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# Surgical management of displaced fractures of the proximal humerus and its functional outcome

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**Abstract**
Proximal humeral fractures account for 4-5% of all fractures. The optimal management of displaced fracture remains controversial. This study was designed to assess the surgical management of displaced fractures of the proximal humerus and its functional outcome. A total of 35 cases with displaced humeral fractures underwent surgical management above 18 years age were recruited. The clinical and radiological examination was conducted and post-operative assessment was done to evaluate pain, function and rotation of fractured location and radiological evaluation for fracture union. Majority cases were in between 51-60 years (34.2%) and 41-50 years (28.47%). Majority cases had fractures by road traffic accidents (62.8%) followed by falling injuries (31.4%) and by other causes (8.57%). 51.4% of cases had no pain, 28.5% cases had mild pain, 8.57% cases had pain with activity and 8.57% of cases had pain during rest. 82.85% of cases had excellent functional outcome, 14.28% of cases had moderate and 2.85% cases had a poor functional outcome. The overall outcome was excellent in 68.57% cases, good in 20% cases, moderate in 8.57% cases and poor in 2.85% cases. The Surgical approach in the management of displaced proximal humeral fractures had less pain, greater range of motion and less stiffness of fracture site. Functional outcome was better in 2 part fractures.

**Keywords:** Proximal humeral fractures, pain relief, functional outcome, range of movement

## Introduction
Proximal humeral fractures are usually seen in elderly people and osteoporotic cases. It accounts for 4-5% of all fractures [1, 2]. The incidence of fractures is approximately 3/10000 in a year with female dominance [3, 4]. Usually, humeral fractures are stable, nondisplaced or minimally displaced, which can be treated by immobilization, casta and splints. But the conservative approach is allied to avascular necrosis, malunion and nonfusion [5]. Displaced and unstable fractures are preferably managed by screw fixation, percutaneous fixation and open and closed reduction, internal fixation and hemiarthroplasty [6, 7]. But, the literature suggests that none of the above approach is considered as the best method to manage proximal humerus fractures [8]. The surgical outcome depends on age, bone quality and good evaluation of the current fixation techniques. This study was designed to assess the surgical management of displaced fractures of proximal humerus and its functional outcome.

## Materials and Methods
The present prospective study was conducted in the Department of Orthopaedics, MNR Medical College and Hospital, Sangareddy from April 2017 to December 2019. A total of 35 cases with displaced humeral fractures underwent surgical management were recruited. Cases above 18 years age and had displaced humeral fractures were included. Cases under 18 years (Non-fusion of epiphysis), cases with severe cognitive impairment, compound fractures, cases with systemic complication and not willing to participate were excluded from the study. Informed consent was obtained from all the cases and study methodology was approved by the institutional ethics committee.
Clinical examination and demographic data were noted. Anteroposterior, lateral and axillary view and chest AP view radiographs were reviewed preoperatively along with CT scan to assess the type, extension and classify fractures. Post-operative follow up was done for first three months and later, every three months with a minimum follow-up period was 6 months

maximum period was 24 months. Post-operative assessment was done to evaluate pain, function and rotation of fractured location and radiological evaluation for fracture union. Constant and Murley's score was used to assess the functional outcome. The outcome values were graded by using Neer's 100 units rating system which contains 35 units for pain, 30 units for function, 25 units for a range of motion and 10 units for the anatomy of site.

## Results

**Table 1:** Demographic data of study participants.

| Parameter | Total cases (n=35) | |
|---|---|---|
| | Number | Percentage (%) |
| **Age (In years)** | | |
| 18-30 years | 03 | 8.57% |
| 31-40 years | 05 | 14.2% |
| 41-50 years | 10 | 28.57% |
| 51-60 years | 12 | 34.2% |
| Above 60 years | 05 | 14.2% |
| **Side of fracture** | | |
| Unilateral Right side | 27 | 77.14% |
| Unilateral left side | 08 | 22.8% |
| **Mode of fracture** | | |
| Road traffic accidents | 22 | 62.8% |
| Due to falling | 11 | 31.4% |
| Others (Assult) | 03 | 8.57% |
| **Nature of fracture** | | |
| Open fracture | - | - |
| Closed fracture | 35 | 100% |
| **Neer's type of fracture** | | |
| 2 part | 22 | 62.8% |
| 3 part | 08 | 22.8% |
| 4 part | 05 | 14.2% |
| **Details of dislocation** | | |
| Dislocation 2 part | 07 | 20% |
| Dislocation 3 part | 05 | 14.2% |
| Dislocation 4 part | 03 | 8.5% |
| No dislocation | 20 | 57.14% |

