ORIGINAL ARTICLE

The Functional Outcome of Philos Plate Fixation in Patients with Proximal Humerus Fracture

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ABSTRACT

Objective: To determine the functional outcome of PHILOS plate fixation in patients with proximal Humerus fracture.
Methodology: A prospective observational study was conducted at the Department of Orthopedic Surgery, Jinnah Postgraduate Medical Centre, Karachi as well as Neurospinal and Medical Institute (NMI), Karachi between June 2016, and January 2021. Post-operative patients with proximal humerus fracture treated with Philos plate fixation were enrolled. Detailed history and physical examination were recorded. Patients were followed up to 12 weeks to determine functional outcome. Constant-Murley Score was used to assess the functional outcome as either satisfactory or unsatisfactory.
Results: A total of 304 patients were recruited in the study with a mean age of 51.42+7.939 years (range; 30-60). 216 (71.05%) patients who were managed with Philos plate for the management of fracture of the proximal humerus had satisfactory outcomes while only about 88 (28.95%) patients had unsatisfactory outcomes. 54 (17.76%) patients with an unsatisfactory outcome were older than 45 years. Body Mass Index was not significantly associated with patient outcome. However, delay in presentation of more than three days was significantly associated with unsatisfactory outcome in patients as 82 out of 90 patients with delay > 3 days had unsatisfactory outcome at the end of the study (p=0.0002).
Conclusion: We reported that philos plate fixation provided adequate stability and overall good functional outcome. Further large-scale studies should be conducted to ascertain our findings and assess the long-term complications.

Key Words: Constant-murley score, philos plate fixation, proximal humerus fracture

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INTRODUCTION

Fractures of the proximal humerus are very frequent, resulting in approximately five percent of all fractures[1]. According to published statistics, it is estimated that the occurrence of proximal humerus fractures has increased to three times since 1970[2].

Despite the advancements in the field of orthopedic surgery, surgical intervention for unstable fractures are still considered as a challenge[3]. There is no consensus for the most optimum treatment option for the management of humerus fractures. There are several techniques and procedures for the management of these fractures, however, none is established as the most superior[4].

Proximal humeral locking plates, such as the Proximal Humeral Interlocking Osteosynthesis (PHILOS) plate have shown a positive outcome in the management of humeral fractures. The Philos fixation procedure is specific to the site of injury. The plate is adjusted to the proximal humerus and the use of locking screws eliminates the need for a plate-to-bone compression and conserves blood supply to the bone. The insertion of polyaxial screws into the head of the humerus allows support in multiple planes[5,6].

The present study was designed with the view that the data on this topic is meager and no recent study is available in Pakistan, therefore this study generated local data and added the current knowledge to the pool of already developed literature. Hence steps towards

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better management of patients with proximal humerus fracture can be taken.

METHODOLOGY

A prospective observational study was undertaken at the Department of Orthopedic Surgery, Jinnah Postgraduate Medical Centre, Karachi for three years from June 2017 to May 2020. Permission from the ethical review committee was sorted prior to conducting the study with ethical approval (IRB No.F.2-81/2021-GENL/64326/JPMC). Informed verbal and written consent were taken from the patients before their induction in the study.

All patients with fracture of proximal humerus from 30 to 60 years of age, duration of less than seven days and either gender were included in the study. Patients with infected wound at fracture site, open wound, pathological fracture, diabetes mellitus, coronary heart disease, malignancy, recurrent fractures, polytrauma, pseudoarthrosis or bilateral fracture were excluded. A non-probability consecutive sampling was used to recruit participants in the study. A thorough clinical history regarding the cause, mode, and duration of fracture along with sociodemographic of the patients was documented on a predefined pro forma. Surgery was performed by a consultant having more than 5 years of experience in orthopedics. The primary outcome variable was the postoperative functional outcome of patients which was assessed by the 12th week of surgery. It was based on the Constant–Murley Score (CMS)[7,8]. The Constant scores of 0 to 55 is termed as "poor", 56 to 70 as "moderate", 71 to 85 as "good", and >86 is "excellent". For the purpose of this study, the presence of a good or/and excellent functional outcome was considered as a satisfactory outcome. Whereas any score below 71 was considered as an unsatisfactory outcome.

Data was analyzed via SPSS version 26. Frequency and percentage were calculated for gender, functional outcome. Mean ± standard deviation was calculated for age, weight, height, BMI, Constant-Murley score and duration of fracture. Stratification was done to control effect modifiers like age, BMI, duration of fracture and gender. Post stratification chi square test was applied, p less than or equal to 0.095 will be taken as significant.

RESULTS

A total of 304 patients were recruited in the study with a mean age of 51.42+7.939 years (range; 30-60). Sociodemographic and clinical parameters of the study population are presented in Table 1.

Table 1: Characteristics of Study Participants (n=304)

Characteristics	n (%)	Mean ± SD
Age (in years)		51.42 ± 7.939
Age Groups		
< 45 years	106 (34.87%)	
> 45 years	198 (65.13%)	
Gender		
Male	118 (38.82%)	
Female	186 (61.18%)	
Constant score		60.45 ± 15.68
Weight (in Kg)		69.75 ± 17.98
Height (in meters)		1.5 ± 0.258
BMI (Kg/m2)		26.12 ± 4.06
Distribution of BMI		
< 23	126 (41.45%)	
> 23	178 (58.55%)	
Duration of Disease/ Trauma		
< 3 days	216 (71.05%)	
> 3 days	88 (28.95%)	

In the present study, we reported that 216 (71.05%) patients who were managed with Philos plate for the management of fracture of the proximal humerus had satisfactory outcomes while only about 88 (28.95%) patients had unsatisfactory outcomes (Figure 1).

