



A PROSPECTIVE STUDY OF FUNCTIONAL OUTCOME OF DISPLACED FRACTURE OF PROXIMAL HUMERUS MANAGED WITH DIFFERENT SURGICAL MODALITIES

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Abstract

Introduction:

Proximal humerus fractures account for 4–5% of all fractures and are commonly treated using various surgical methods. The PHILOS plate, developed by AO-ASIF, offers angular stability and enhanced fixation, promoting early mobilization and improved outcomes. This study evaluates the functional outcomes of different surgical interventions for displaced proximal humerus fractures.

Materials and Methods:

A prospective study was conducted on 30 patients at Vinayaka Mission Kirupananda Variyar Medical College and Hospital, Salem, over 24 months. Ethical clearance was obtained prior to the study.

Results:

Most patients were males (80%) aged 56–60 years (30%), with no prior proximal humerus injuries (73.33%). According to Neer's classification, 63.33% were class III fractures. Neer's shoulder score at follow-up was excellent in 73.33% of cases. Union was achieved in 73.33% of patients within 10–12 weeks, with a mean union time of 12.3 ± 0.4 weeks. Mean Constant-Murley scores showed progressive improvement: 75.81 at 1 month, 81.95 at 3 months, 91.12 at 6 months, and 98.23 at 1 year. Complications included infection (13.33%), malunion (6.66%), and implant failure (3.33%). Most patients stayed in the hospital for over 5 days (93.33%), and reported high satisfaction (86.66%), return to work (73.33%), and preserved range of motion (76.66%).

Conclusion:

Surgical management of proximal humerus fractures—particularly using stable fixation methods like PHILOS plate, yields excellent functional recovery, high union rates, and low complication rates, supporting early rehabilitation and return to daily activities

Keywords

PHILOS, Proximal humerus fractures, Clinical outcome, multiple k- wires, intramedullary nailing and shoulder hemiarthroplasty.

Introduction

Proximal humerus fractures are one of the most common injuries in elderly patients and often occur because of low-energy falls. They are the third most common fractures in older people (after hip and distal radius) [3], accounting for ~5-6% of all fractures.

Displaced fractures of the proximal humerus are a substantial clinical challenge due to difficulty in obtaining and maintaining satisfactory reduction secondary to complex shoulder joint anatomy with an important function at the upper extremity. Proximal humerus fractures have had a significant paradigm shift in the management over time. Treatment consists of different surgical modalities like open reduction and internal fixation (ORIF) with



locking plates, intramedullary nailing or shoulder arthroplasty. All of these methods have their respective indications, advantages as well as possible risks. The type of surgery depends on high variability such as patient age, quality bone quantity and pattern fracture or surgeon experience the decision. Open reduction and internal fixation with locking plates is a popular procedure because it allows for stable fracture fixation while permitting early mobilization. It is, however, fraught with complications like screw perforation and avascular necrosis of the bone as well. Compared with plate fixation, IM nailing is a less invasive option and has the advantage of minimal soft tissue dissection and preservation of periosteal blood supply 1; however, it may not be as efficacious for more complex fracture patterns. Shoulder arthroplasty, which include hemi arthroplasty and reverse total shoulder arthroplasty is usually done in elderly patients with poor bone quality or a severely comminuted fracture to restore the function of the should and alleviate pain. Recovery to the pre-injury level of shoulder function is achieved in 10-12week period, which is said to be primary goal in treatment for proximal humerus fractures. This is achieved through both anatomical reduction and stable fixation as well as an extended rehabilitation program. Functional outcomes depend on multifactorial reasons such as reduction in fracture and stability of fixation, rehabilitation protocol followed post-operatively with the compliance to care by patient other than proficiency. The purpose of this prospective study is to report the functional outcomes in patients with displaced proximal humeral fracture treated by different modalities. This study will also evaluate the incidence of complications related to each treatment modality and potential variables capable of influencing the outcome in a surgical procedure. It is important to place this information in the context of a greater understanding about how these surgical methods compare with respect to relative efficacy and safety, so as to inform clinical decision-making aimed at improving patient care. This study aims to assist in the development of evidence-based recommendations for displaced proximal humerus fracture patients by providing valuable new information and improving their quality of life.

AIM AND OBJECTIVES:

AIM: To access the Functional outcome of fracture using standardised scoring systems like Constant-Murley Score. **Objective:** To compare the functional outcome in displaced fracture of proximal humerus managed through varied surgical interventions.

