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Study To Evaluate The Functional And Radiological Outcome In Patients Undergoing Philos Plating For Proximal Humerus Fractures

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ABSTRACT

Introduction: Proximal humerus fractures are common and debilitating injuries and its incidence is increasing especially in elderly. Fractures of the Proximal Humerus constitute 5% of all fractures. These are third most common fractures in elderly population after hip & distal radius fractures.

Aim: To find out the functional outcome of proximal humerus fractures in patients treated by internal fixation with PHILOS plate by using Neer's score.

Material and Methods: This was a prospective study conducted at department of Orthopaedics in a government hospital in Jaipur, Rajasthan. Sample size calculated was 30 patients.

Results: In the present study mean age of study subjects was 48.57 ± 14.95 years. Most of the patients with proximal humerus fracture undergoing PHILOS plating were males (60%) while 12 (40%) were females. In the present study most of the fracture humerus were of 3 part Neer type (50%), followed by 2 part type (30%) and 4 part type (16.7%), while only 1 (3.3%) patient had Fracture dislocation. All patients aged <30 years showed excellent outcome (100%). Among patients aged 30-49 years, most patients (70.6%) had satisfactory outcome and 17.6% patients had unsatisfactory outcome, only 2 (11.8%) patients had excellent outcome.

Conclusion: The incidence of complications and subsequent re-operation is relatively high. Based on our observations, inadequate positioning of the implant resulted in reduced functional outcome. Hence, to improve functional results, we consider plate positioning to be of utmost importance when using PHILOS plate fixation. Adequate surgical skills and surgeon's experiences with the surgical technique are necessary to achieve correct implant fixation and avoid these intraoperative errors.

Key Words: *PHILOS plating, Proximal humerus fractures.*

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INTRODUCTION

Proximal humerus fracture first documented by Hippocrates in 460 BC and treatment done with traction, Krocher classified fractures of the proximal humerus in 1869, to improve treatment. Neer's classification In 1970 expanded on the concept of four-part and included anatomic, biomechanical, and treatment principles[1]. Proximal humerus fractures are common and debilitating injuries and incidence of them are increasing especially in elderly Fractures of the Proximal Humerus constitute 5% of all fractures. These are third most common fractures in elderly population after hip and distal radius fractures. In geriatric population incidence found to be increasing due to more geriatric population with osteoporosis in elderly age and growing incidences of higher velocity injuries, road traffic accidents, natural disasters and industrial accidents, together with assault leading to multiple fractures and higher incidence of morbidity in young patients.[2]

Most of the proximal humeral fractures in the past century have been treated by nonsurgical methods but recently it has been observed that marked functional impairment may occur even with proximal humerus fractures which are undisplaced with two thirds of patients having chronic pain. Among 15% to 20% of displaced proximal humerus

fractures significant displacement has been noted especially in communited fractures, they were associated with poor functional outcome, hence preferring surgical fixation for better results[3].

It has been always managemental enigma because of numerous muscles attachment and very small space available for fixing implant in fracture of proximal humerus[4,5]. Several complications have been described in association with these techniques including implant failure, loss of reduction, non-union or malunion of the fracture, impingement syndrome and osteonecrosis of the humeral head[2,4].

In order to minimize these complications, the AO/SAIF group has developed anew Proximal Humerus Inter Locking Osteo Synthesis(PHILOS) plate. It provides betterangular stability than a conventional implants. Proximal humerus locking plate (PHILOS) is the preferred implant now for treatment of displaced proximal humerus fractures since they provide rigid anatomical fixation and more angular stability hence early mobilization and good functional limb ensured. With this background, this present study conducted aimed to study the functional outcome of proximal humerus fractures in patients treated by internal fixation with PHILOS plate by using Neer's score.

MATERIAL AND METHODS:

The study was conducted at department of Orthopaedics at Rukmani Devi Beni Prasad Jaipuria Hospital attached with RUHS College of Medical Sciences, Jaipur, Rajasthan. Sample size was calculated to be 30 subjects.

