

FUNCTIONAL OUTCOMES OF CLOSE REDUCTION AND PERCUTANEOUS PINNING IN PROXIMAL HUMERUS FRACTURES

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ABSTRACT

INTRODUCTION

Proximal humerus fractures are usually sustained from trivial fall in elderly. These fractures are usually associated with severe degree of comminution and deformity. Therefore, anatomical reduction of fracture fragments, and early mobilization are key factors for optimal outcomes of involved limb. This study was intended to evaluate the functional outcomes of proximal humerus fractures in adults managed by closed reduction and percutaneous pinning (CRPP).

MATERIAL AND METHODS

This prospective and observational hospital based study was carried out in Orthopedics Department, Universal College of Medical Sciences-Teaching Hospital (UCMS-TH) from July 2021 to June 2023. All patients with proximal humerus fractures who fulfilled the inclusion criteria and who underwent closed reduction and percutaneous pinning were enrolled in the study and functional outcome was assessed according to Constant murley scoring system and Visual analogue score. Post-operatively patients were regularly followed at 6 weeks, 3 months and 6 months.

RESULTS

In this study of 60 cases, the mean age group was 53.08 ± 13.10 years and male patients outnumbered female patients (37 males and 23 females). Forty one cases (68.3%) were of right side and 19 (31.7%) were of the left side. Majority of the fractures were due to fall injury (53.3%), followed by road traffic accident (40%). The mean Constant Murley Score was 76.95 ± 5.53 and VAS (visual analogue score) was 1.97 ± 0.97 .

CONCLUSION

Closed reduction and percutaneous pinning is simple, less invasive and effective procedure for proximal humerus fracture providing good functional outcome.

KEYWORDS

Proximal humerus fracture, Closed reduction and percutaneous pinning, Functional outcome

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INTRODUCTION

Proximal humerus fractures are increasing due to increase in road traffic accidents, increasing sports related activity and increase in the incidence of osteoporosis. Its overall fracture incidence is about 4-5% and recent reports show that over 70% of all proximal humeral fractures occur in patients over 60 years.¹ Most of these fractures occur due to low velocity trauma like fall from standing height. In young adults, these fractures more commonly occur due to high velocity trauma. These fractures are more common in female individuals, with a ratio of 2 to 3:1.²

Several therapeutic approaches have been proposed depending on fracture pattern, patient's age, general health status and patient's level of activity. Conservative treatment, open reduction and internal fixation (ORIF), joint replacement, and percutaneous pinning are the various treatment modalities for these fractures.³⁻⁸ Conservative treatment has few indications with late functional recovery and joint stiffness. Being a non-invasive and non-surgical treatment modality, it may be an effective treatment in undisplaced or mildly displaced fractures. Joint replacement procedure has also very limited indications where strict selection of patients is mandatory. Although it has faster active recovery rate, it is considered as major surgical procedures with significant complication rare like bleeding, infection etc.^{5,6} Advantages of ORIF with plates and screws are anatomic restoration of fracture and early mobilization; however, open surgery may be associated with higher rates of infections, avascular necrosis of the humeral head and neurovascular lesions.⁴ Minimally invasive techniques like percutaneous pinning, where soft tissue disruption is minimal may offer advantages over conventional fixation methods. Percutaneous pinning has been described as a viable treatment option for a multitude of fractures in all age groups.⁹⁻¹¹

Thus, with this background we conducted this study to determine the clinical and functional outcome of proximal humerus fracture managed with closed reduction and percutaneous pinning.

MATERIAL AND METHODS

Study design/ place and duration of study

This prospective hospital-based observational study was carried out in the Department of Orthopedics, UCMS-TH, Bhairahawa from July 2021 to June 2023

Ethical approval and patient consent

After ethical clearance (UCMS/IRC/087/21) from Institutional Review Board (IRB) of UCMS-TH, all patients with proximal humerus fracture (Neers classification),¹² who fulfilled the inclusion criteria were enrolled in the study. Patients were informed about the purpose of the study and written consent was taken. Cases were admitted either via Out-patient department (OPD) or emergency department of UCMS-TH. Data collection was done by the researcher.

