



Original Article

Functional and Radiological Outcome of Patients with 3-Part and 4-Part Proximal Humerus Fractures

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ABSTRACT

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PHFs account for 6% of all fractures in the majority of regions worldwide. It ranks as the third most common fracture associated with osteoporosis, following fractures of the distal radius and vertebrae. The age group of individuals aged 50 and beyond represents more than 85% of the reported cases, with a male to female ratio of 70:30 within the age range of 60 to 90 years. Upon admission, demographic data, historical information, clinical examination findings, and investigation details were documented in the research proforma. All patients who visited the orthopaedic department throughout the study period and were scheduled for conservative treatment were included in the study. The patients were presented with shoulder exercises, physiotherapy, and treated with analgesics. Participants aged 61-70 years showed a significant functional improvement (100% satisfactory) compared to older age groups ($p < 0.001$). Females demonstrated a higher proportion of excellent and good outcomes compared to males ($p < 0.001$). Participants without hypertension had better outcomes compared to those with hypertension ($p = 0.031$). Participants aged 61-70 years had the highest percentage of good radiological outcomes (92.3%) compared to older age groups ($p = 0.029$). Males had a significantly higher proportion of good outcomes (92.3%) compared to females (55.6%) ($p < 0.0001$).

Keywords: Functional Outcome, Radiological Outcome, 3-Part And 4-Part Proximal Humerus Fractures.

INTRODUCTION

Non-operative management of proximal humerus fractures with a period of immobilization and progressive physiotherapy is a simple, noninvasive and readily available treatment option.

There is ongoing controversy regarding the necessity of intervention in a significant number of these displaced PHFs, particularly in the context of current research such as PROFHER.¹

Furthermore, it is important to differentiate between designated institutions that have well-established shoulder sections and local hospitals that have orthopedic surgeons who are not trained in this particular area while managing this sort of fracture. In these recent facilities, conventional therapy is typically preferred due to the technical complexity of these procedures. Therefore, it is crucial to prioritize the non-operative management of PHFs in order to achieve a consensus.^{2,3}

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associated with osteoporosis, following fractures of the distal radius and vertebrae. The age group of individuals aged 50 and beyond represents more than 85% of the reported cases, with a male to female ratio of 70:30 within the age range of 60 to 90 years.⁴

Managing this common injury often poses challenges and sparks controversy. While nonoperative therapy is the most common approach for patients, many complex fractures require surgical intervention. Recent polls suggest that a significant number of surgeons, especially those with expertise in the shoulder and elbow, decide shoulder arthroplasty and operative fixation for treating various types of fractures in older patients. This mode of operation is questionable.

There is ongoing debate over the best treatment for 3- and 4-part fractures. However, there is a strong inclination among doctors to use open reduction and internal fixation with angular locking plates or glenohumeral arthroplasty.²¹ This observational study highlights the continued effectiveness and viability of conservative treatment for patients with 3-part and 4-part PHFs. Therefore, this study was conducted to evaluate the functional and radiological results of conservative treatment in older patients with 3-part and 4-part PHFs

METHODOLOGY

STUDY DESIGN:

An observational analytical study

STUDY AREA:

The research study included individuals who were diagnosed with a proximal humerus fracture and were taken to the orthopaedics department.

STUDY PERIOD AND DURATION:

The research was conducted over a period of one year and four months

STUDY POPULATION:

Male and female patients with 3-part and 4-part proximal humerus fractures who meet the specified criteria and are admitted to the Department of Orthopaedics

SAMPLE SIZE CALCULATION

In 2016, Corley et al conducted a study which revealed that the occurrence rate of proximal humerus fracture was five percent.^[23]

Formula:

$$N = 4 * p * q / d^2$$

Where,

P = prevalence

Q = compliment of p

D = absolute error (which is 5 percent) N = 75

Therefore, a minimum sample size of 75 was necessary to achieve a 95 percent confidence interval. The sample size was determined using nMaster software Version 2.0 by inputting the specified parameters into the formula mentioned above.

INCLUSION CRITERIA:

- All patients with 3-part and 4-part proximal humerus fracture
- Both gender of age more than 60 years
- Patients within minimum of one year duration from the period of study.

