

# Management of Neer Type of Humerus Fracture by Proximal Humerus Internal Locking System (Philos) Plate

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## ABSTRACT

**Background:** Proximal fracture is one the common fracture affecting people of all age groups worldwide and it is estimated that 5.7% of all the fracture of the human body are the proximal humerus fractures. It is the second most common fracture of the upper extremity. More than 85% of the humerus fractures are the proximal humerus fractures. Proximal fractures affect people of the old age due to fall and the osteoporosis or young age due to trauma.

**Objective:** To evaluate the functional outcomes of the proximal humerus internal locking system (PHILOS) plating for all types of Neer Classified fractures in humerus in adults.

**Materials and Methods:** This descriptive case series study was conducted in Akber Medical Centre Ramdas Bazaar Peshawar Pakistan from August 2018 to February 2022 on total 71 patients of either gender of age more than 15 years. Routine investigations, detailed history and clinical examination was performed. Radiological study of the proximal humeral fracture was done by taking X Ray AP, lateral and axillary views of the scapula. All basic line investigations were done. Prophylactic antibiotics, IV fluid was given. Surgery was performed under general anesthesia using the anterior deltopectoral approach. Data was analyzed with help of SPSS version 23.

**Results:** Our study shows that among 71 patients, 26(37%) patients were in age range 15-40 years, 45(63%) patients were in age range 41-70 years. 51(72%) patients were male, and 20(28%) patients had female. 31(43%) patients had BMI  $\leq 25$  Kg/m<sup>2</sup> and 40(57%) patients had BMI  $> 25$  Kg/m<sup>2</sup>. 43(61%) patients were rural, and 28(39%) patients were urban. 46(65%) patients were illiterate, and 25(35%) patients were literate. 9(12%) patients were rich, 29(41%) patients were middle class, 33(47%) patients were poor. 32(45%) patients had road traffic accident, 26(36%) patients had fall, 13(19%) patients had sports injury. Moreover 56(79%) patients had favorable outcome while 15(21%) patients had unfavorable outcome.

**Conclusion:** Our study concludes proximal humeral interlocking system plating (PHILOS) had 79% favorable outcome in the treatment of proximal humeral fractures in adults.

Keywords: Functional Outcomes; Fractures; Humerus; Internal Locking System; Proximal; Plate

## Introduction

Proximal fracture is one of the common fractures affecting people of all age groups worldwide and it is estimated that 5.7% of all fractures of the human body are the proximal humerus fractures [1]. It is the second most common fracture of the upper extremity [2]. More than 85% of the humerus fractures are the proximal humerus fractures [3]. Proximal fractures affect people of the old age due to fall and the osteoporosis or young age due to trauma [4,5]. The proximal humerus fractures are classified since the Neer classification [6] which classifies the fractures based on number of parts (2-4 parts) and displacement. The proximal humerus fractures are treated conservatively if there is minimal displacement. Some patients need surgical interventions for the management of the proximal humerus fracture especially in young or active elder patients. Surgical treatment depends upon the medical conditions, bone quality and fracture types or method of fixation of the bone. There are many methods used for the management of the proximal humerus fracture including the open reduction and internal fixation or minimally invasive internal fixation. Internal fixation could be achieved by locking plates or intramedullary nails [7,8].

