

Outcome of Neer Type 3 & 4 Fractures of Humeral Head Treated with Proximal Humerus Internal Locking System (PHILOS) Plate Osteosynthesis

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ABSTRACT

Objective: To assess the outcome of Neer type 3 and 4 fractures of humeral head treated with Proximal Humerus Internal Locking System (PHILOS) plating.

Study Design: Descriptive case series.

Place and Duration: This study was conducted in The Department of Orthopaedics and Spine Surgery, Lahore General Hospital, Postgraduate Medical Institute, Lahore Pakistan from 1st September 2020 to 30th March 2022.

Methodology: A total of 30 patients aged between 18-60 years presenting with displaced three and four parts fractures of proximal humerus were analyzed. At the time of enrollment, demographic data was noted and medical history was taken. All fractures were classified with the help of plain radiographs. All patients underwent PHILOS Plate osteosynthesis as per standard surgical approach. The patients were followed up till 6-months. Final outcomes were labeled in terms of total constant score and functional outcome.

Results: In a total of 30 cases, 73.3% were male while overall mean age was 36.73±12.85 years. There were 56.7% patients who had road traffic accident and 36.7% reported fall from height and 6.7% patients had physical assault (hit by bull). The mean duration of surgical procedure was 59.57±19.39 minutes while the mean duration of hospitalization was 5.50±2.17 days. The mean constant score was 72.76±12.25. The functional outcome of patients after 6 months were excellent in 10.0% patients, good 40.0% and 50.0% had fair outcome. There were 93.3% patients who had grade-1 union and 6.7% had grade-2 union after 6 months of follow up.

Conclusion: Very acceptable functional outcomes with PHILOS plating were found in Neer type 3 and 4 fractures of humeral head. Early mobilization of shoulder can be achieved without any compromise in fracture union with six months follow and there was no avascular necrosis.

Keywords: Accidents, Hospitalization, Humerus, Necrosis, Shoulder, Surgical Procedures, Proximal Humerus Internal Locking System (PHILOS) Plating

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INTRODUCTION

Proximal humerus fractures (PHF) is calculated to constitute around 5% of all the fractures and mostly occur in old age¹. Majority of the PHF cases may be treated without operation due to minimal displacement². Unstable and displaced fractures have high morbidity, particularly in elderly cases.

Management of displaced and unstable 3 and 4 part fractures is still challenging while best options regarding the management continue to be debatable. Different techniques of internal fixation exist like bone sutures, tension band, cerclage, T-plates, K-wires, intra-medullary nails, semi-tubular blade plate, double tubular plates and device like Polarus nail³. Surgical interventions for the management of displace and unstable 3 and 4 part fractures may accompany complications including cutout of the screws and plates, non-union/mal-union, migration of nail, impingement syndrome and rotator cuff impairment⁴. These can effect functional outcome of shoulder joint⁵.

Hemiarthroplasty and total arthroplasty of shoulder joint has poor outcomes⁶. Regional data analyzing outcomes of "Proximal Humerus Internal Locking System (PHILOS)" plating among 2, 3 and 4 part PHF having a mean follow-up of 10 weeks revealed

that mean constant score was 66.7 ± 16.3 (range 33- 98), with excellent score in 9.6%, good 38.7%, fair 25.8% and poor in 25.8% patients⁷. Another study analyzing outcomes of PHILOS plating showed excellent outcomes in 17%, good 38.5%, fair 34% while poor in 10.5% of patients⁸.

Not much local data analyzing PHILOS plating in Neer type 3 & 4 fractures of humeral head exist so the present study was planned to report our local experience. This study was done to determine the outcome of Neer type 3 & 4 fractures of humeral head treated with PHILOS plating.

METHODOLOGY

This descriptive case series study was performed at The Department of Orthopaedics and Spine Surgery, Lahore General Hospital, Postgraduate Medical Institute, Lahore Pakistan from 1st September 2020 to 30th March 2022. Inclusion criteria were patients aged between 18-60 years presenting with displaced 3 and 4 parts PHF. Exclusion criteria were patients with open fractures, Neer 1 and 2, and neglected PHF whereas patients who refused to be part of this study. Approval from "Institutional Ethics Committee (AMC/PGMI/LGH/Research No/109/20)" was acquired while informed written consents were taken. Patients were enrolled from outpatient or emergency department of the study institute.

