



# International Journal of Orthopaedics Sciences

E-ISSN: 2395-1958  
P-ISSN: 2706-6630  
IJOS 2021; 7(1): 109-112  
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[www.orthopaper.com](http://www.orthopaper.com)  
Received: 17-11-2020  
Accepted: 26-12-2020

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## A prospective study of outcome of fracture of proximal humerus treated with PHILOS plating

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DOI: <https://doi.org/10.22271/ortho.2021.v7.i1b.2468>

### Abstract

**Background:** PHILOS plating is used for two to four fragmented dislocated fractures of the proximal humerus, including fractures involving osteopenic bone, pseudarthroses and osteotomies in the proximal humerus. Various studies have been conducted regarding outcome of fracture of proximal humerus treated with PHILOS plating with variable outcome. Present study was designed to determine the efficacy and functional outcome of PHILOS locking plate in proximal humerus fractures.

**Method:** As per study criteria 40 patients with fracture of shoulder was included in this study. After admission of patients a detailed careful history was taken to know the mechanism of injury. Patient was assessed clinically to evaluate general condition, vitals were recorded and examination of fracture site was done to know the Swelling, deformity, loss of function and nerve injury, distal vascularity. Radiological assessment was done and fracture was classified and preoperative routine haematological investigation was done.

**Result:** Regarding complications of surgery postoperative infection was found in 2(5%) patients, stiffness of shoulder was present in 2(5%) patients, one patient developed malunion and Osteonecrosis was present in one patient. Constant score was excellent in 20 (50%) patients; it was good in 18(45%) patients and fair in 2(5%) patients.

**Discussion and conclusion:** From present study we can conclude that PHILOS plating provides good fracture stabilization in the treatment of proximal humeral fractures. Stiffness of shoulder was common complication but present in 5% patients. Postoperative outcome was excellent in most of the patients.

**Keywords:** Proximal humerus, fracture, PHILOS plating, outcome

### Introduction

Fracture of proximal humerus is also called fracture of shoulder. It is common in elderly associated with low energy fall precipitated by osteoporosis. This fracture account 5-6% of all adult fractures [1, 2]. Anatomically proximal humerus is complex. It has two necks (anatomical and surgical) and two tuberosity (greater and lesser) in addition to that other structures are bicipital groove/intertubercular sulcus, medial calcar, and insertion sites for the deltoid, pectoralis major, and latissimus dorsi muscles [3, 4]. Surgical neck which is an area of constriction distal to the tuberosities is the common site of fracture. The deforming forces of attachment of muscle and neurovascular structures in that area makes it more vulnerable for non-union and complication [5].

Various surgical and non-surgical treatment options are available for management of proximal fracture of humerus. That include hemiarthroplasty, plate osteosynthesis, percutaneous fixation, intramedullary nailing, reverse shoulder arthroplasty and selection of treatment method depends upon type and severity of fracture, age of patients, expertise of surgeon and condition of patients [6].

PHILOS plating is used for two to four fragmented dislocated fractures of the proximal humerus, including fractures involving osteopenic bone, pseudarthroses and osteotomies in the proximal humerus. Various studies have been conducted regarding outcome of fracture of proximal humerus treated with PHILOS plating with variable outcome. Shahid R, Mushtaq A, Northover J, Maqsood M has concluded that PHILOS plate is a reliable implant [7]. Gaheer RS, Hawkins A *et al.* has concluded that Good fracture stability can be achieved early,

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allowing early mobilization without compromising fracture union [8]. Doshi C, Sharma GM, Naik LG, Badgire KS, Qureshi F has concluded that PHILOS plating has a good functional outcome. However, proper patient selection, thorough knowledge of the anatomy and biomechanical principles are the pre-requisites for a successful surgery. We have designed this study to determine the efficacy and functional outcome of PHILOS locking plate in proximal humerus fractures and incidence of complication that may occur with it in our clinical setup.

**Material and method**

**Place and time of study:** This study has been conducted in the department of orthopaedics, Konaseema institute of medical sciences, Amalapuram, Andhrapradesh from January 2017 to November 2020.

**Type of study:** This is a prospective observational study.  
**Ethics:** Approval from institutional ethics committee was taken before start of study. A written informed consent was obtained from all patients before enrolling them for study.

**Selection of patients**

The patients admitted in the department of orthopaedics with displaced fracture of proximal end of humerus were enrolled for this study as per following exclusion and inclusion criteria.

**Inclusion criteria**

- Age more than 18 years
- Both sex
- Based on Neer's classification two part, three part, and four part fractures of proximal humerus
- Both open and closed fractures of proximal humerus

**Exclusion criteria**

- Less than 18 years
- Acute infection
- Pathological fracture and malignancy

**Method**

As per study criteria 40 patients with fracture of shoulder was included in this study. After admission of patients a detailed careful history was taken to know the mechanism of injury. Patient was assessed clinically to evaluate general condition, vitals were recorded and examination of fracture site was done to know the Swelling, deformity, loss of function and nerve injury, distal vascularity. Radiological assessment was done and fracture was classified and preoperative routine haematological investigation was done.

