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Comparison of the functional outcome of Philos Plate Vs. external fixator in the management of proximal humerus fracture

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Abstract

Background: Proximal humerus fractures, are a major medical issue that are relatively prevalent. 4-5% of all fractures are proximal humeral fractures, most of which involve older and osteoporotic individuals.

Objectives: To compare the functional outcome of philos plate vs. external fixator in the management of proximal humerus fracture.

Material and Methods: A retrospective comparative study was conducted at the Department of Orthopaedic Surgery, Ghurki Trust Teaching Hospital, Lahore. From November 23, 2022, to May 23, 2023. After approval from the hospital's ethical board, 112(56 per group) patients were included in the study through an emergency. Informed consent was taken from parents. We stratified patients into two groups. Group A received the treatment of Philos, while Group B received the external fixator treatment. Functional outcome was assessed at the end of 3 months postoperatively using constant shoulder score. The collected data were entered and analyzed accordingly using SPSS version 27.

Results: In the current study, a total of 112 patients included underwent two surgical interventions, among these, 56 patients underwent Philos plating while an equal number of patients underwent external fixation. In Group A and B, the majority were males (37:47) out of 112. The mean age of patients was equal in both groups (Group A=44.36±11.71), and the mean age of patients was (Group A=44.88±10.05), ranging from 20 to 80 years. In Group A, the average BMI was less than 24.29±4.23, ranging from 18-35 kg/m2, compared to Group B, 28.89±3.77, ranging from 22-35 kg/m2. 38(67.9%) were effected from right side as in Group A while 41(73.2%) were effected from right side in Group B. Majoruty 28(50.0%) had history of RTA in Group A while patients 24(42.9%) were observed with history of RTA in Group B25(44.6%) cases reported excellent outcome, 6(10.7%) reported very good outcome, 16(21.4%) good, 7(12.5%) fair and 2(3.6%) poor outcome in Group A. In Group B, 36(64.3%) excellent, 7(12.5%) very good, 12(21.4%) cases reported Good and 1(1%) reported fair outcome. So it is concluded that 25(44.6%) cases reported excellent outcome in Group A, comparatively low as compared to Group B 36(64.3%). Only age was significantly associated with excellent outcomes as $p<.05$.

Conclusion: It is concluded that External fixation demonstrated a better outcome as compared to Philos Plating, so in Orthopaedic practice, External fixation should be preferred for patients diagnosed with proximal humerus fracture to get better results and reduce the complications.

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Keywords: External Fixation; Proximal Humerus Fracture; PHILOS Plate; T Plate; Complications; Functional outcomes

1. Introduction

PHFs, or proximal humerus fractures, are a major medical issue that is relatively prevalent. 4-5% of all fractures are proximal humeral fractures, the majority of which involve older and osteoporotic individuals.[1,2] One of the fractures seen today in orthopaedic clinics most frequently is proximal humerus fracture. The rise in the usage of machines in man's everyday activities is the reason for the recent increase in the occurrence of this ailment. Road vehicular accidents have a significant role in it. Although the treatment for a proximal humerus fracture does not have significant side effects, it can cause a working person to lose months of work and temporarily become disabled. In these circumstances, limb function restoration becomes crucial. [3]

The orthopaedic surgeon will determine nonoperative and operative treatment options for this injury based only on its classification. Nonoperative therapy is favored for minimally displaced fractures since the non-union incidence is low. Minimally invasive treatments are employed in bones that are elderly and osteoporotic. The management of proximal humerus fractures is always changing, and implant firms are developing novel implants. Conversely, hemiarthroplasty is the preferable therapy when the fracture is significantly comminuted and displacement is present. A minimal degree of malunion that doesn't affect the limb's functionality or appearance can be tolerated. Many studies favor both nonoperative therapy and surgical intervention, so it might not be easy to decide between the two. The treatment approach relies on the kind of fracture, the patient's degree of activity, and the state of the soft tissues.[3,4]

For three- or four-part PHF, conservative management with a universal shoulder immobilizer or closure reduction with internal fixation utilizing k-wire produces unsatisfactory results. Thus, they are typically managed with open reduction and internal fixation (ORIF) using any of these methods 1) proximal humeral plates, 2) hemiarthroplasty, 3) percutaneous or minimally invasive techniques such as pinning, screw osteosynthesis, external fixator, Ilizarov and 4) the use of intramedullary nails. Satisfactory anatomical reduction and regaining functional range of motion (ROM) are critical treatment objectives for managing PHF. Critical treatment goals for controlling PHF include achieving anatomical reduction that is satisfactory and regaining a functional range of motion (ROM). Due to its anatomically comparable design, the proximal humerus internal locking device is the preferred implant for treating misplaced or complicated PHF. By adopting a locked construct of convergent and divergent screws, it allows for angled stability and enhances pull-out strength in osteoporotic bone. However, few prospective studies are available that evaluate the results of this technique or report on the treatment-related complications.[5,6] However, older patients with osteoporotic communiated fractures and patients with systemic illnesses respond dramatically to treatment with an external fixator since it is quick to do, inexpensive, has lower patient morbidity than conservative care, and is comparable to philos plating.[1]