At the time of enrollment, demographic data was noted and medical history was taken. All fractures were classified in accordance to Neer⁹ using plain radiographs. All patients underwent PHILOS Plate osteosynthesis as per standard surgical approach. All the patients were given intravenous antibiotics pre-operatively and for few days post operatively. Drains were removed after 48 hours post-operatively. Patients were encouraged to mobilize 1–2 days post-operatively and advised to commence passive range of motion with support as tolerated after 3 to 4 days and active after 3 weeks.

The patients were followed up in the outpatients department at 2 weeks for wound examination and stitches removal. Variables of constant shoulder score was recorded on fortnightly follow up visits and total score was calculated and graded. Any complications post-operatively or during the follow up period were also documented. Final outcomes included total constant score and functional outcome that were labeled after 6-months follow up. The "Constant-Murley score (CMS)" is a 100-points scale composed of a number of individual parameters. These parameters define the level of pain and the ability to carry out the normal daily activities of the patient⁷.

Data Analysis: All data was entered and processed in "Statistical Package for Social Sciences (SPSS)", version 26.0. Qualitative data were described as frequency and percentages while quantitative data were presented as mean and standard deviation.

RESULTS

During the study duration, a total of 30 patients (N=30) were analyzed as per inclusion/exclusion criteria. There were 22

(73.3%) male and 8 (26.7%) female patients representing a male to female ratio of 2.8:1. The mean age was 36.73 ± 12.85 years ranging between 18-60 years while 17 (56.7%) patients were between 18-35 years of age, 8 patients (26.7%) were between 36-50 years of age, while there were 5 (16.7%) patients between 50-60 years of age. There were 17 (56.7%) patients who had road traffic accident and 11 (36.7%) reported fall from height and 2 (6.7%) patients had physical assault (hit by bull). Table-I is showing characteristics of patients.

Table-I: Characteristics of Patients (N=30)

	Variables	Number (%)
Gender	Male	22 (73.3%)
	Female	8 (26.7%)
Age (years)	18-35	17 (56.7%)
	36-50	8 (26.7%)
	51-60	5 (16.7%)
Residence	Urban	11 (36.7%)
	Rural	19 (63.3%)
Mode of injury	Road-traffic accident	17 (56.7%)
	Fall from height	11 (36.7%)
	Physical assault	2 (6.7%)
Fracture Type	Neer 3	22 (73.3%)
	Neer 4	8 (26.7%)

Table-II: Final outcomes among Patients (N=30)

	Outcomes	Number (%)
Constant Score	56-70	15 (50.0%)
	71-85	12 (40.0%)
	86-100	3 (10.0%)
Functional outcome	Excellent	3 (10.0%)
	Good	12 (40.0%)
	Fair	15 (50.0%)

The mean duration of surgical procedure were 59.57 ± 19.39 minutes ranging between ranging between 45-120 minutes. There were 26 (86.7%) patients who operated between 45-60 minutes while 4 (13%) patients had duration of surgical procedure between 61-120 minutes. The mean duration of hospitalization were 5.50 ± 2.17 days ranging between 3-10 days. There were 21 (70.0%) patients who had duration of hospitalization between 3-6 days, 8 (26.7%) between 7-10 days while 1 (3.3%) patients had stay in the hospital above 10 days. The mean constant score was 72.76 ± 12.25 while there were 15 (50.0%) patients who had total score between 56-70, 12 (40.0%) between 71-85 while only 3 (10.0%) patients between 85-100 total score. The functional outcome of patients after 6 months were excellent in 3 (10.0%) patients, good 12 (40.0%) and 15 (50%) had fair outcome (table-II). There were 28 (93.3%) patients who had grade-1 union and 2 (6.7%) had grade-11 union after 6 months of follow up. No major complications were reported during post-surgical follow up period.