**Table 2:** Details of types of implants used in the present study.

| Implant type | Total cases (n=35) | | 2 part | 3 part | 4 part |
|---|---|---|---|---|---|
| | Number | Percentage | | | |
| K-Wire | 11 | 31.42% | 07 | 01 | 03 |
| Cancellous screw | 04 | 11.42% | 04 | - | - |
| T buttress plate | 05 | 14.2% | 03 | 02 | - |
| TBW | 03 | 8.5% | 01 | 02 | - |
| LCP | 08 | 22.8% | 02 | 03 | 03 |
| Cancellous screw with K wire | 02 | 5.71% | 01 | - | - |
| Cancellous screw with TBW | 02 | 5.71% | 01 | - | - |

**Table 3:** Post-operative complication in the study participants.

| Post-Op Complications | Total cases (n=35) | |
|---|---|---|
| | Number | Percentage (%) |
| **Early Complications** | | |
| Wound gapping | 02 | 5.7% |
| Skin necrosis | 01 | 2.8% |
| Deltoid atony | 02 | 5.7% |
| Axillary nerve damage | 02 | 5.7% |
| **Late complications** | | |
| Malunion | 03 | 8.5% |
| Non union | - | - |
| Joint instability | 02 | 5.7% |
| Heterotopic ossification | 01 | 2.8% |
| Joint stiffness | 05 | 14.2% |