Inclusion Criteria: 1. Patients above 18 years of age, of either gender. 2. Admited with proximal humerus fracture of closed type. 3. Managed by definitive ORIF with PHILOS plating. 4. Operated within 2 weeks of injury.

Exclusion Criteria: 1. Pathological fractures. 2. Open fractures. 3. Previous operative treatment of proximal part of Humerus.

Procedure: The study was started after obtaining clearance for Institution review board. Patients presenting with fracture of proximal humerus were admitted from OPD and emergency. After assessing the inclusion and exclusion criteria, eligible subjects were recruited into the study, with obtaining written informed consent. Demographic data, History, Clinical examination were recorded in the study proforma.

Standard antero-posterior view and lateral view was taken along with computed tomography (CT) scan to assess the fracture geometry. Universal Shoulder Immobilizer was applied to the affected limb. According to radiograph, fracture classification was done. (Fig 1a and 1b)

Figure 1a: 3D CT scan showing proximal humerus fracture.

Figure 1b: Pre-operative radiograph of right proximal humerus fracture.

Routine pre-operative investigations were done for all patients using a standard protocol. Pre-anaesthetic evaluation was done before the surgery.

Continuous variables were expressed as mean and standard deviation or median and range, and were analyzed using independent sample t test for comparison between the two groups. One way ANOVA test was used for comparison between >2 groups.

RESULTS AND OBSERVATIONS:

In the present study mean age of study subjects was 48.57 ± 14.95 years. Most of the patients with proximal humerusfracture undergoing PHILOS plating were males (60%) while 12 (40%) were females. (Figure 2a and 2b)


Figure 2a: Intra-operative C-arm image of PHILOS plating.

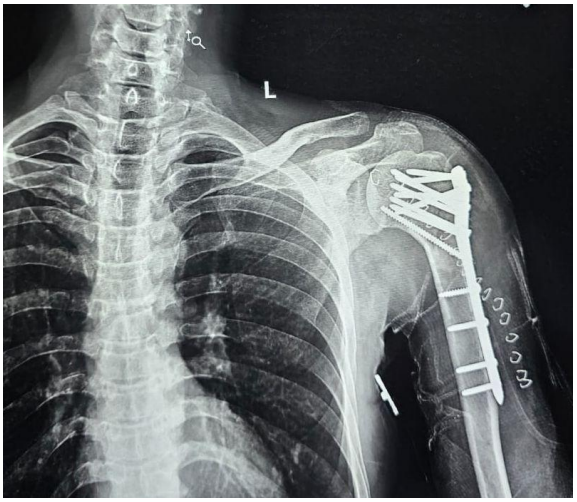

Figure 2b: Post-operative image of PHILOS plating.

We found that most of the female patients were housewives (26.7%). Twenty percent of the patients were labourers, while 4 (13.3%) were businessman and retired persons each. Other occupation among patients with humerus fracture was driver (10%), govt. employee (10%), salesman (3.3%) and student (3.3%). Most of the patients with humerus fracture belonged to middle SES (53.3%), followed by low SES (40%) and only 2 (6.7%) belonged to High SES.

Table 1: Distribution of study subjects according to mode of injury.

Mode of injury	No. of patients	Percentage
Fall	16	53.3
RTA	12	40
Seizures	2	6.7
Total	30	100

In the present study most common cause of fracture humerus among study subjects was fall from height (53.3%), followed by Road traffic accident (40%), while in 2 (6.7%) patients, seizure was the cause of fracture humerus. Only patients with closed fracture were included in the study. Patients with open fracture were excluded from the study. Fracture of left side humerus was more common (60%) as compared to right side (40%).

Table 2: Distribution of study subjects according to NEER's type of fracture.

Neer's type of fracture	No. of patients	Percentage
2 part	9	30
3 part	15	50
4 part	5	16.7
Fracture dislocation	1	3.3
Total	30	100

In the present study most of the fracture humerus were of 3 part NEER type (50%), followed by 2 part type (30%) and 4 part type (16.7%), while only 1 (3.3%) patient had Fracture dislocation.