MATERIALS AND METHODS: The present prospective study was conducted on 30 patients in the Department of Orthopaedics at Vinayaka Mission Kirupananda variyar Medical College and Hospital, Salem for a period of 24 months. Prior to the initiation of the study, Ethical and Research Committee clearance was obtained from Institutional Ethical Committee. Patients ≥ 18 years of age male and female of either of the gender, patients having intra articular, partially articular and extra-articular comminution spiral fractures extending into diaphysis, Three- or four-part displaced, unstable proximal humeral fracture angulation of articular surface in any plane $>45^\circ$ displacement between major fracture fragments ≥ 1 cm, Tribe Patients who could give consent were included in the study. Patients < 18 years of age, Fractures later than 4 weeks or after a pathological fracture, Pathologic fractures, Interventional radiography, unwilling patient for surgery, Patients with a number of different illnesses, Patients without consent to participate and Uncooperative patients were excluded from the study.

INFORMED CONSENT All patients who met selection criteria were informed of the disease process, treatment option and its final outcome along with adverse events, complications & risk for recurrence in between procedure given a written Informed consent before enrolment. The children also were informed that they could terminate the study at any time.

RESULTS:

TABLE 1: AGE WISE DISTRIBUTION OF SUBJECTS

Age group (years)	Number of subjects (N)	Percentage (%)
18 to 25	3	10
26 to 35	4	13.33
36 to 45	6	20
46 to 55	7	23.33
56 to 60	9	30
> 60	1	3.33
Total	30	100



Mostly, participants were in their middle age (56-60 years) that is 9 subjects [30 %].

GRAPH 1: DISTRIBUTION OF SUBJECTS BASING ON THEIR GENDER.

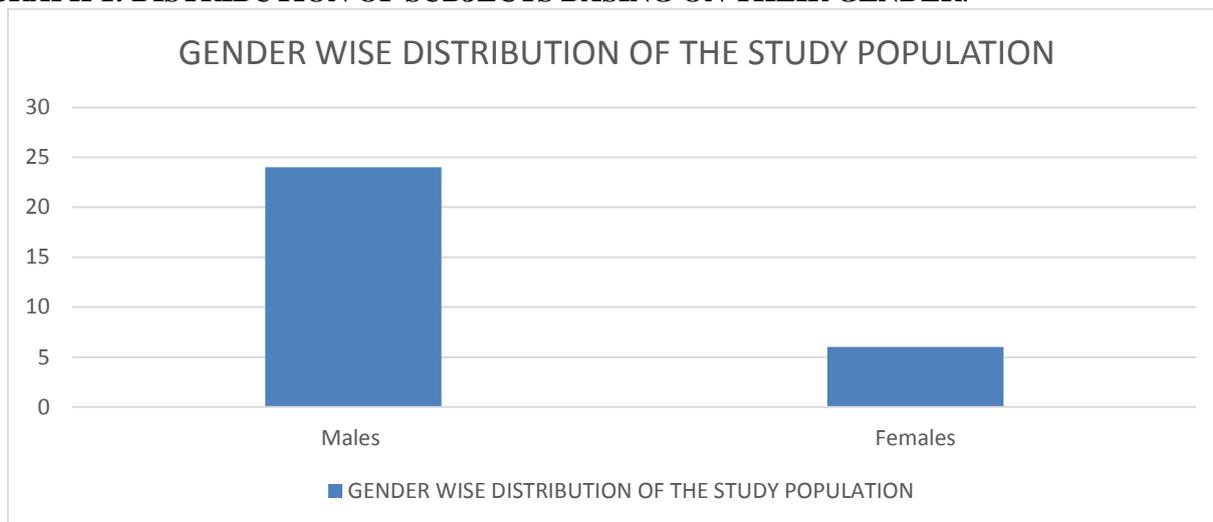


TABLE 2: DISTRIBUTION OF SUBJECTS BASING ON THEIR PAST HISTORY OF PROXIMAL HUMERUS INJURIES

Past history of proximal humerus injuries.	Number of subjects (N)	Percentage (%)
Yes	8	26.66
No	22	73.33
Total	30	100

Majority of subjects had no past history of proximal humerus injuries i.e., 22 subjects (73.33 %)

