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A STUDY OF SURGICAL MANAGEMENT OF PROXIMAL HUMERUS FRACTURES

Orthopaedics

Aditi Munmun Sengupta*
Member Academy of Family Physicians of India, Harvard Medical School, Dept of CME Post Graduate Association member. *Corresponding Author

ABSTRACT

Background: Proximal humerus fractures are common in elderly patients and often pose a challenge due to osteoporotic bone and complex fracture patterns. While non-operative treatment suffices for many, displaced and unstable fractures frequently require surgical intervention to restore anatomy and function. **Objective:** To evaluate clinical and radiological outcomes of surgically managed proximal humerus fractures and determine factors influencing functional recovery. **Methods:** A prospective observational study was conducted on 60 patients with displaced proximal humerus fractures treated surgically between January 2023 and December 2024 at a tertiary care center. Fractures were classified using the Neer classification. Surgical fixation modalities included locking plate osteosynthesis, intramedullary nailing, and hemiarthroplasty based on fracture pattern and bone quality. Functional outcomes were assessed using Constant–Murley Score and DASH (Disabilities of the Arm, Shoulder and Hand) at 6 and 12 months post-operatively. Complications and radiological union were recorded. **Results:** The cohort consisted of 41 females and 19 males, mean age 68.3 ± 10.7 years. According to Neer classification: 2-part (40%), 3-part (42%), 4-part (18%). Locking plates were used in 38 patients, intramedullary nails in 12, and hemiarthroplasty in 10. At 12 months, the mean Constant score was 78.2 ± 11.5 and mean DASH score was 19.4 ± 8.7. Patients with 2-part fractures showed significantly better functional outcomes ($p < 0.05$). Complications included screw cut-out (3.3%), avascular necrosis (5%), and shoulder stiffness (8.3%). Radiological union was achieved in 90% by 16 weeks. **Conclusion:** Surgical management of displaced proximal humerus fractures yields satisfactory functional outcomes, especially when anatomical reduction and stable fixation are achieved. Locking plate fixation remains the mainstay in multi-fragmentary fractures, while arthroplasty has a role in complex 4-part and head-split fractures in elderly patients.

KEYWORDS

humerus, fracture, conservative, surgical, fixation

INTRODUCTION

Proximal humerus fractures account for approximately 5–6% of all fractures and are particularly prevalent in the elderly due to osteoporosis and fall-related injury mechanisms (figure1). Treatment strategies range from conservative immobilization to complex surgical reconstruction depending on displacement, patient age, bone quality, and functional demands. Multifragmentary patterns (3- and 4-part) have higher risk of malunion and poor function without surgical intervention (1).

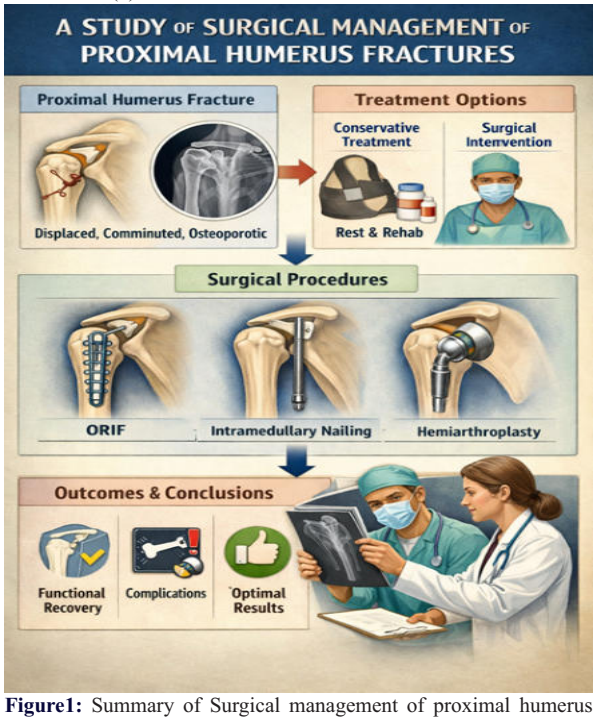

Figure1: Summary of Surgical management of proximal humerus fractures

Given advancements in fixation devices and perioperative care, surgical options now include locking plates, intramedullary devices, and arthroplasty (hemiarthroplasty or reverse shoulder arthroplasty). However, optimal selection of surgical modality remains a subject of ongoing research (2).