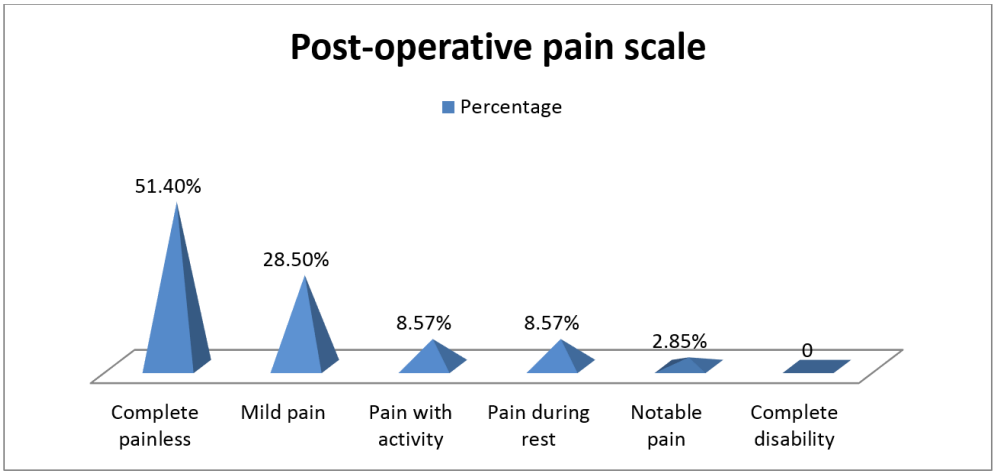


**Fig 1:** Details of Post-operative pain in study participants.

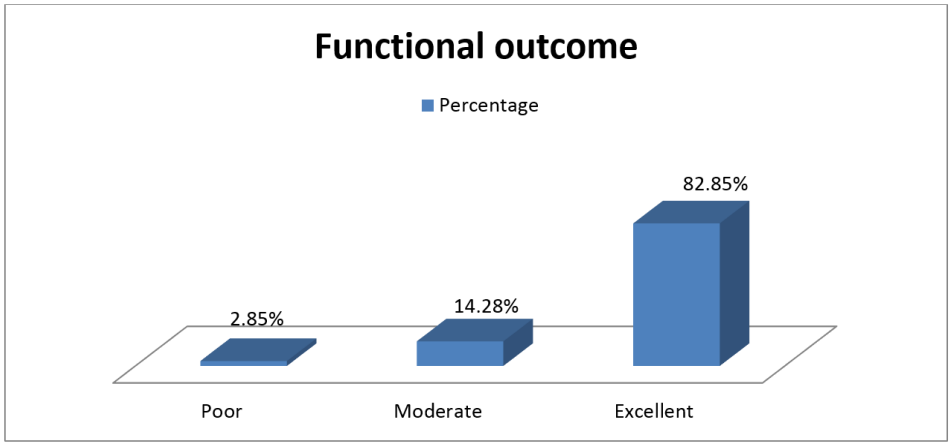


**Fig 2:** Status of functional outcome of fracture in study participants.

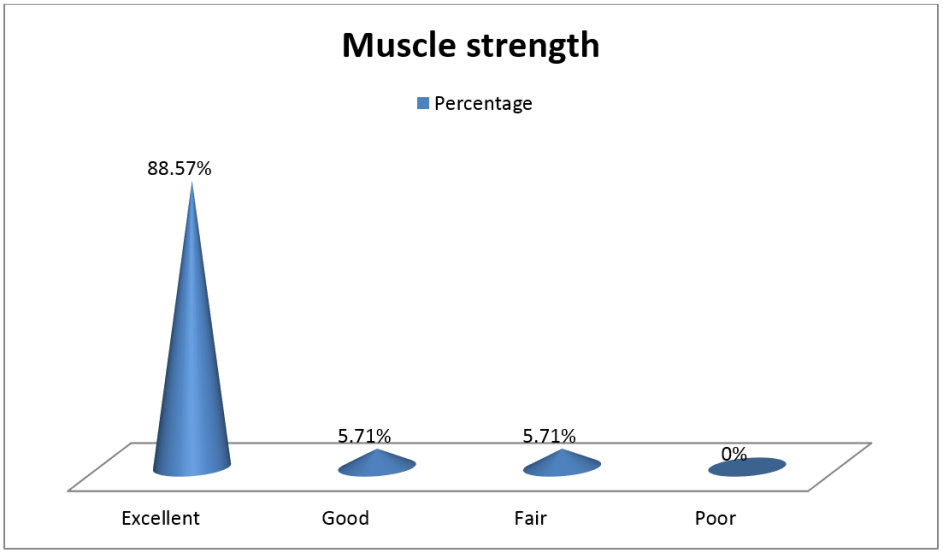


**Fig 3:** Details of post-operative muscle strength in study participants.

**Table 4:** Details of range of movements.

| Movement | Range (In degrees) | Average (In degrees) |
|---|---|---|
| Flexion | $80^0$-$120^0$ | $98.24^0$ |
| Extension | $30^0$-$55^0$ | $49^0$ |
| Abduction | $70^0$-$160^0$ | $134.1^0$ |
| Internal rotation | T3-L4 | T12 |
| External rotation | $35^0$-$60^0$ | $53^0$ |
| Elevation | $90^0$-$170^0$ | $141.3^0$ |