EXCLUSION CRITERIA:

- Patients with pathological fracture
- Patients underwent surgical treatment
- Patients with open fracture
- Patients with cognitive dysfunction
- Patients had a history of stroke and hemiplegia.

SAMPLING METHOD:

All consecutive patients diagnosed with 3-part and 4-part proximal humerus fracture between August 2022 and January 2024, who were hospitalized to the Orthopaedics department at the Tertiary Care Hospital in Bangalore, and had identical symptoms.

DATA COLLECTION PROCEDURE

After receiving appropriate approval and clearance, the patients who met the inclusion criteria were enrolled in the study after obtaining informed consent.

Upon admission, demographic data, historical information, clinical examination findings, and investigation details were documented in the research proforma.

All patients who visited the orthopaedic department throughout the study period and were scheduled for conservative treatment were included in the study. The patients were presented with shoulder exercises, physiotherapy, and treated with analgesics.

All routine investigations were sent and collected. Radiological investigations like chest x-ray , shoulder xray etc were carried out. Then all the patients were followed up after 6 months.

Assessed for functional and radiological outcome

Assessment of pain relief was done using VAS scoring

RESULTS

Table 1: Distribution of the study participants according to their Functional outcome by Constant Shoulder Scoring (n = 75)

Functional outcome by Constant Shoulder Scoring		Frequency	Percent
	Adequate	3	4.0
	Excellent	13	17.3
	Good	51	68.0
	Satisfactory	8	10.7
	Total	75	100.0

According to the Constant Shoulder Scoring, the functional outcomes for the 75 study participants were as follows: 68.0% (51 individuals) achieved a "Good" outcome, 17.3% (13 individuals) had an "Excellent" outcome, 10.7% (8 individuals) had a "Satisfactory" outcome, and 4.0% (3 individuals) had an "Adequate" outcome. This shows that the majority of participants had a good or better functional outcome.

Table 2: Distribution of the study participants according to their Radiological outcome assesses by X-ray (n = 75)

Radiological outcome assesses by X-ray		Frequency	Percent
	Good	56	74.7
	Poor	19	25.3
	Total	75	100.0

Based on X-ray assessments, 74.7% (56) of the 75 study participants had a "Good" radiological outcome, while 25.3% (19) had a "Poor" radiological outcome. This indicates that the majority of participants had a favourable radiological result.

DISCUSSION

According to the Constant Shoulder Scoring, the functional outcomes for the 75 study participants were as follows: 68.0% (51 individuals) achieved a "Good" outcome, 17.3% (13 individuals) had an "Excellent" outcome, 10.7% (8 individuals) had a "Satisfactory" outcome, and 4.0% (3 individuals) had an "Adequate" outcome. This shows that the majority of participants had a good or better functional outcome.

Participants aged 61-70 years showed a significant functional improvement (100% satisfactory) compared to older age groups ($p < 0.001$). Females demonstrated a higher proportion of excellent and good outcomes compared to males ($p < 0.001$). Participants without hypertension had better outcomes compared to those with hypertension ($p = 0.031$).

Based on X-ray assessments, 74.7% (56) of the 75 study participants had a "Good" radiological outcome, while 25.3% (19) had a "Poor" radiological outcome. This indicates that the majority of participants had a favourable

radiological result.

Participants aged 61-70 years had the highest percentage of good radiological outcomes (92.3%) compared to older age groups ($p = 0.029$). Males had a significantly higher proportion of good outcomes (92.3%) compared to females (55.6%) ($p < 0.0001$).

As our understanding of the natural progression of proximal humerus fractures improves, the therapy of these injuries is also advancing. There is a growing emphasis on patient-centered clinical outcomes and the continuous improvement of surgical procedures. The majority of humerus fractures that occur closest to the body are either not displaced or have limited displacement. These fractures can be effectively treated without surgery and typically result in favourable outcomes. The nonoperative approach for these stable injuries involves immobilizing the affected area with a sling for a certain period of time. Early range of motion exercises are then gradually introduced based on the patient's comfort level. The technique of immobilization varies significantly, but is commonly accomplished with a basic sling, shoulder-immobilizer brace, or sling- and-swathe bandage. Irrespective of the immobilization technique employed, the main treatment principles are to stabilize the fracture, ensure patient comfort, and prevent neurological compression.⁵