Proximal humeral internal locking system plating for displaced proximal humeral fractures is used nowadays throughout the world. This procedure works on the principle of combination of the fixation with the conventional plate and the locking screws. This gives angular and axial stability and rigid fixation. Many studies have observed that proximal humeral internal locking system plating have shown good surgical and functional outcomes in the term of stability and early mobilization of the shoulder [9,10]. The functional outcomes of the PHILOS are usually labeled by Constant and Murley scoring system [11]. Jabbar FA, et al. [12], concluded that proximal humerus fractures treated with PHILOS plate has good favorable functional outcome in all the patients at final follow up. Neer has classified the fracture for management and prognosis purposes in four parts which is the worst type. [13] According to one study by Thyagarajan DS, et al. [14] the functional outcome of the PHILOS in displaced proximal humeral fracture had 76% favorable and 24% unfavorable functional outcome. The objective of this study is to evaluate the functional outcomes of the proximal humerus internal locking system (PHILOS) plating for all types of Neer's Classified fractures in humerus in adults. Going through the literature search it was observed that proximal humeral internal locking system plating (PHILOS) has good functional outcomes. This study will help us in the determination of the functional outcomes of PHILOS in our population. As no such study had been done in our population for the past five years, therefore this study will provide us the latest and updated information about the use of proximal humeral internal locking system plating (PHILOS) for the management of proximal humerus fracture in the population. Moreover, the results of this study will be shared with other health professionals so that future research strategies may be drawn up.

## Material and Methods

This descriptive case series study was conducted in Akber Medical Centre Ramdas Bazaar Peshawar Pakistan from August 2018 to February 2022 on total 71 patients of either gender of age more than 15 years. Using WHO sample size calculator, keeping 76% [12] prevalence of favorable functional outcome of the PHILOS plating measured based on Constant and Murley scoring system, 95% confidence level and 10% margin of error the sample size was 71. Non-probability Consecutive sampling Technique was used in our study. All the patients with the history of injury to the proximal humerus, having displaced two, three and four parts fractures of the proximal humerus as classified by the Neer verified by antero-posterior, lateral, and axillary views of X-ray radiograph of both gender having age range of 15-70 years were included in the study while patients having American society of anesthesiology grade III and above.

Pathological fractures, open fractures, fractured managed conservatively or managed by other procedure, Metastatic tumors, fractures with neurological deficit, Severe uncontrolled co-morbidities such as diabetes mellitus, ischemic heart disease and hypertension were excluded from the study. All the patients fitting into the inclusion criteria were enrolled in the study through Out patients department/ Emergency and were admitted in Orthopedic Unit, Northwest General Hospital and Research Centre Peshawar, Pakistan. Informed written consents were taken from patients for both surgical procedure and study to be conducted. Routine investigations, detailed history and clinical examination were performed. Radiological study of the proximal humeral fracture was done by taking X ray AP, lateral and axillary views of the scapula. All basic line investigations were done including Complete blood count, human immunodeficiency syndrome, anti-Hepatitis C Virus and Hepatitis B Surface Antigen by ELISA, Chest X-ray and Electrocardiogram to exclude any co-morbidity. Pre anesthetic assessment was done by anesthesiologist. Patient meeting the inclusion criteria were put on operation list. Prophylactic antibiotics, intravenous fluid was given. Surgery was performed under general anesthesia using the anterior deltopectoral approach.

The cephalic vein was retracted laterally. Reduction was done according to the type of fracture and temporary K wire fixation was done of the Humeral shaft, tuberosities and humeral head. PHILOS plate was applied after reduction of the fracture bone on the lateral aspect and was fixed with locking screws in both proximal and distal segments. Final fluoroscopic images had taken in different planes to see adequate reduction and position of the screws. All patients were given sling post operatively and was discharged when vitally stable. Post operatively follow ups was done on 1st and 3rd months interval to see the functional outcomes based on Constant and Murley scoring system developed by the European Society for Shoulder and Elbow surgery.

All the above mentioned information like age, gender, weight (measured in kg by same weight machine by me: third year resident), height (measured in cm by measuring tape with a wall by me: third year resident), BMI (persons weight in kg divided by the square of height in meters), residency (urban/rural), education level, socioeconomic status, mechanism of fracture, Neer type of fracture, post of complications, Constant Murley Score on 1st and 3rd months, functional outcome on the basis of constant and Murley Scoring system on 1st and 3rd months was recorded in a pre-designed proforma. This was the scoring system for the outcome of PHILOS plating having three domains on clinical examination i.e., pain, range of motion and activities of daily living and did not need any radiological or lab investigation. Exclusion criteria were strictly followed to reduce bias and confounders in the study results. All the data was analyzed in SPSS 23.