Only patients with a time gap of less than 2 weeks from injury to surgery were included in the study. Of these 16 (53.3%) patients were operated within 1 week of injury, while rest 14 (46.7%) patients were operated between 1-2 weeks of injury. Among the proximal humerus fracture patients operated by PHILOS technique, Delto-pectoral approach was used in most patients (93.3%), while deltoid splitting approach was used in only 2 patients.

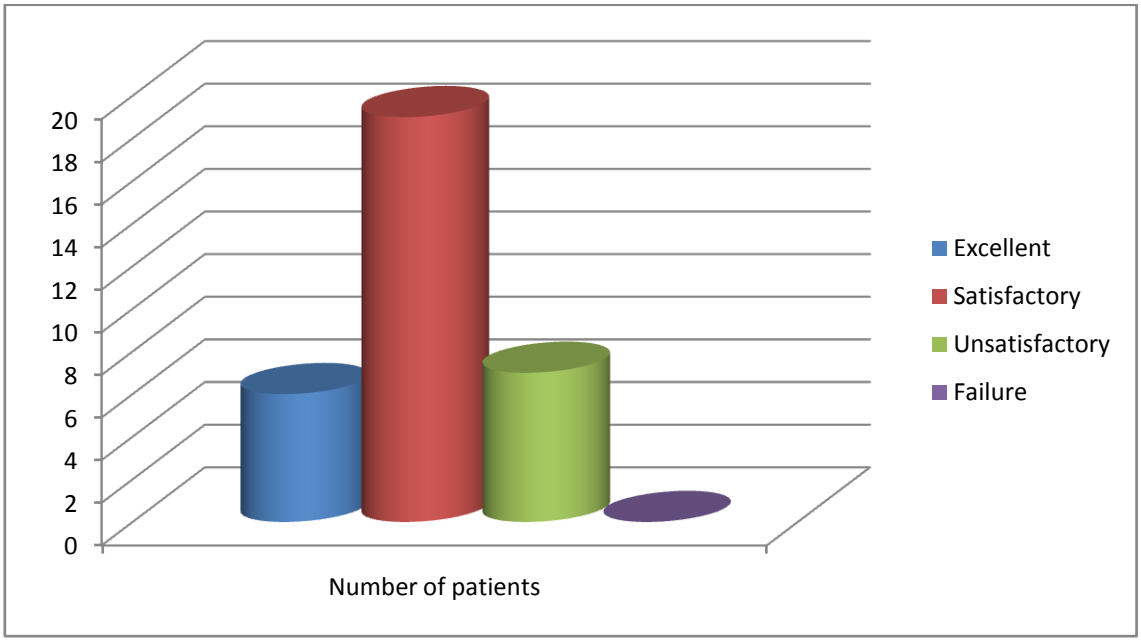

Figure 3: Distribution of study subjects according to functional outcome.

In the present study among the proximal humerus fracture patients operated by PHILOS technique in present study, most patients (56.7%) had satisfactory functional outcome, while 6 (20%) patients had excellent outcome. Only 6 (23.3%) had unsatisfactory outcome, while no patient had failure.

In the present study all patients aged <30 years showed excellent outcome (100%). Among patients aged 30-49 years, most patients (70.6%) had satisfactory outcome and 17.6% patients had unsatisfactory outcome, only 2 (11.8%) patients had excellent outcome. Functional outcome was better in younger patients, this difference in functional outcome in different patients was found to be statistically significant (p=0.004).