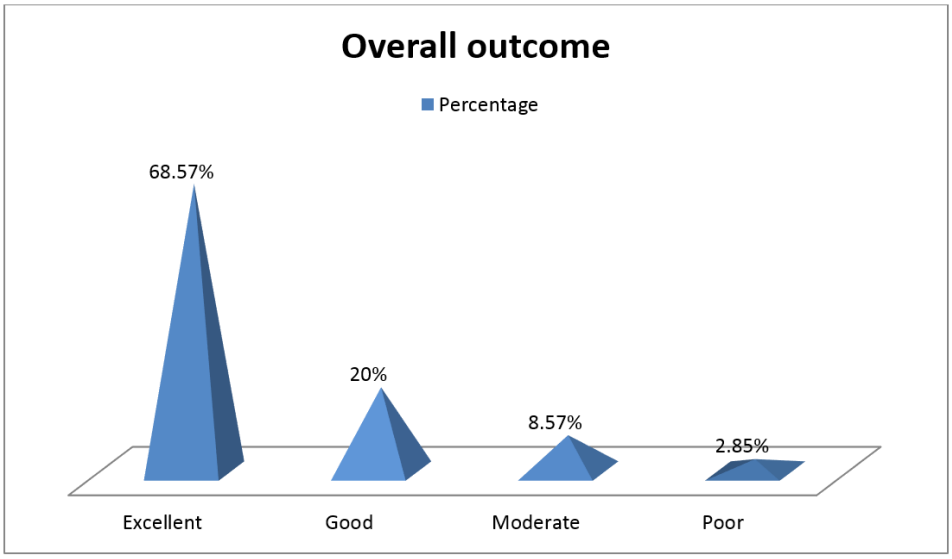


**Fig 4:** Details of overall outcome of the study.

## Discussion

The management of proximal humeral fractures has various options namely operative and non-operative. Non-operative option is poor in obtaining early mobilization [9]. The operative method has many options likely closed K-wire fixation, open reduction internal fixation, external fixation, percutaneous screw fixation, and tension band fixation. But every procedure has its limitations and drawbacks. This study was designed to assess the surgical management of displaced fractures of the proximal humerus and its functional outcome. This study includes 35 cases with displaced humeral fractures underwent surgical management. Majority cases were in between 51-60 years (34.2%) and 41-50 years (28.47%). A study by Srinivasan anbu *et al*., included cases ranged from 16-70 years with mean age 44 years and majority cases were in their 5th decade (30%) [10]. A study by Sharma *et al*., included cases ranged from 27-85 years with mean age 51.1 years [11].

In this study, majority cases had fractures by road traffic accidents (62.8%) followed by falling injuries (31.4%) and by other causes (8.57%). A study by Srinivasan anbu *et al*., noticed that majority cases had injuries by fall at ground level (45%), followed by road traffic accidents (35%), fall from height (15%) and epilepsy (5%) [10]. A study by Shiva *et al*., on 26 cases, noticed that majority cases had injuries by road traffic accidents (20 cases), followed by self fall in 6 cases [11]. Sharma *et al*., in their study noticed that 75% cases had falling injuries and 25% cases had road traffic accidents [12]. Jagiasi JD *et al*., in their study found that majority cases had fractures due to falling injuries (60%), followed by road traffic accidents (40%) [13]. Vijayanand A *et al*., in their study found that majority cases had fractures due to road traffic accidents (60%), followed by falling injuries (40%) [6]. In this study, as per Neer's type of fracture classification, the most common type of fracture was 2 part fracture (62.8%), followed by 3 part fractures (22.8%) and 4 part fracture (14.2%). As per Vijayanand A *et al*., the most common type of fracture was 2 part (40%), followed by 3 part (26.7%) and 4 part (23.3%) [6]. In a Study by shiva *et al*., most common type of fracture was 2 type (15 cases) followed by 3 part (11 cases) [11].

In this study, 51.4% of cases had no pain, 28.5% of cases had mild pain, 8.57% cases had pain with activity and 8.57% cases had pain during rest. 82.85% of cases had excellent functional outcome, 14.28% of cases had moderate and 2.85% cases had a poor functional outcome. 88.57% of cases had excellent muscle strength, 5.71% of cases had good and 5.71% cases had fair muscle strength. A study by Anbu S *et al*., had a good outcome in cases, fair outcome in 16 cases and poor outcome in 4 cases [10].

In this study, the overall outcome was excellent in 68.57% cases, good in 20% cases, moderate in 8.57% cases and poor in 2.85% cases. A study by Anbu S *et al*., had excellent outcome in 50% cases, a satisfactory outcome in 30% cases, the unsatisfactory outcome in 10% cases and failure outcome in 10% cases [10]. A study by Jagiasi JD *et al*., had excellent outcome in 40% cases, very good outcome in 6.66% cases, good outcome in 30% cases, fair outcome in 20% and poor outcome in 3.33% cases [13]. A study by Vijayanand A *et al*., had excellent outcome in 23 cases, satisfactory outcome in 4 cases, unsatisfactory outcome in 2 cases and one case had a failure [6].

## Conclusion

Management of proximal humeral fractures and deciding the treatment modality is a major task for the orthopaedic surgeon. The surgical approach in the management of displaced proximal humeral fractures had less pain, greater range of motion and less stiffness of fracture site. Functional outcome was better in 2 part fractures.

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