%) of them had implant failure whereas 19 (90.48%) did not have any implant failure.

Constant Murley Scoring System which is a grading method for evaluating results consisting of four

components: pain, strength, activities of daily living and range of motion. When the functional outcome was assessed based on Constant Murley Scoring System at the of 6 months to assess pain, strength, activities of daily living and range if motion it was seen that 8 (38.1%) of them had moderate score, 7(33.33%) had good score whereas 3(14.28%) of them had both poor and excellent score.

Table 3: Distribution of Study Participants Based On Post-Operative Complications (N = 21)

POST OPERATIVE COMPLICATIONS		
Determinants	Frequency	Percentage
Present	3	14.29
Absent	18	85.71
Total	21	100.0
IMPLANT FAILURE		
Present	2	9.52
Absent	19	90.48
Total	21	100.0

Table 4: Distribution Of Study Participants Based On Constant Score (N = 21)

Constant Score	Frequency	Percentage
<55 (Poor)	3	14.28
56 – 70 (Moderate)	8	38.1
71 – 85 (Good)	7	33.33
86 – 100 (Excellent)	3	14.28
Total	21	100.0

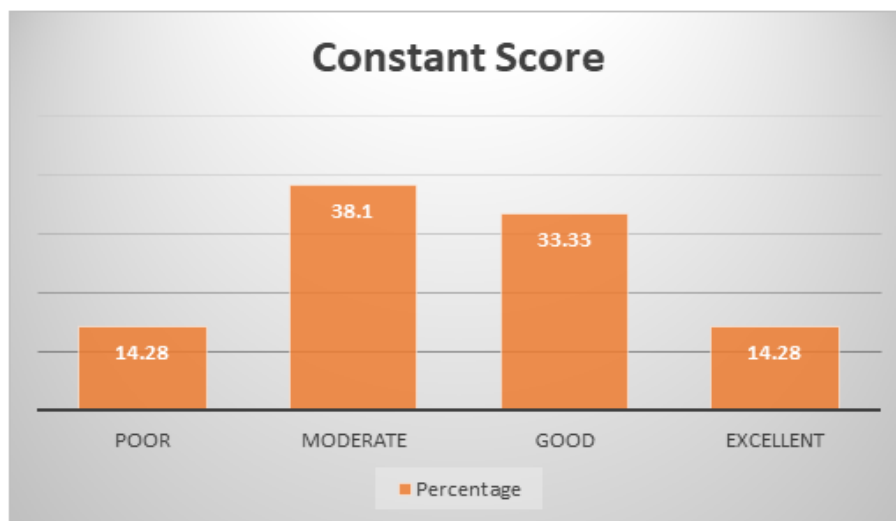


Figure 1:

Table 5: Distribution of study participants regarding association between their functional outcome on the basis of Constant score with socio demographic characteristics and Neer type of fracture

DETERMINANTS	MEAN CONSTANT SCORE
AGE	
45-60	78.17
61-75	68.07
>75	79.5
GENDER	
Male	73.18
Female	71.9
NEER TYPE OF FRACTURE	
3-Part	74.66
4-Part	71.73

This study shows that overall, the functional outcome was found to be good to excellent in 47.61% (10) patients. 38.1% (8) patients had moderate functional outcome. Only 14.28% (3) patients had poor functional outcome upon assessment at the last follow-up visit at 6 months. The mean Constant score was found to be 75.25 (with a range from 45 to 90). The mean Constant score was found to be lower in patients with 4-part fractures as compared to those with 3 part fractures.

Discussion

In our study, high-velocity road accident injuries resulted in more complex fractures in both men and women. According to Western literature, proximal humerus fractures are more prevalent in elderly women. Our study included 33.33 percent of patients with slip and-fall injuries and 66.67 percent of patients with road traffic accident injuries, which is consistent with several studies in western literature. The primary cause in young individuals is traffic collisions.

Our study shows that mean constant scores in terms of gender was 73.18 for males and 71.9 for females. This may be because women with osteoporosis are more likely to have impaired healing and inadequate bone stock, and the majority of female fractures occur after menopause. After six months of follow-up, the average Constant Murley score for patients in our study was 72.57. Our results were comparable to those seen in western literature. Various researches however have yielded inconsistent results.

Valenti and D. Aliani discovered in a multicentric research of 51 patients that proximal humerus fractures treated with hemiarthroplasty had an average Constant Score of 50, with a range of 17 to 91.97 In a similar prospective analysis of 57 individuals by R. Castricini, the mean Constant score was 59.2.98 Michael Robinson reported a Constant-Murley score of 64 after performing shoulder hemiarthroplasty on 163 patients.⁹⁹ In his study of 35 patients, Hiroshi Hashiguchi obtained a mean Constant Murley score of 76.2 for different fracture patterns.¹⁰⁰

Furthermore, the vast majority of studies have reported favourable functional outcomes and have recommended shoulder hemiarthroplasty for difficult proximal humerus fractures, particularly in older patients with poor bone quality. In our study, the average Constant score for 4-part fractures was 71.73, which was lower than the mean score for 3-part fractures, which was 74.66. According to a prospective study, 4-part fractures had a lower average Constant score than other types of fractures. Given the complexity of the fractures and the difficulties of surgically restoring the joint architecture, these outcomes were anticipated.

After the operation, only a handful of complications were observed. The most common complication is infection. The patients were treated by switching their antibiotics and lowering their blood sugar levels. None of the subjects required a second operation for management of infection. A small number of patients reported implant failure. According to published research, the likelihood of implant failure is attributable to a lack of healing capacity in the elderly and incorrect surgical technique.

The limitations of the study include the absence of a control group, a short follow-up time, and the failure to evaluate any patient variables that may be failure or risk factors.

Conclusion

From this study it was seen that most of the study participants had excellent to good functional outcome by modular bipolar hemiarthroplasty. It is needed to conduct longer-term research on a bigger sample size to better understand the long-term outcomes of modular bipolar hemiarthroplasty.

The patient's age, and the best post-operative therapy all affect the final functional outcomes. For femoral neck fractures, modular bipolar hemiarthroplasty offers a higher range of motion, pain relief, and a quicker return to independent activity with a manageable complication rate.

Proximal humeral fractures are caused due to high velocity trauma in young adults while in osteoporotic bone, domestic slip and fall is the cause of injury. The functional outcome was better in three-part fractures, younger age groups and in males. The mean constant score obtained in our study was 72.57. 3 patients in our study had a poor score. Hence Shoulder Hemiarthroplasty greatly improves the functional outcome in patients with complex proximal humerus fractures and is a viable option especially in elderly patients with poor bone stock.

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