Sample size and sampling technique

The targeted sample size after using the sample size formula ($n = z^2 pq/d^2$) was 60.

[n =required sample size; p =prevalence of disease (4%);¹ $q=100-p$; $z=1.96$ taken at 95% confidence interval; d =allowable error taken as 5%; $P=2\%$, $q=98\%$]

Displaced proximal humerus fracture, acute injuries and age above 18 years were included in the study.

Open fractures, pathological fractures, undisplaced proximal humerus fractures, congenital anomaly and previous fracture of the affected limb were excluded.

Patient management

All the cases with proximal humerus fracture who presented in the OPD or casualty department meeting the inclusion criteria were included in the study. Demographic data such as age, sex and address were recorded along with information regarding mode of injury, side involved and other associated injuries. Depending on the radiological findings, fracture was classified according to Neer's classification. Radiographical images of the affected region were taken along with CT-scan if needed. Pre-anesthetic check-up along with pre-operative investigations was done.

Surgical technique

In the operation theatre, prophylactically all patients were given Inj. cefuroxime 1.5 gram intravenous injection half an hour before surgery. After brachial block or general anesthesia, patient was placed in a supine position and far laterally on the table as possible with lateral thorax support to prevent the patient from being pulled off the operating table. The involved extremity was draped to allow free mobility for reduction maneuvers, fixation and radiographic imaging. Long sterile drape was placed under axilla for counter-traction. Reduction of the fracture was done under the vision obtained by image intensifier and fracture was fixed by 2.5mm K-wires and K-wires were used according to number of fragments. Post-operatively, x-ray of shoulder was taken on the day of surgery. Analgesics and antibiotics were given for days to weeks depending upon the patient's pain tolerance and wounds status respectively. Post-operative immobilization was done by shoulder immobilizer and active mobilization of elbow and wrist was encouraged on first postoperative day. K-wires site dressing was advised within interval of 3 days and was removed after x-rays done in 6 weeks depending on the status of fracture.



Figure 1. Pre-operative x-ray

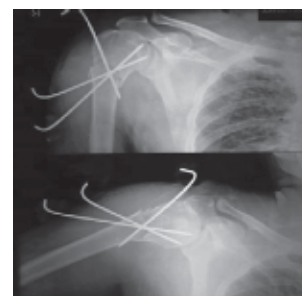


Figure 2. Post-operative x-ray

Regular follow-ups were done at 6 weeks, 3 months and 6 months. In every follow-up, patient's clinical and radiographic findings, range of motion and patient's daily functional activity were assessed. Finally at 6 months, functional assessment of shoulder was assessed by using visual analogue score (VAS) and Constant Murley score.¹³ Complications such as pin-tract infection, shoulder stiffness were treated by regular dressing, antibiotics and physiotherapy.



Figure 3 and 4. Follow up at 6-month post-op

Statistical analysis

All the data were collected using pre-designed Performa that included patients demographic profile, general history, clinical and radiological findings and regular follow up. Data were entered and analyzed by SPSS Vs.20. Descriptive statistics like frequency, percentage, mean, standard deviation and ANOVA were used to analyze the data.

RESULTS

In this study, the mean age group was 53.08 ± 13.10 years ranging from 18 years to 72 years and male patients outnumbered female patients (37 males and 23 females). Out of 60 cases, 46 cases (76.7%) were of right side and 16 (23.3%) were of the left side. Majority of the fractures were due to fall injury (53.5%), followed by road traffic accident (40%).