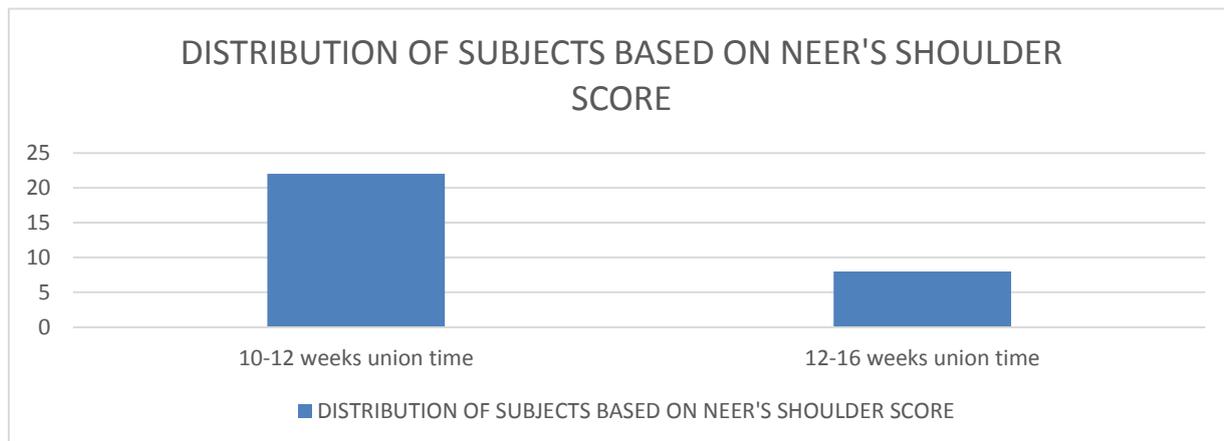
TABLE 3: DISTRIBUTION OF SUBJECTS BASING ON THE NEER'S CLASSIFICATION.

Neer's shoulder score	Number of subjects (N)	Percentage (%)
Excellent	22	73.33
Satisfactory	5	16.66
Unsatisfactory	2	6.66
Failure	1	3.33
Total	30	100

Majority of subjects had excellent score, i.e., 22 subjects (73.33 %); followed by 5 subjects (16.66 %) with satisfactory score; 2 subjects (6.66 %) with unsatisfactory score and finally 1 subject (3.33 %) with treatment failure.



GRAPH 2: DISTRIBUTION OF SUBJECTS BASED ON NEER'S SHOULDER SCORE



Fractures of majority subjects were united within 10 to 12 weeks, i.e., 22 subjects (73.33 %); followed by 8 subjects (26.66 %) with union time of 12 to 16 weeks. The mean union time was 12.3 ± 0.4 weeks.

TABLE 4: DISTRIBUTION OF SUBJECTS BASING ON THEIR UNION TIME OF FRACTURES.

Constant-Murley score	Score	
	Mean	Sd
1 month	75.81	3.58
3 months	81.95	2.15
6 months	91.12	2.45
1 year	98.23	1.11

The mean Constant-Murley score of subjects was 75.81 ± 3.58 ; 81.95 ± 2.15 , 91.12 ± 2.45 and 98.23 ± 1.11 at the end of 1 month, 3 months, 6 months and 1 year respectively.

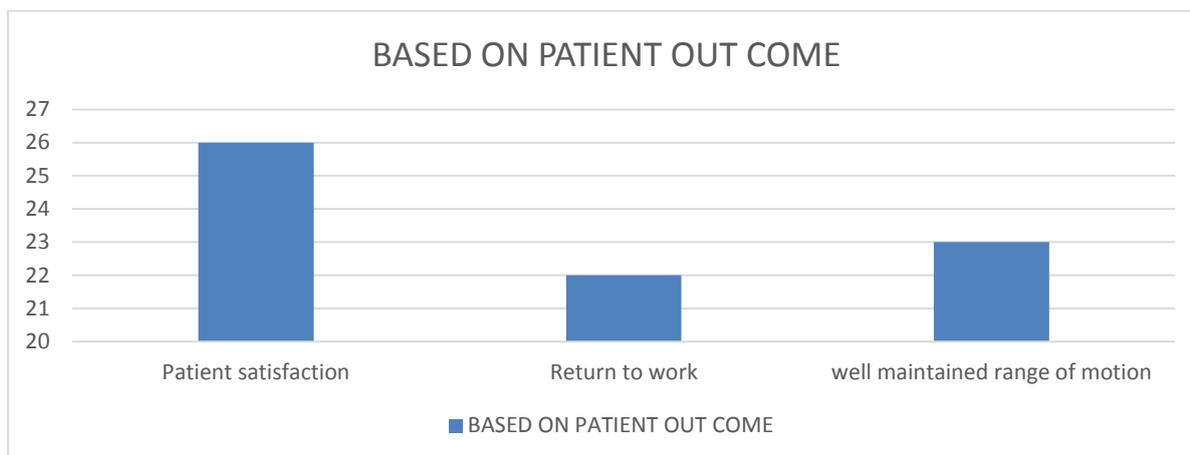
TABLE 5: MEAN DATA OF CONSTANT-MURLEY SCORE OF SUBJECTS AT VARIOUS INTERVALS.

Complications	Number of subjects (N)	Percentage (%)
Non-union	1	3.33
Malunion	2	6.66
Infection	4	13.33
Stiffness	1	3.33
Implant failure	1	3.33

Majority subjects had infection, i.e., 4 subjects (13.33 %); followed by 2 subjects (6.66 %) with malunion; 1 subject (3.33 %) each with non-union, shoulder stiffness and implant failure respectively.