Table 3: Functional outcome in relation to NEER classification

Outcome	2 part		3 part		4 part		Fracture dislocation	
	N	%	N	%	N	%	N	%
Excellent	2	22.2	4	26.7	0	0	0	0
Satisfactory	7	77.8	7	46.7	3	60	0	0
Unsatisfactory	0	0	4	26.7	2	40	1	100
Failure	0	0	0	0	0	0	0	0
Total	9	100	15	100	5	100	1	100

In table 3, Most of the patients with 2 part fracture had satisfactory outcome (77.8%) and 22.2% had excellent outcome. Among patients with 3 part facture, 46.7% had satisfactory outcome, while 26.7% had unsatisfactory outcome and only 4 (26.7%) had excellent outcome. Though, favorable functional outcome was seen in 2 part and 3 part fracture, as compared to 4 part and fracture dislocation, the difference was not statistically significant. (Figure 4)

Figure 4: 2 months follow-up of PHILOS plating following proximal humerus fracture in Neer's 3 part humerus fracture.

We found that the mean union time for the study subjects was 11.8weeks. One third of the patients (33.3%) had Neer's score of 40-49, while 26.7% patients had score of 50-59, followed by score of 60-69 (23.3%) and only 16.7% had a score of 70-80. The mean Neer's score was 56.77 ± 10.79, ranging from 40-80. The mean Neer's score was higher in patients with 3 part fracture (60.53) followed by patients with 2 part fracture (57.11) and was minimum in patients with 4 part fracture or fracture dislocation (46.83). This difference in Neer's score among different type of NEER fractures was found to be statistically significant (p=0.025).

Table 4: Frequency of complications among study subjects.

Complication	No. of patients	Percentage
Stiffness	8	26.7
Infection	4	13.3
Plate impingement	3	10
Screw penetration	2	6.7
Malunion	1	3.3

In table 4, Joint stiffness was the most common complication seen in 8 (26.7%) of subjects. Infection occurred in 4 (13.3%) of patients. Plate impingement was found in 3 (10%) of patients, while screw penetration occurred in 2 (6.7%) patients. Malunion occurred in only one patient.

DISCUSSION:

In last few years, the incidence of proximal humerus fractures has increased due to increase in longevity and increase in road traffic accidents. The best management in these is still uncertain. Undisplaced proximal humerus fracture mostly treated by conservative methods. The decision making in the treatment of displaced fracture or fracture dislocation is very difficult. The present study was conducted to assess the factors determining the outcome and results of two part, three part and four proximal humeral fracture treated by open reduction internal fixation by Proximal Humerus Internal Locking System(PHILOS) plates.

Mean age of study subjects was 48.57 ± 14.95 years. Most of the study subjects belonged to 30- 49 years age group (56.7%), followed by 50-69 years (20%).This is consistent with study finding by Dolfi Herscovici et al[6] in which the mean age was found to be 52 years.

The study showed Most of the patients with proximal humerus fracture undergoing PHILOS plating were males (60%) while 12 (40%) were females. This figure can be explained by a higher involvement of men in road traffic accidents as explained by the high incidence of these fractures due to motor vehicle accidents. This is in consensus with the results obtained by C.Gerber, CM Werner et al[7], which was1.35:1 as their Male to Female ratio.

Most common cause of fracture humerus among study subjects was fall from height (53.3%), followed by Road traffic accident (40%), while in 2 (6.7%) patients seizure was the cause of fracture humerus. These observations were found to be consistent with the study by Dolfi Herscovici et al[6] which revealed 19 (45%) road traffic accidents, 20(50%) history of fall and 01 (5%) history of assault out of the fortycases studied. In another study by Sameer Aggarwal, Kamal Bali et al[8] showed that out of 47 patients of proximal humerus fracture, fall accounted for 55% of fracture, roadside accident 42.5% and 1 fracture (2.5%) was caused by seizure.

According to the present study, most of the fracture humerus were of 3 part NEER type (50%), followed by 2 part type (30%) and 4 part type (16.7%), while only 1 (3.3%) patient had Fracture dislocation. In the study done by Rizwan Shahid et al[9] ina series of 50 patients studied, 11(22%) were 2 part fractures, 21(42%) were 3 part fractures and 18(36%) were 4 part fractures.