Jagiasi et al. examined the functional outcome of operative management of proximal humeral fractures with Philo's plate fixation. The results showed that Excellent results were found in 12 patients (40%), 2 had very good results (6.66%), 9 patients had good (30%), and 6 had fair (20%) functional outcome using the Constant Scoring system.[8] Gupta et al. conducted the study to explore the functional outcome of proximal humerus fracture with external fixation. The findings revealed that 18.75% (n=3) patients showed excellent results, 62.5% (n=10) had good results, 18.75% (n=3) had fair results, and 12.5% had poor results.[1] I want to conduct this study as there is no local literature available.

The rationale of the study is to establish the difference in the functional result of proximal humerus fracture treated with PHILOS plate and external fixation. Fractures of the proximal humerus are frequent injuries, and more specifically, individuals of the elderly age group make up a considerable number of patients affected, which hampers the functions of the shoulder joint and inevitably influences the quality of life of the affected individuals. The PHILOS (Proximal Humerus Internal Locking System) plate is an option that gives more stable fixation and, theoretically, at least, may mean better alignment of the limb and early mobilization. On the other hand, external fixators give way less invasive surgeries and hence are less likely to cause problems like those observed with open surgeries. However, the fixation applied fixes the choice of the fixation method that is capable of affecting the healing process, the time local rehabilitation takes, and the ultimate functional result. This research will aim to offer a detailed evaluation of these two therapies by evaluating clinical signs like range of motion, pain scores, complication profile, and patient satisfaction. The goal of the findings is that orthopedic surgeons are able to choose the best approach to address the proximal humerus fracture and, thus, enhance the care of the affected patients.

2. Material and Methods

A retrospective comparative study was conducted at the Department of Orthopaedic Surgery, Ghurki Trust Teaching Hospital, Lahore. From November 23, 2022, to May 23, 2023. After approval from the hospital's ethical board, 112(56 per group) patients were included in the study through an emergency. A sample of 112(56 per group) was calculated with a 5% level of significance and 80% power of the test and took the proportion of excellent outcome as 40% in philos plating8 and 18.75% in the external fixator group using Constant Score.[1] we included patients age ranged from 20 to 80 years, skeletally matured patient and patient with proximal humerus fracture. Patients with Skeletal immature patients (open physis), any Revision surgery, and lost to follow-up were excluded. Non-probability, consecutive sampling was used to collect data from patients. Informed consent was taken from parents. We stratified patients into two groups. Group A received the treatment of Philos, while Group B received the external fixator treatment. The procedure was performed with the patient under general/regional anaesthesia. The patient was put in the beech chair position. Access to the proximal humerus fracture is achieved through the deltopectoral groove taking care of the cephalic vein, axillary artery, and nerve plexus. All fragments were reduced under the vision, and then ORIF was done through a Philos plate. Shoulder ROM and joint congruity were assessed preoperatively. On the other hand, external fixator reduction of the proximal segment was done image intensifier—4mm/5 mm percutaneous scahnz inserted through the safe area of the deltoid region proximal to the fracture. Proximal Schanz was connected to the supporting rod with a clamp connector. Three or more Schanz inserted distal to fracture, respecting the coarse of the radial nerve and maintaining the reduction of fracture through appropriate spanning. The second supporting rod connected to the assembly and the stability and assembly were assessed intraoperatively. Moment and shoulder and fracture reduction were assessed under image preoperatively. Movement of the shoulder joint was assessed per-operatively under an image intensifier for the stability of fixation. Shoulder mobilization exercises started within one week as soon as post-operative pain and swelling subsided. It was assessed at 12 weeks postoperatively using the Constant Shoulder Score. This system was based on a 100-point score composed of several individual parameters. The subjective parameters assessed the degree of pain the patient experiences and the ability to perform normal tasks of daily living as they apply to them in both activity and position-related terms. Both of these assessments were subjective and were carried out independently before objective testing of active motion range and shoulder power. Constant score was categorized as <30 =unsatisfactory; 30-39=fair; 40-59=good; 60-69=very good; and 70 and over =excellent.[7] Excellent outcome was studied. All patients were followed up at 3, 6 & 12 weeks for pain, function, range of motion, and anatomy with a check X-ray. All procedures were performed by the consultant orthopedic surgeon (with at least 3 years of post-fellowship experience). The collected data were entered and analyzed accordingly using SPSS version 22. Mean ± SD was calculated for age and BMI. Frequency and percentages were calculated for gender, side, comorbidity, and Excellent functional outcome (Yes vs. No). Data were stratified for age, gender, side, and mode of injury to study the effect modifier. Post-stratification chi-square was applied. P-value ≤ 0.05 was considered significant.