**Results**

In this study age distribution among 71 patients was analyzed as 26(37%) patients were in age range 15-40 years, 45(63%) patients were in age range 41-70 years. Gender distribution among 71 patients was analyzed 51(72%) patients were male and 20(28%) patients had female. Status of BMI among 71 patients was analyzed 31(43%) patients had BMI ≤25 Kg/m<sup>2</sup> and 40(57%) patients had BMI >25 Kg/m<sup>2</sup>. Residence among 71 patients was analyzed 43(61%) patients were rural and 28(39%) patients were urban. Education level among 71 patients was analyzed 46(65%) patients were illiterate and 25(35%) patients were literate. Socioeconomic status among 71 patients was analyzed 9(12%) patients were rich, 29(41%) patients were middle class, 33(47%) patients were poor. Mechanism of fracture status among 71 patients was analyzed 32(45%) patients had road traffic accident, 26(36%) patients had fall, 13(19%) patients had sports injury. Neer's classification was used in our study in which 58(82%) patients had Neer (two parts), 10(14%) patients had Neer (three parts), 3(4%) patients had Neer (four parts) fracture. Frequency of functional outcome among 71 was analyzed 56(79%) patients had favorable outcome while 15(21%) patients had unfavorable outcome (Table 1). Stratification of functional outcome with respect to age, gender, residency (urban/rural), education level, socioeconomic status, mechanism of fracture, Neer type of fracture is given in (Tables 2-9).

**Table 1:** Functional outcome (n=71).

Functional Outcome	Frequency	Percentage
Favorable	56	79%
Un Favorable	15	21%
Total	71	100%

**Table 2:** Stratification of Functional Outcome with Respect to Age Distribution.

Functional Outcome	15- 40 years	41-70 years	Total
Favorable	21	35	56
Un Favorable	5	10	15
Total	26	45	71

Note: Chi square test was applied in which P value was 0.7660.

**Table 3:** Stratification of Functional Outcome with Respect to Gender (N=71).

Functional Outcome	Male	Female	Total
Favorable	40	16	56
Un Favorable	11	4	15
Total	51	20	71

Note: Chi square test was applied in which P value was 0.8841.

**Table 4:** Stratification of Functional Outcome with Respect to Bmi Distribution (N=71).

Functional outcome	≤ 25Kg/m <sup>2</sup>	> 25Kg/m <sup>2</sup>	Total
Favorable	24	32	56
Un Favorable	7	8	15
Total	31	40	71

Note: Chi square test was applied in which P value was 0.7916.

**Table 5:** Stratification of Functional Outcome with Respect to Duration of Residency (n=71).

Functional Outcome	Rural	Urban	Total
Favorable	34	22	56
Un Favorable	9	6	15
Total	43	28	71

Note: Chi square test was applied in which P value was 0.9599.

**Table 6:** Stratification of Functional Outcome with Respect to Education Level.

Functional outcome	Illiterate	Literate	Total
Favorable	36	20	56
Un Favorable	10	5	15
Total	46	25	71

Note: Chi square test was applied in which P value was 0.8638.

**Table 7:** Stratification of Functional Outcome with Respect to Socio-economic Status.

Functional Outcome	Rich	Middle Class	Poor	Total
Favorable	7	23	26	56
Un Favorable	2	6	7	15
Total	9	29	33	71

Note: Chi square test was applied in which P value was 0.9950.

**Table 8:** Stratification of Functional Outcome with Respect to Mechanism of Fracture (n=71).

Functional Outcome	Road traffic Accident	Fall	Sports Injury	Total
Favorable	25	20	11	56
Un Favorable	7	6	2	15
Total	32	26	13	71

Note: Rhi square test was applied in which P value was 0.8490.

**Table 9:** Stratification of Functional Outcome with Respect to Neer Type of Fracture (n=71).

Functional Outcome	Two parts	Three Parts	Four Parts	Total
Favorable	46	8	2	56
Un Favorable	12	2	1	15
Total	58	10	3	71

Note: Chi square test was applied in which P value was 0.8683.