In present study, final functional outcome is assessed with NEER'S score. Most patients (56.7%) had satisfactory functional outcome, while 6 (20%) patients had excellent outcome. Only 6 (23.3%) had unsatisfactory outcome, while no patient had failure. According to study of A A Martinez et al[10], out of 58 persons studied 13(22.4%) cases had excellent results, 36(62%) cases had satisfactory result, 8(14%) cases had unsatisfactory outcome and 1(1.7%) patient had failure. This results were consistent with those obtained in the study by Rizwan Shahid et al[9].The results were also compared based on NEER'S classification and the results showed that most of the patients with 2 part fracture had satisfactory outcome (77.8%) and 22.2% had excellent outcome.

In this series, Joint stiffness was the most common complication seen in 8 (26.7%) of subjects. Infection occurred in 4 (13.3%) of patients. Plate impingement was found in 3 (10%) of patients, while screw penetration occurred in 2 (6.7%) patients. (Figure 5)

Figure 5: Screw penetration after PHILOS plating.

Malunion occurred in only one patient. (Figure 6)

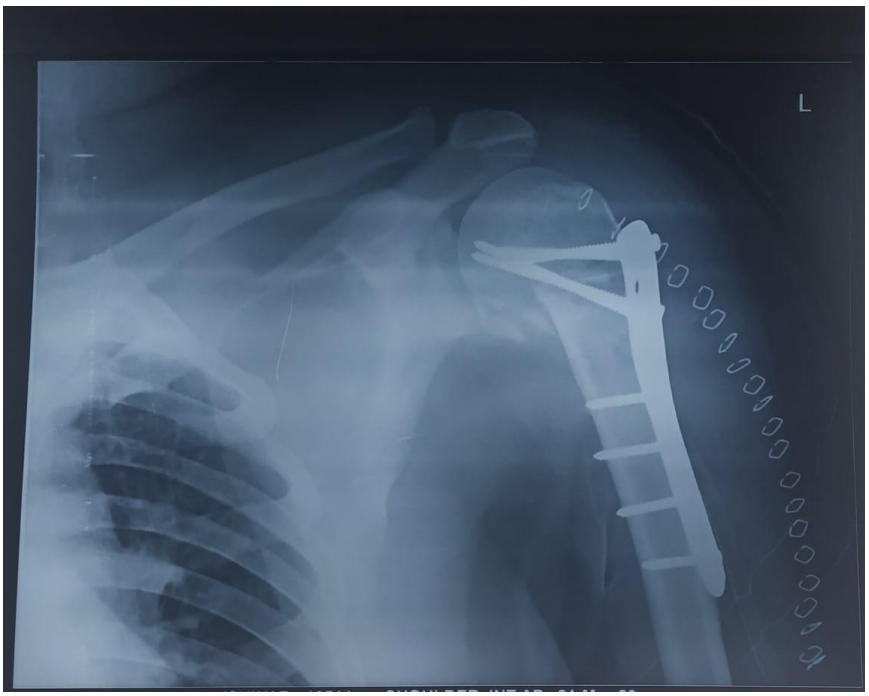

Figure 6: Malunion (varus collapse) following PHILOS plating.

There were no reported non-union, osteonecrosis or implant loosening. Ramachander Siwach et al [11] reported 8% of malunion, 8 % of impingement and 4 % of implant loosening. According to study by Felix Brunner et al[12] there were 1.26% of infection, 2.5 % malunion, 8.22% avascular necrosis, 2.53 % impingement, 14%screw penetration and 2.5 % stiffness reported.

CONCLUSION:

The incidence of complications and subsequent re-operation is relatively high. Based on our observations, inadequate positioning of the implant resulted in reduced functional outcome. Hence, to improve functional results, we consider plate positioning to be of utmost importance when using PHILOS plate fixation. Adequate surgical skills and surgeon's experiences with the surgical technique are necessary to achieve correct implant fixation and avoid these

intraoperative errors. Moreover patient's risk for complications should be evaluated more individually and taken into consideration for the concept of treatment.

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