3. Results

In the current study, a total of 112 patients included underwent two surgical interventions; among these, 56 patients underwent Philos plating while an equal number of patients underwent external fixation. In Group A and B, the majority were males (37:47) out of 112, while fewer than 19 females were in Group A and 15 were in Group B. The mean age of patients was equal in both groups (Group A=44.36±11.71), and the mean age of patients was (Group A=44.88±10.05), ranging from 20 to 80 years. In Group A, the average BMI was less than 24.29±4.23, ranging from 18-35 kg/m2, compared to Group B, with 28.89±3.77, ranging from 22-35 kg/m2. 38(67.9%) were affected from the right side as compared to the left side, 18(32.1%) were in Group A, 41(73.2%) were affected from the right side, and 15(26.8%) were affected from the left side in Group B. The majority, 28(50.0%), had a history of RTA in Group A, while patients 24(42.9%) were observed with a history of RTA in Group B. The average Constant score was high in Group B at 69.05±13.20 as compared to Group A at 61.45±17.55. 25(44.6%) cases reported excellent outcome, 6(10.7%) reported very good outcome, 16(21.4%) good, 7(12.5%) fair and 2(3.6%) poor outcome in Group A. In Group B, 36(64.3%) excellent, 7(12.5%) very good, 12(21.4%) cases reported Good and 1(1%) reported fair outcome. So it is concluded that 25(44.6%) cases reported excellent outcome in Group A, comparatively low as compared to Group B 36(64.3%). Stratification of excellent outcome in Group A and B was observed with respect to demographic parameters, and the results indicate that only age was significantly associated with excellent outcome as $p<.05$.

Table 1 Demographic profile of patients

Characteristics	Group A	Group B	p-value
Gender	37	41	
Male	19	15	.411
Female			
Age (years)	44.36±11.71 (20-80)	44.88±10.05 (20-80)	.833
BMI (kg/m^2)	24.29±4.23 (18-35)	28.89±3.77 (22-35)	<.001
Side effected			
Left	18	15	.534
Right	38	41	
Mode of Injury			
RTA	28	24	
Fall	18	14	.213
Others	10	18	
Constant Shoulder Score	61.45±17.55 (28-90)	69.05±13.20 (36-90)	.011

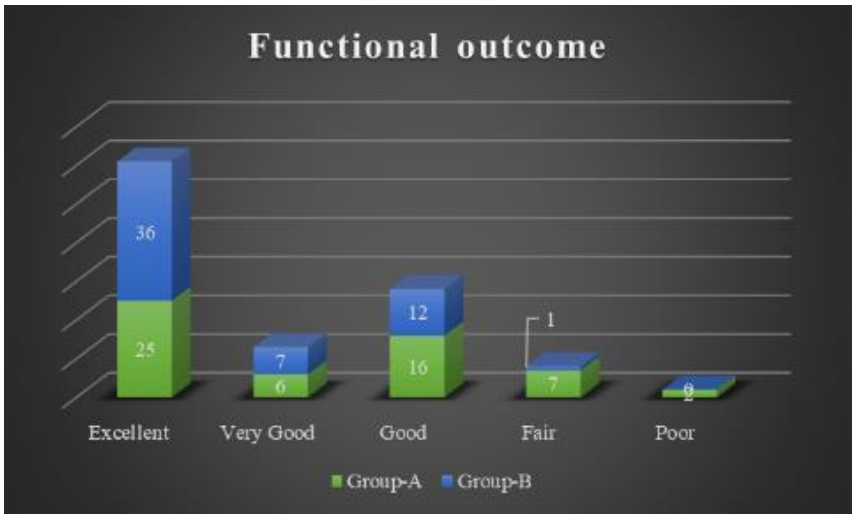

Figure 1 Comparison of outcome between external fixator & philos plate

Table 2 Comparison of Excellent Functional outcome based on demographic characteristics

Gender	Excellent Outcome	Study groups		p-value
		Group-A	Group-B	
Male	Yes	17	25	0.184
	No	20	16	
Female	Yes	8	11	.069

	No	11	4	
Age (Years)				
20-45	Yes	16	17	0.611
	No	17	14	
46-80	Yes	9	19	**0.010
	No	14	6	
BMI (kg/m2)				
≤25	Yes	20	10	0.075
	No	21	3	
>25	Yes	5	26	0.070
	No	10	17	
Side effected				
Left	Yes	9	9	0.170
	No	12	6	
Right	Yes	19	27	0.177
	No	19	14	
Mode of Injury				
RTA	Yes	11	14	0.266
	No	17	10	
Fall	Yes	8	10	0.165
	No	10	4	
Others	Yes	6	12	1.000
	No	4	6	

**Significant; Group-A (Philos Plate); Group B (External Fixator)

4. Discussion

Our findings showed that employing proximal humerus locking plates has several advantages.