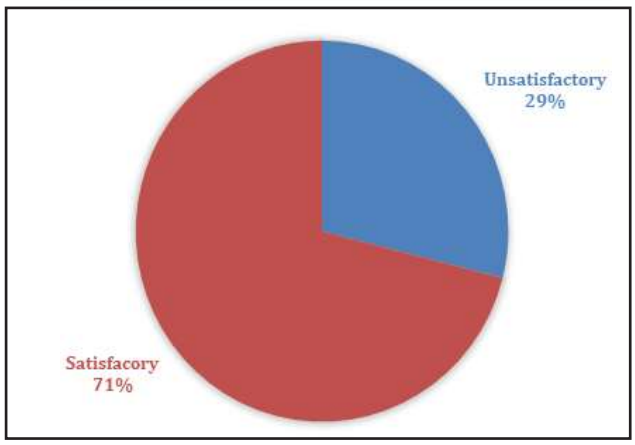

Figure 1: Functional Outcome in Patients with Proximal Humerus Fracture

We revealed that 28 (9.21%) patients had excellent, 188 (61.84%) had good, 10 (3.29%) had moderate, while 78 (25.66%) patients had poor outcomes (Figure 2).

Present study evaluated factors associated with poor/unsatisfactory outcomes in patients managed with

Figure 2: Functional Outcome According to Constant-Murley Score (CMS)

the Philos plate (Table 2). It was found that the majority of the patients with unsatisfactory outcome i.e., 54 (17.76%) were older than 45 years. However, the difference was insignificant (p=0.32). More females as compared to males had unsatisfactory outcomes, 62 (20.39%) and 26 (8.55%), respectively. Body Mass Index was not significantly associated with patient outcome. However, delay in presentation of more than three days was significantly associated with unsatisfactory outcome in patients as 82 out of 90 patients with delay > 3 days had unsatisfactory outcome at the end of the study (p=0.0002) (Table 2).

Surgical intervention for unstable fractures, however, is still challenging for the orthopedic surgeons, despite the advancement in the field[10]. Management of severe fractures without opting for surgical treatment is linked with poor outcomes[11]. Several surgical techniques such as wiring and platting for complicated fractures is a testament to the lack of superiority of any one single method[12]. Most of the surgical techniques result in complications, including hardware failure, mal-unions, osteonecrosis, or rotator cuff impairment. The present study evaluated the functional outcome of Philos plate fixation in patients with proximal Humerus fracture in our population. We reported an overall satisfactory functional outcome postoperatively in our study population with a mean Constant-Murley Score of 60.45 ± 15.68. Our study findings are in accordance with recent literature[13,14]. Ganesh et al., revealed that the mean Constant-Murley score (CMS) in their cohort of patients at the end of 3mo was 22.5 at 6mo 56 and at the end of 1yr was 73.3[13].

Proximal humeral locking plates have shown a positive outcome in the management of the majority of the humeral fractures[15]. However, despite the benefits of the Philos fixation, certain studies have associated it with construct failure and need of recurrent surgery in patients over the age of 65[16].

Table 2: Factors Associated with Patient Outcome in the Study

Variable	Patient Outcome			P-value
	Total	Satisfactory Outcome	Unsatisfactory Outcome	
Age Groups				0.32
Below 45 years	106 (34.87%)	70 (23.03%)	36 (11.84%)	
45 years or above	198 (65.13%)	144 (47.37%)	54 (17.76%)	
Gender				0.17
Male	118 (38.82%)	92 (30.26%)	26 (8.55%)	
Female	186 (61.18%)	124 (40.79%)	62 (20.39%)	
Distribution of BMI				0.192
< 23	126 (41.45%)	84 (27.63%)	44 (14.47%)	
> 23	178 (58.55%)	131 (43.42%)	44 (14.47%)	
Delay in Presentation				0.002*
< 3 days	214 (71.05%)	166 (54.61%)	48 (15.79%)	
> 3 days	90 (28.95%)	48(15.79%)	42 (13.82%)	

* p-value is significant at < 0.095

DISCUSSION

Fractures of the proximal humerus are very frequent, resulting in 5-9% of all fractures[7]. It is the most common fracture in the elderly population[8]. Such fractures are generally stable and can be treated conservatively[9].

In another study conducted at the Krishna Hospital and Research center Karad, it was revealed that 80 percent of the patients with proximal humerus fractures which were managed via Philos plate had excellent or good functional outcome[17].

Philos plate has also been favored by surgeons because it is a minimally invasive procedure. It allows for an indirect reduction of the fracture, therefore reducing the probability of avascular necrosis and minimizing immobilization time, limiting the possibility of a frozen shoulder. Additionally, it is a fixating device, which is highly stable in osteoporotic bones. Our study is supported by the earlier published literature and highlights the significance of Philos plate fixation in the management of fractures of proximal humerus.

However, as true with any research our study also had certain apparent limitations. Firstly, since it was a single center study, the sample population was undiversified and had similar socio demographics hence, the applicability of the findings on a larger Pakistani population is not logical. Moreover, due to a lack of resources we were unable to keep a long-term follow-up of patients for more than 12 weeks.

CONCLUSION

We reported that Philos plate fixation provided adequate stability and overall, a good functional outcome. A delay in presentation was associated with a poor functional outcome. Further large-scale studies should be conducted to ascertain our findings and assess the long-term complications.

Conflict of interest: Authors declare that there is no conflict of interest.

Authors' Contribution: PA**:** Principal investigator and worked on Paper Writing, Data Interpretation, literature review, MB: Worked on Data collection, and Literature review, FJ: Helped in paper writing, DM, IM, EM, MS, and RE: worked on Data Collection.

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