MATERIALS AND METHODS

Study Design and Setting

Prospective observational study conducted at a tertiary care hospital after Institutional ethical approval from January 2023 to December 2024.

Inclusion Criteria

- Age ≥18 years
- Displaced proximal humerus fracture (Neer 2-part, 3-part, 4-part)
- Presented within 2 weeks of injury

Exclusion Criteria

- Open fractures
- Pathological fractures
- Pre-existing shoulder pathology
- Neurological deficit affecting the ipsilateral limb

Preoperative Assessment

Fracture classification was performed using standard anteroposterior and lateral shoulder radiographs, supplemented with CT scans in complex patterns.

Surgical Protocol

Patients received regional or general anesthesia. Choice of surgical technique:

- **Locking Plate Osteosynthesis** (PHILOS/Equivalent) for most displaced 2- and 3-part fractures
- **Intramedullary Nailing** for select 2- and some 3-part fractures
- **Hemiarthroplasty** for comminuted 4-part, head-split, and osteoporotic bone where fixation would be unreliable

Standard deltopectoral approach was used in plate and arthroplasty cases. Perioperative antibiotics and thromboprophylaxis were administered per institutional protocol.

Postoperative Rehabilitation

- Sling immobilization for 2–3 weeks
- Passive range-of-motion (ROM) initiated at 2 weeks
- Active assisted ROM at 6 weeks
- Strengthening from 10–12 weeks

Outcome Measures

- **Functional:** Constant–Murley Score and DASH at 6 and 12 months
- **Radiological:** Time to union
- **Complications:** Infection, screw penetration, non-union,

avascular necrosis

Statistical Analysis
Data analyzed using SPSS v26. Continuous variables expressed as mean ± SD. ANOVA and chi-square tests used with significance at $p < 0.05$.

RESULTS
Demographics

Parameter	Value
Total patients	60
Mean age	68.3 ± 10.7 years
Gender (F:M)	41:19
Mechanism of injury	Fall (78%), RTA* (22%)
*Road Traffic Accidents	

Fracture Patterns (Neer Classification)
- 2-part: 24 (40%)
- 3-part: 25 (42%)
- 4-part: 11 (18%)

Surgical Procedures
- Locking Plate: 38
- Intramedullary Nail: 12
- Hemiarthroplasty: 10

Functional Outcomes
At 12 months:
- Mean Constant Score: 78.2 ± 11.5
- Mean DASH Score: 19.4 ± 8.7

Patients with 2-part fractures had statistically superior scores compared to 3- and 4-part ($p = 0.03$).

Complications
- Screw cut-out: 2 (3.3%)
- Avascular Necrosis (AVN): 3 (5%)
- Shoulder stiffness: 5 (8.3%)
- Superficial wound infection: 2 (3.3%)

Radiological Union
Union achieved in 54 out of 60 (90%) by 16 ± 3 weeks. Non-union occurred in 6 patients, all in the locking plate group with poor bone quality.

DISCUSSION
This study demonstrates favorable outcomes for surgically managed proximal humerus fractures with careful patient selection and appropriate fixation strategy. Locking plates provided stable fixation allowing early mobilization but had risks of hardware irritation and screw cut-out, particularly in osteoporotic bone. Intramedullary nailing offered minimally invasive fixation with acceptable outcomes in select patterns. Hemiarthroplasty yielded moderate results in complex fractures where reconstruction was impractical(3,4).

Functional outcomes were consistent with published literature, which reports constant scores in the range of 70–85 for surgically treated fractures. AVN remains a challenging complication in 4-part and head-split fractures due to compromised blood supply.

Limitations
- Single-center study
- Relatively small sample size
- Lack of long-term follow-up beyond 12 months

CONCLUSIONS
Surgical management of displaced proximal humerus fractures leads to satisfactory clinical and radiological outcomes when fracture reduction and stable fixation are achieved. Locking plate fixation is effective for most displaced fractures, whereas arthroplasty should be considered in complex patterns with poor bone quality (5,6, 7).

DECLARATIONS
Ethical Considerations:
This material is the author's own original work, which has not been previously published elsewhere**.** Confidentiality of data was strictly maintained throughout the study. Permission from Institutional ethical committee has been taken.

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Conflict Of Interest
The author states that the study was conducted for educational purpose only, in absence of any commercial or financial relationships that may give rise to a potential conflict of interest.

Contribution Of Authors
AMS- Conceptualized and designed the study, literature search, data collection, interpreted the study, prepared first draft of the manuscript, critical revision of the manuscript.

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