In 2012, Boons et al. conducted a RCT in the Netherlands to examine the reduction of pain and improvement in functional level in elderly patients with four-part PHFs who were treated either nonoperatively or with hemiarthroplasty. They assigned 50 patients at random to one of the two approaches. There were no disparities in patient demographics between the two groups. After a 12-month follow-up, there were no discernible advantages identified in the treatment of patients aged 65 or older with four-part fractures of the proximal humerus using either hemiarthroplasty or nonoperative treatment.⁶

Yuksel et al conducted a retrospective assessment of prospectively gathered data from 18 patients. The average age was 68.2 ± 13.8 years. The authors assess the outcomes of conservative treatment for three- and four-part fractures of the proximal humerus in patients who declined surgery or were unable to undergo surgery due to medical reasons. The patients were divided into two groups: Group A consisted of individuals under the age of 65, whereas Group B included individuals aged 65 or older. Their findings indicate that the specific type of fracture does not affect functional outcomes. However, patients under the age of 65 with three-part fractures seem to have better results. The outcomes of the conservative management of these fractures are acceptable, especially in geriatric patients. The radiographic findings did not align with the functional outcomes.⁷

Torrens et al conducted a prospective research in Spain in 2011 using a sample of 70 individuals. The researchers evaluated the functional and quality-of-life outcomes of older individuals with proximal humeral fractures who were treated conservatively. Their findings indicate that conservative treatment of proximal humeral fractures in adults over the age of 75 years effectively alleviates pain but has limited impact on functional success. Although the people tested did not see significant improvement in their functional result, it did not have any impact on their opinion of quality of life. Fractures that are divided into four parts have the most severe outcomes, and it may be necessary to have a discussion with the patient about treatment alternatives in order to align the treatment with the patient's expectations.⁸

CONCLUSION

- Participants aged 61-70 years showed a significant functional improvement (100% satisfactory) compared to older age groups ($p < 0.001$). Females demonstrated a higher proportion of excellent and good outcomes compared to males ($p < 0.001$). Participants without hypertension had better outcomes compared to those with hypertension ($p = 0.031$).
- Participants aged 61-70 years had the highest percentage of good radiological outcomes (92.3%) compared to older age groups ($p = 0.029$). Males had a significantly higher proportion of good outcomes (92.3%) compared to females (55.6%) ($p < 0.0001$).

REFERENCES

1. Solberg BD, Moon CN, Franco DP, Paiement GD. Surgical Treatment of Three and Four-Part Proximal Humeral Fractures. JBJS. 2009 Jul 1;91(7):1689.
2. Capo JT, Criner KT, Shamian B. Exposures of the humerus for fracture fixation. Hand Clin. 2014 Nov;30(4):401-14, v.
3. Paryavi E, Pensy RA, Higgins TF, Chia B, Eglseder WA. Salvage of upper extremities with humeral fracture and associated brachial artery injury. Injury. 2014 Dec;45(12):1870-5.
4. Samart S, Apivatgaroon A, Lakchayapakorn K, Chemchujit B. The correlation between acromion-axillary nerve distance and upper arm length; a cadaveric study. J Med Assoc Thail Chotmaihet Thangphaet. 2014 Aug;97 Suppl 8:S27-33.
5. Iyengar JJ, Ho J, Feeley BT. Evaluation and Management of Proximal Humerus Fractures. Phys Sportsmed. 2011 Feb;39(1).

6. Boons HW, Goosen JH, Van Grinsven S, Van Susante JL, Van Loon CJ. Hemiarthroplasty for Humeral Four-part Fractures for Patients 65 Years and Older: A Randomized Controlled Trial. *Clin Orthop*. 2012 Dec;470(12):3483–91.
7. Yüksel HY, Yılmaz S, Akşahin E, Çelebi L, Muratlı HH, Bıçimoğlu A. The Results of Nonoperative Treatment for Three- and Four-Part Fractures of the Proximal Humerus in Low-Demand Patients. *J Orthop Trauma*. 2011 Oct;25(10):588–95.
8. Torrens C, Corrales M, Vila G, Santana F, Caceres E. Functional and Quality-of-Life Results of Displaced and Nondisplaced Proximal Humeral Fractures Treated Conservatively. *J Orthop Trauma*. 2011;25(10).