When compared to similar studies in the field, the results of our study of 112 patients admitted to a single center and operated on with proximal humerus locking plates for displaced and unstable proximal humerus fractures were found to be good in most of the patients.

Younger patients and those with less complicated fractures had better results, it was discovered. The functional outcome scores showed a considerable improvement over three months, which was also observed in trials of a similar kind.[10]

In the current study, a total of 112 patients included underwent two surgical interventions; among these, 56 patients underwent Philo's plating (Group A), while an equal number of patients underwent external fixation (Group B). In Group A and B, the majority were males (37:47) out of 112. The mean age of patients was equal in both groups (Group A=44.36±11.71), and the mean age of patients was (Group A=44.88±10.05), ranging from 20 to 80 years. In Group A, the average BMI was less than 24.29±4.23, ranging from 18-35 kg/m2, compared to Group B, 28.89±3.77, ranging from 22-35 kg/m2. 38(67.9%) were effected from right side as in Group A while 41(73.2%) were effected from right side in Group B. Majoruty 28(50.0%) had history of RTA in Group A while patients 24(42.9%) were observed with history of RTA in Group B25(44.6%) cases reported excellent outcome, 6(10.7%) reported very good outcome, 16(21.4%) good,

7(12.5%) fair and 2(3.6%) poor outcome in Group A. In Group B, 36(64.3%) excellent, 7(12.5%) very good, 12(21.4%) cases reported Good and 1(1%) reported fair outcome. So it is concluded that 25(44.6%) cases reported excellent outcome in Group A, comparatively low as compared to Group B 36(64.3%). Only age was significantly associated with excellent outcome as $p<.05$.

Iqbal et al.[11] sought to compare the effects of proximal humerus fractures on functional recovery and fracture union between PHILOS and T plates. There were included 48 proximal humerus fracture cases.12 (25%) female patients and 36 (75%) male patients made up the total number of cases. Patients were divided evenly into two groups. In group I (PHILOS), the average age was 47.9 years and 8.42 months, and the average BMI was 23.6 kg/m2; RTA was the most frequent etiology in group I patients. In 15 of the cases in group I, the right side was the most often afflicted. The PHILOS group displayed more frequent excellent and good outcomes (16.7%, 54.2%).

Jagiasi et al. examined the functional outcome of operative management of proximal humeral fractures with Philo's plate fixation. The results showed that Excellent results were found in 12 patients (40%), 2 had very good results (6.66%), 9 patients had good (30%), and 6 had fair (20%) functional outcome using the Constant Scoring system.[8] Gupta et al.[1] conducted the study to explore the functional outcome of proximal humerus fracture with external fixation. The findings revealed that 18.75% (n=3) patients showed excellent results, 62.5% (n=10) had good results, 18.75% (n=3) had fair results, and 12.5% had poor results.[1] I want to conduct this study as there is no local literature available.

The mean Constant Score in our study was 65.25±15.92 while Thyagarajan et al., in their study on 30 patients, reported an average Constant score of 57.5.[12]

Monga et al.[13] revealed the functional outcome of proximal humerus fracture using the constant score, and the findings reveal that 50% of cases reported excellent outcome, 30% reported good, 10% fair, and 10% reported poor outcome.

JESS is a complementary treatment option for Neer's 2- and 3-part proximal humerus fractures, notably in older patients with osteoporotic bone, exhibiting excellent to good outcomes in nearly 80% of cases. To confirm the potential benefits of external fixation, further randomized research is required. A surgeon must have sufficient surgical skills and competence in the surgical technique in order to place an implant correctly and avoid intraoperative errors. Physiotherapy following surgery is also essential for the patient's rehabilitation to be effective. When appropriately applied by a trained surgeon, the anatomic locking compression plate can be a great surgical option for treating proximal humeral fractures and can produce an acceptable functional outcome.

5. Conclusion

From the findings, it is concluded that External fixation demonstrated a better outcome as compared to Philos Plating, so in Orthopaedic practice, External fixation should be preferred for patients diagnosed with proximal humerus fracture to get better results and reduce the complications.

Compliance with ethical standards

Disclosure of conflict of interest

No conflict of interest to be disclosed.

Statement of informed consent

Informed consent was obtained from all individual participants included in the study.

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