GRAPH 3: DISTRIBUTION OF PATIENTS BASED ON OUT COMES



DISCUSSION:

One of the most frequently seen fractures is proximal humerus fracture. These amount to about 4-5% of the fractures. Cancellous bone support along the humeral neck has been weakened by senility and osteoporosis so that these fractures may occur with equal or even greater frequency than in cancer patients. Three- and four-part fractures constitute 13-16% of proximal humerus fractures. This leads to unmanageable fractures, exacerbated by tremendous morbidity (5,6). The use of k-wire fixation, [1] rush nailing, intramedullary nailing (IMN), [] and plating [] or prosthesis replacement have all been described. The optimal treatment of these fractures remains controversial as most are potentially associated with a failure of osteosynthesis, avascular necrosis (AVN) humeral head and also non-union/malunion of the fracture which could all end in symptomatic painful shoulder based on poor results. In addition, avoid replacement after four-part humeral fractures because satisfactory function is also poor. Based on these pathomechanical concepts, a new plate (PHILOS) has recently been introduced by AO-ASIF to overcome the problems of this fracture and try to maintain biological integrity of humeral head as well achieve an anatomical reduction with multiple screws in combination with angular stable locking. The result is improved osteosynthesis and fixation with the PHILOS plate. It had significantly lower rates of implant failure and subsequent loss of reduction compared to days 3-5 with improved clinical outcomes due to early mobilization. The age range for majority being 56-60 years which was observed in 30 % followed by ages 46-55 years (23.33%), 36-45 years (20%), 26 to 35 (13.33%), 18 to 25 years (10%) and finally >61 year, contributing 3 %. The results of our study were in co-relation with the past studies conducted by Court Brown CM et al¹, Aiyer A et al³ and Kim SH et al⁴. Majority of subjects were males i.e., 80 % followed by 20 % females. The results of our study were in co-relation with the past studies conducted by Court Brown CM et al¹, Aiyer A et al³ and Kim SH et al⁴. Majority of subjects had no past history of proximal humerus injuries i.e., 73.33 % subjects followed by 26.66 % subjects with past history of proximal humerus injuries. The results of our study were in co-relation with the past studies conducted by Court-Brown CM, et al⁷, Schumaier A et al⁸ and Court-Brown CM et al⁹. Majority of subjects were under class III of NEER'S classification, i.e., 63.33 % subjects; followed by 26.66 % subjects under class II and finally 10 % subjects under class I. The results of our study were in co-relation with the past studies conducted by Zyto K et al¹⁰, Kristiansen B et al¹¹ and Kristiansen B et al¹². Majority of subjects had excellent score, i.e., 73.33 % subjects; followed by 16.66 % subjects with satisfactory score; 6.66 % subjects with unsatisfactory score and finally 3.33 % subjects with treatment failure. Proximal humerus fractures of majority subjects were united within 10 to 12 weeks, i.e., 73.33 % subjects; followed by 26.66 % subjects with union time of 12 to 16 weeks. The mean union time was 12.3 ± 0.4 weeks and the mean Constant-Murley score of subjects was 75.81 ± 3.58; 81.95 ± 2.15, 91.12 ± 2.45 and 98.23 ± 1.11 at the end of 1 month, 3 months, 6 months and 1 year respectively. These results of our study were in co-relation with the past studies conducted by Goldman RT et al¹³, Kumar GN et al¹⁴ and Giannoudis PV et al¹⁵. Majority subjects were satisfied with the procedure, i.e., 86.66 % subjects; 76.66 % subjects had well maintained range of motion and finally 73.33 % subjects were able to return to work. The results of our study were in co-relation with the past studies conducted by Hodgson S, et al¹⁶, Vijayanand A et al¹⁷ and Jain H et al¹⁸.



CONCLUSION:

In the treatment of three- and four-parts humerus fractures, anatomic reduction is very important for good results; by using multiplanar locked plate osteosynthesis with locking multidirectional fixing screws (especially onto tubercle fragment regaining), a successful clinical benefit can be achieved safely without loss of periosteal sleeves or soft tissue envelopes around site that provides more primary stability and load transfer through implant to spared remaining trabecular bone stock about prevented complications. Functional outcomes with PHILOS Plate are satisfactory. We advocated this surgical procedure because of its minimal soft-tissue aggression and rapid recovery to function. Most patients, predominantly middle-aged men, showed excellent functional results as judged by the Constant Murley score. He found that most fractures healed reasonably quickly over 10-12 weeks and complications were few. Excellent satisfaction rates and preservation of range of motion resulted in accomplishing return to pre-injury job if performing the surgery further supported its effectiveness. Thus, PHILOS plate can be considered as a dependable alternative for improving the results of proximal humerus-fracture fixation.

CONFLICT OF INTEREST: NIL

EXTERNAL FUNDING: NIL

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