

FUNCTIONAL OUTCOMES OF OPEN REDUCTION AND INTERNAL FIXATION IN PROXIMAL HUMERUS FRACTURES BY PHILOS PLATE

Shreshal Shrestha,¹ Prakriti Raj Kandel,¹ Bipan Shrestha,¹ Kishorman Shrestha,¹ Subash Pandey,¹ Dipendra Singh Chhetri,² Sanjeeb Babu Gharti³

ABSTRACT

INTRODUCTION

Proximal humerus fractures are one very common and usually occur in elderly people. These fractures are usually associated with some degree of comminution and deformity. Therefore, good anatomical reduction of fracture fragments and early mobilization are the main component for optimal outcomes of involved limb. This study was intended to evaluate the functional outcome of proximal humerus fracture in adults managed by open reduction and internal fixation (ORIF) by proximal humerus interlocking osteosynthesis (PHILOS) plate.

MATERIAL AND METHODS

This prospective and observational hospital based study was carried out in Orthopedics Department of Universal College of Medical Sciences-Teaching Hospital (UCMS-TH) from October 2021 to September 2023. All patients with proximal humerus fractures who fulfilled the inclusion criteria and who underwent open reduction and internal fixation by PHILOS plate were enrolled in the study. 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 55.38 ± 11.40 years and male patients outnumbered female patients (39 males and 21 females). 36 cases (60%) were of right side and 24 (40%) were of left side. Majority of the fractures were due to fall injury (57%) followed by road traffic accident (35%). The mean Constant Murley Score was 78.15 ± 5.620 and VAS (visual analogue score) was 1.88 ± 0.865 .

CONCLUSION

Open reduction and internal fixation by PHILOS plate is an effective procedure providing good anatomical restoration and early mobilization in proximal humerus fracture thus providing good functional outcome.

KEYWORDS

Proximal humerus fracture, Open reduction and internal fixation, Functional outcome

1. Department of Orthopaedics and Trauma Surgery, Universal College of Medical Sciences, Bhairahawa, Nepal
2. Department of Orthopaedics and Trauma Surgery, Devdaha Medical College, Devdaha, Nepal
3. Bhim Hospital, Bhairahawa, Nepal

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For correspondence

Dr. Shreshal Shrestha
Department of Orthopaedics & Trauma Surgery
Universal College of Medical Sciences & Teaching Hospital
Bhairahawa, Nepal
E-mail: loveshresal@gmail.com

INTRODUCTION

Fractures of the proximal humerus account for 4-5% of all fractures and 45% of all humerus fractures. It is more common in elderly patient and is mostly related to osteoporosis.¹ A major proportion of these fractures is stable, undisplaced or minimally displaced and can be treated conservatively. Majority of undisplaced or minimally displaced fractures are treated conservatively and majority of displaced fractures are treated by operative treatment.² Surgical options are numerous including percutaneous pinning, anatomical reconstruction using extra or intramedullary fixation techniques or hemiarthroplasty.³ Conservative treatment are effective in undisplaced or mildly displaced fractures but has side-effects like late functional recovery and joint stiffness. Joint replacement has very limited indications and has faster active recovery but strict selection of patients is mandatory.^{4,5} Minimally invasive techniques may offer advantages over conventional fixation by less chances of infection and minimal blood loss. Percutaneous pinning has been described as a viable treatment option for a multitude of fractures in all age groups but it is considered safe only in stable cases.⁶⁻⁸ Advantages of open reduction and internal fixation (ORIF) by PHILOS plate are anatomic restoration, stable fixation, early mobilization and good functional recovery.⁹

Thus, with this background we have conducted this study to determine the clinical and functional outcome of proximal humerus fracture managed with open reduction and internal fixation by PHILOS plate.

MATERIAL AND METHODS

Study design/ place and duration of study

This prospective hospital-based longitudinal, observational study was carried out in the Department of Orthopedics, UCMS-TH, Bhairahawa from October 2021 to September 2023.

Ethical approval and patient consent

After Ethical clearance (UCMS/IRC/124/21) from Institutional Review Board (IRB) of UCMS-TH, all patients with proximal humerus fracture (Neers classification),¹⁰ 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 ($n = z^2pq/d^2$) 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 (FIG. 1) 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 beach chair position and the involved extremity was draped to allow free mobility for reduction maneuvers, fixation and radiographic imaging. Deltopectoral approach was used and the conjoint tendon was retracted medially. The fragments were indirectly reduced and temporarily fixed with the help of K-wires under image intensifier control. After obtaining acceptable reduction, the long head of the biceps tendon was identified and the plate was then placed at least 8 mm distal to the upper end of the greater tuberosity and lateral to the long head of the biceps without compromising its function. The humeral head fragment as well as the metaphyseal shaft fracture was fixed with locking head screws. Standard length wires were inserted into the humeral head through a guide and the length of screw required was determined by placing a measuring device over the protruding wire and locking screw was inserted. The final position of the implant was checked with the image intensifier in multiple planes along with stability of fixation, range of movements and absence of impingement.¹¹ Post-operatively, x-ray of shoulder (Fig. 2) 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. Incision site dressing was advised within interval of 3 days and suture was removed after 14 days depending on the status of wound.