Table 1. Demographic variables

| Variables | Frequency (n) | Percentage (%) |
|-----------------------|-------------------|----------------|
| Gender | | |
| Male | 37 | 61.7 |
| Female | 23 | 38.3 |
| Age (in years) | 53.08 ± 13.10 | |
| Side | | |
| Right | 41 | 68.3 |
| Left | 19 | 31.7 |
| Mode of injury | | |
| Road traffic accident | 24 | 40 |
| Fall injury | 32 | 53.3 |
| Physical assault | 4 | 6.7 |
| Complication | | |
| Yes | 4 | 6.7 |
| No | 56 | 93.3 |

Most of the cases were Neer 2 parts (28 patients; 46.7%) and 3 parts (21 patients; 35%). Only 4 patients (6.7%) had minor complications like pin tract infection. After 6 months, the mean Constant Murley Score was 76.95 ± 5.53 where Neer 2 parts, 3 parts and 4 parts had mean of 76.07 ± 4.78 , 76.33 ± 5.42 and 80.36 ± 6.67 respectively. The mean VAS (visual analogue score) was 1.97 ± 0.97 . The mean Constant Murley Score difference between different classifications of Neer was calculated by using ANOVA test. The result showed that there was no significant mean difference between different classification of Neer ($p=0.074$).

Table 2. Difference between Neers and Murley score in ANOVA TEST

| Neer | N | Mean | Std. Deviation | p value |
|---------|----|-------|----------------|---------|
| 2 parts | 28 | 76.07 | 4.78 | 0.074 |
| 3 parts | 21 | 76.33 | 5.42 | |
| 4 parts | 11 | 80.36 | 6.67 | |
| Total | 60 | 76.95 | 5.53 | |

DISCUSSION

Several therapeutic approaches have been proposed depending on fracture pattern, patient's age, general health status and patient's level of activity. Conservative treatment, open reduction and internal fixation (ORIF), joint replacement, and percutaneous fixation are the various treatment modalities for these fractures.³⁻⁸ Minimally invasive techniques like percutaneous pin fixation, where soft tissue disruption is minimal may offer advantages over conventional fixation methods. Percutaneous fixation has been described as a viable treatment option for a multitude of fractures in all age groups.⁹⁻¹¹

In this study, the mean age group was 53.08 ± 13.10 which is similar to the study done by Dolfi et al¹⁴ where the mean age group was 50 years. There were 37 males (61.7%) and 23 females (38.3%) which is similar to study done by Yu et al¹⁵ where there were 40 males (62.5%) and 24 females (37.5%). In this study, out of 60 cases, 41 cases (68.3%) were of right side and 19 (31.7%) were of the left side which is similar to the study done by Keener et al¹⁶ where 62.9% were of right side and 37.03% were of left hand. In this study, the major cause of fracture was fall injury (53.3%), followed by road traffic accident (40%) which is similar to the study done by Dolfi et al¹⁴ where fracture were due to fall injury (50%) and road traffic accident (45%). In this study, majority of the cases were Neer 2 parts (28 patients; 46.7%) and 3 parts (21 patients; 35%) which is similar to the study done by Dolfi et al¹⁴ where majority cases were Neer 2 parts (51.2%) and 3 parts (39.02%). Only 4 patients (6.7%) had minor complication like pin tract infection and loosening which is similar to the study done by Keener et al¹⁶ where 4% had minor complications. All were treated with local wound care and dressing. At 6 months, the mean Constant Murley score was 76.95 ± 5.53 which is similar to the study done by Brunner et al¹⁷ and Fenichel et al¹⁸ where the mean Constant Murley score was 73.6 and 81 respectively. In this study, the mean VAS (Visual Analogue Score) was 1.97 ± 0.97 which is similar to the study by Brunner et al¹⁷ and Magnovern et al¹ where the mean VAS (Visual Analogue Score) was 1.4. In this study, the mean Constant Murley Score difference between different classifications of Neer showed no significant difference ($p=0.074$) which is similar to the study done by Yu et al¹⁵ where there was no significant difference ($p > 0.05$) at 6-month follow-up.

Like the other studies, our study had few limitations. The study was done in single centre along with small sample size. Our study follow-up was only for 6 months, so longer follow-up cohort study is required for better result.

CONCLUSION

Closed reduction and percutaneous pinning is simple, less invasive and effective procedure for proximal humerus fracture providing good functional outcome.

CONFLICT OF INTEREST

None

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