**Surgical procedure:** - Patient was placed in supine and beach chair position under regional block. After the assessment of shoulder images by fluroscopy the operative field prepared and draped in sterile manner. The deltopectoral approach was used, the ceohalic vien was identified and retracted laterally. Soft tissue dissection performed until fracture site visualized. The humerus head was reduced carefully and temporary fixation done by two or three k-wires under fluroscopy guidance by checking in both AP and Lateral views. Then, the plate was placed in position lateral to intertubercular sulcus and fixed with angle stable screws to both head and shaft. Position of plates and screws were checked by fluroscopy to see length of screws. At the end of surgical procedure sterile dressings applied. No cast or splint was applied. Immediate post-operative x rays were taken in

both AP and Lateral views. Patient was followed follow-up every 6 weeks till fracture union and at 1 year after surgery and constant score was used for functional assessment higher the score better was the outcome [10].



**Fig 1:** Pre-operative and post-operative x ray of fracture of proximal humerus



**Fig 2:** Intraoperative images of fracture of proximal humerus

**Result**

During our study period of two years eleven months we enrolled 40 patients with fracture proximal humerus treated with PHILOS plating as per our enrolled criteria. In present study mean age of patients were 60.32±9.34 years. Most common age group with fracture proximal humerus were between 45 to 69 years of age that was 16(40%). Number of patients between 18 to 30 years of age were 4(10%), between 31 to 45 years of age were 8(20%), more than 61 years of age were 12(30%). There was female predominance.

**Table 1:** Characteristic of patients with fracture of proximal humerus

Variables	Number	Percentage
Age (Mean± SD = 60.32±9.34 years)	18 to 30	4 10
	31 to 45	8 20
	46 to 60	16 40
	More than 61	12 30
Sex	Male	16 40
	Female	24 60
Neers classification	One part	2 5
	Two part	8 20
	Three part	22 55
	Four part	8 20
Mechanism of trauma	Road traffic accident	26 65
	Trivial fall	4 10
	Fall from height	10 25
Associated medical condition	osteoporosis	12 30
	Diabetes mellitus	4 10
	hypertensions	8 20

Regarding Neer's classification three part fracture was most common and was found in 22(55%) patients, one part fracture was found in 2(5%) patients, two part fracture was present in

8(20%) patients and for part fracture was present in 8(20%) patients. Road traffic accident 26(65%) was most common mode of injury followed by fall from height 10 (25%) and trivial fall 4(10%). In present study osteoporosis is most common associated medical condition 12(30%), hypertension was present in 8(20%) patients and 4 (10%) have diabetes mellitus.

**Table 2:** Post-operative complications of patients with fracture of proximal humerus treated with PHILOS plating

Complication	Number	Percentage
Post-operative infection	2	5
Stiffness of shoulder	2	5
Malunion	1	2.5
Non-union	0	0
Osteonecrosis	1	2.5

Regarding complications of surgery postoperative infection was found in 2(5%) patients, stiffness of shoulder was present in 2(5%) patients, one patients developed malunion and Osteonecrosis was present in one patients.

**Table 3:** constant score of patients with fracture of proximal humerus treated with PHILOS plating

Result	Number	Percentage
Excellent	20	50
good	18	45
fair	2	5
poor	0	0

As per table 3, constant score was excellent in 20 (50%) patients; it was good in 18(45%) patients and fair in 2(5%) patients.

**Table 4:** Value of Constant score of patients

Constant score	Range		Mean	SD
	Min	Max		
	72	100		

The mean of constant score was  $88.64 \pm 8.42$ , maximum value was 100 and minimum value was 72.

## Discussion

In present study 40 patients with fracture of proximal end of humerus was evaluated who were treated with PHILOS plating. Mean age of patients were  $60.32 \pm 9.34$  years. Most common age group with fracture proximal humerus were between 45 to 69 years of age that was 16(40%) and there was female predominance. Bergdahl, C., Ekholm, C., Wennergren, D. *et al.* has reported in his study that most humeral fractures occurred in patients aged fifty years or older and the majority of these were in women which support our study [11]. In our study three part fracture was most common which is supported by the work of A. Roux, L. Decroocq, S. El Batti *et al.* [12]. Road traffic accident 26(65%) was most common mode of injury followed by fall from height and trivial fall which is supported by Dr. Yogesh C Patel and Dr. Pranay R Laddha but Doshi C, Sharma GM, Naik LG, Badgire KS, Qureshi F has reported that fall from height is more common [9, 13]. Osteoporosis is most common associated medical condition which is supported by the work of Schumaier A, Grawe B *et al.* [14].

In present study shoulder stiffness is most common complication which is supported by the work of Ziegler P, Maier S, Stöckle U, Gühring M, Stuby FM [15]. Geiger EV,

Maier M, Kelm A, Wutzler S, Seebach C, Marzi I has reported that avascular necrosis of the humeral head in two patients (7.2%) which support our study. Spross C, Platz A, Rufibach K, Lattmann T, Forberger J, Dietrich M has reported that avascular necrosis was the main reason for secondary arthroplasty which again support our study.

In our study outcome was excellent in 20 (50%) patients; it was good in 18(45%) patients and fair in 2(5%) patients which is supported by P Kosalaraman; P Balamurugan, S Marimuthu, R Ragavanandam [18]. The mean of constant score was  $88.64 \pm 8.42$  which is supported by Haridas \*S J, Thyagarajan D, Dent C, Evans R, and Williams R *et al.* [19].

## Conclusion

From present study we can conclude that PHILOS plating provides good fracture stabilization in the treatment of proximal humeral fractures. Stiffness of shoulder was common complication but present in 5% patients. Postoperative outcome was excellent in most of the patients.

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