## Discussion

Proximal fracture is one the common fracture affecting people of all age groups worldwide and it is estimated that 5.7% of all the fracture of the human body are the proximal humerus fractures [1]. It is the second most common fracture of the upper extremity [2]. More than 85% of the humerus fractures are the proximal humerus fractures [3]. Our study shows that among 71 patients, 26(37%) patients were in age range 15-40 years, 45(63%) patients were in age range 41-70 years. 51(72%) patients were male, and 20(28%) patients had female. 31(43%) patients had BMI  $\leq$ 25 Kg/m<sup>2</sup> and 40(57%) patients had BMI >25 Kg/m<sup>2</sup>. 43(61%) patients were rural, and 28(39%) patients were urban. 46(65%) patients were illiterate, and 25(35%) patients were literate. 9(12%) patients were rich, 29(41%) patients were middle class, 33(47%) patients were poor. 32(45%) patients had road traffic accident, 26(36%) patients had fall, 13(19%) patients had sports injury. Moreover 56(79%) patients had favorable outcome while 15(21%) patients had unfavorable outcome.

Similar results were observed in another study conducted by Thyagarajan DS, et al. [14] in which of the 30 patients who underwent surgery with proximal humeral locking plate, we reviewed 29

patients as 1 patient had died due to coexisting medical ailments. Table 1 shows the characteristics of the 29 patients included in this study in relation to their age and the outcome score. Out of the 29 patients, 19 were females and 10 were males. There were 6 two-part, 14 three-part and 10 four-part fractures. Radiological union was achieved within 12 weeks following the surgery. The average overall ASES score was 66.5. The average overall Constant score was 57.5. The functional outcome of the PHILOS in displaced proximal humeral fracture had 76% favorable and 24% unfavorable functional outcome [14]. Similar results were observed in another study conducted by Jabbar FA, et al. [12] in which the study population consisted of n= 50 patients of which n= 35 were males and n= 15 were females having a mean age of 38-50 years. The mean duration of follow up was 24 months. All the patients in the study had union of fracture both radiographically and clinically, the meantime duration for the radiographically evident union of the humerus bone was 12 weeks with a range of 8 to 20 weeks, the mean Constant Murley score for the functional outcome of the shoulder joint was 79 at the final follow up with a range of 50 to 100. Complications were found in n= 9 patients and varus malunion was the most common complication. In our case series we did not observe complications such as avascular necrosis, nonunion or implant failure.

Similar results were observed in another study conducted by Ali-uddin AM, et al. [15] in which two patients were lost to follow up. Mean age was 40 years (20-70). Mean follow up was 6 months. 4 patients had a two-part fracture, 10 patients had three-part, and 6 patients had four-part fracture. Radiological union was achieved in average 8.31 weeks ( $\pm$ 1.37 SD). Average DASH score in young patients was 15.14 ( $\pm$ 1.91 SD) and in elderly was 31.66 ( $\pm$ 4.08 SD). One case of implant failure was noted. Better results in younger patients were achieved as compared to elderly proved by DASH score. In another study conducted by Siddalinga murthy G, et al. [16] had reported 9 patients had Neer's four-part fracture, 12 patients had 3-part fracture and 4 patients had 2-part fracture. After 6 months of follow up mean Constant and Murley score of 63.76 was achieved. Outcomes were excellent, good, moderate, and poor in 2(8%), 3(12%), 14(56%), 6(24%) respectively. The most frequent complication seen was shoulder stiffness in 6 patients, mal reduction in 4 and impingement in 4 patients [16].

## Conclusion

Our study concludes proximal humeral internal locking system (PHILOS) plating had 79% favorable outcome in the treatment of proximal humerus fractures in adults. PHILOS plating has revolutionized the management of proximal humerus fracture as there was no such perfect implant to fix such type of fracture.

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