Fig.1. Pre-operative x-ray **Fig.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 (Fig 3&4) was assessed by using visual analogue score (VAS) and Constant Murley score.¹²



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

Statistical analysis

All the data was collected using preformed Pro forma 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 test were used to analyze the data.

RESULTS

In this study, the mean age group was 55.38 ± 11.40 years ranging from 23 years to 72 years and male patients outnumbered female patients (39 males and 21 females). Out of 60 cases, 36 cases (60%) were of right side and 24 (40%) were of the left side. Majority of the fractures were due to fall injury (57%) followed by road traffic accident (35%).

Table1. Demographic variables

Variables	Frequency (n)	Percentage (%)
Gender		
Male	39	65
Female	21	35
Age	55.38 ± 11.40 years	
Side		
Right	36	60
Left	24	40
Mode of injury		
Road traffic accident	21	35
Fall injury	34	57
Physical assault	5	8
Complication		
Yes	7	11.7
No	53	88.3

Most of the cases were Neer 4 parts (26 patients; 43.3%), 3 parts (22 patients; 35%) and Neer 2 parts (12 patients; 21.7%). Only 7 patients (11.7%) had complications like infections and stiffness. After 6 months, the mean Constant Murley Score was 78.15 ± 5.620 where Neer 2 parts, 3 parts and 4 parts had mean of 83.69 ± 4.328 , 76.43 ± 5.43 and 76.77 ± 4.64 respectively. The mean VAS was 1.88 ± 0.865 . The mean Constant Murley Score difference between different classifications of Neer was calculated by using ANOVA test. The result showed that constant score for 2 parts fracture was significant compared to 3 parts and 4 parts ($p < 0.001$).

Table2. Difference between Neers and Murley score in ANOVA TEST

Neer	N	Mean	Std. Deviation	P Value
2 parts	12	83.69	4.328	
3 parts	22	76.43	5.427	
4 parts	26	76.77	4.642	<0.0001
Total	60	78.15	5.620	

DISCUSSION

In this study, the mean age group was 55.38 ± 11.40 which is similar to the study done by Frima et al¹³ where the mean age group was 59 years. There were 39 males (65%) and 21 females (35%) which is similar to study done by Kumar et al¹⁴ where there were 26 males (63.5%) and 15 females (36.5%). In this study, Out of 60 cases, 36 cases (60%) were of right side and 24 (40%) were of the left side which is similar to the study done by Doshi et al¹⁵ where 58.5% were of right side and 41.5% were of left side. In this study, the major cause of fracture was fall injury (57%), followed by road traffic accident (35%) which is similar to the study done by Vijayvargiya et al¹⁶ where fracture were due to fall injury (53.8%) and road traffic accident (46.2%). In this study, majority of the cases were Neer 4 parts (26 patients; 43.3%) and 3 parts (22 patients; 36.6%) which is similar to the study done by Kiran et al¹⁷ where majority cases were Neer 4 parts (45.09%) and 3 parts (29.41%). Only 7 patients (11.7%) had minor complications like infections and stiffness which is similar to the study done by Doshi et al¹⁵ where 9.4% had complications like varus collapse and screw back out. All were treated with antibiotics, dressing and physiotherapy. At 6 months, the mean Constant Murley score was 78.15 ± 5.620 which is similar to the study done by Thanasas et al¹⁸ and Vijayvargiya et al¹⁶ where where the mean Constant Murley score was 74.3 and 72.5 respectively. In this study, the mean VAS was 1.88 ± 0.865 which is similar to the study done by Sun et al¹⁹ where the mean VAS was 1.2 ± 0.8 . The mean Constant Murley Score difference between different classifications of Neer showed that constant score for 2 parts fracture was more significant compared to 3 parts and 4 parts ($p < 0.001$) which is similar to the study done by Kumar et al¹⁴ where the mean of Constant Score difference between different classifications of Neer showed 2 parts ($p = 0.002$) fracture was more significant compared to 3 parts and 4 parts.

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

Open reduction and internal fixation by PHILOS plate is an effective procedure providing good anatomical restoration and early mobilization in proximal humerus fracture thus providing good functional outcome.

CONFLICT OF INTEREST

None

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