DISCUSSION

Better biomechanical properties and enhanced anchorage is achieved by angular stability of recently invented implants,

particularly in osteoporotic bone while goal of treatment is a painless shoulder with satisfactory functional outcome.^{10,11} The PHILOS plate is intended to result in improvement in fixation of screw and reduction in soft tissue dissection to minimum. This aim is achieved by multi-directional locking screws for the head, pre-contouring of plate as well as locking screws in 3 & 4 part PHF¹². Some researchers have observed that PHILOS plate resulted in good outcomes in treating patients with displaced 3 and 4-part PHF, and quite stable fixation is achieved which allows early mobilization¹³⁻¹⁵. Our study showed that the PHILOS plate results in excellent and good results in treatment of PHF Neer type 3 & 4.

In our case series, the mean age was 36.73±12.85 while 56.7% of patients were between 18-35 years of age. In a study carried out by Bjorkenheim, age affecting results after PHILOS plate fixation was of interest as there was a strong belief that these plates provided a more secure fixation in the osteoporotic bone but the clinical outcome in this study, in patients over 55 years, was poor¹⁶. In another study conducted by Moonot et al, there was no appreciable difference in practical outcome in patients under and over 65 years of age². In one study done by Thyagarajan et al, 58 years was the average age of patients ranging between 19-92 years which shows that relatively younger age was observed in the present case series¹⁷. In a study carried out by Aggarwal, mean age was 58.51 years⁸. We noticed that 73.3% patients in this study were male. In a study carried out by Aggarwal et al, there were 57.4% males which is showing the male predominance somewhat near to what we noted⁸.

In our study, the injury was implicated by simple fall and fall from height in 36.7% patients, 6.7% had physical assault and 56.7% had fracture because of road traffic accidents. In a study presented from UK by the Gaheer et al, mechanism of injury was fall in 78.6% patients while 12 (21.4%) patients had road-traffic accidents¹².

In our study, the mean operative time was 59.57±19.39 minutes (ranging 45-120 minutes). In a study reported by Leonard et al, mean operative time was 81 minutes (ranging 60–123)¹³. In our study, the mean constant score was 72.76±12.25 with a range from 0-100 score. In a study carried out by Moonot et al, the mean constant score in patients aged more than 60 years was 66.1 (ranging 30-81) and 67.1 (ranging 38-92) among those aged less than 60 years while the difference was not statistically significant ($p=0.8443$)².

In the present research, the functional outcome after 6 months follow up, 10.0% patients had excellent result, 50.0% good results and 40.0% fair results. In this study, overall 60% patients had excellent and good results. In a study reported by Moonot et al, 84.4 patients showed excellent or satisfactory result but in five patients (15.6%) had poor outcomes². In another study by Bjorkenheim et al, 3% cases reported with nonunion, 4% avascular necrosis and 3% with implant failures having loss of fixation. The authors recommended the utilization of PHILOS plate, especially in elderly patients having osteoporotic bone¹⁶. Erpala et al found locking plate osteosynthesis to be superior to hemiarthroplasty in Neer type 3 and 4 fractures which again highlight the findings of this study¹⁸. In another study carried out

by Park et al, there were 78.0% with excellent, 11% satisfactory and 11% unsatisfactory results which is comparable with our study³. A recent study by Gurnani et al revealed that ROM pertaining to flexion, extension, abduction, internal rotation, and external rotation for individuals with PHILOS® plating was 20%, 12.5%, 14.7%, 11.5%, and 18.5% higher than those who received Neer's hemiarthroplasty¹⁹. Other researchers have also shown that PHILOS plate is useful in majority of fractures with help of correct surgical technique.⁴

Being a single center study conducted on a relatively small sample size, these were some limitations. The follow up period of 6 months is also moderate so we were unable to document long-term follow ups in the current case series.

CONCLUSION

Very acceptable functional outcomes with PHILOS plating were found in Neer type 3 and 4 fractures of humeral head. Early mobilization of shoulder can be achieved without any compromise in fracture union with six months follow and there was no avascular necrosis.

AUTHOR'S CONTRIBUTION

Ijaz A: Conceived Idea, Designed Research Methodology.

Basit MA: Literature Search, Manuscript Writing.

Hussain R: Data Collection, Data Interpretation.

Shakeel M: Literature Review, Statistical Analysis

Hanif M: Manuscript final reading and approval

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