



STUDY OF FUNCTIONAL OUTCOME OF DISPLACED PROXIMAL HUMERUS FRACTURE TREATED WITH PROXIMAL HUMERUS PLATING

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ABSTRACT

Background: Nearly 4% to 5% of all fractures, or about 25% of all humerus fractures, are proximal humerus fractures. The Proximal Humerus Internal Locking System (PHILOS) plate was made to help prevent these problems, especially in older people who have osteoporosis. Highly broken-up 3 and 4-part fractures can be fixed with rotator cuff sutural ties and a plate, which improves the patient's ability to use the arm. This study enlightens the functional outcome of management of the fracture of humerus involving the proximal part, with PHILOS plate. **Methodology:** The present retrospective study included 50 cases of proximal humerus fractures treated surgically with Proximal Humerus Inter Locking System (PHILOS) plate. Patients with all displaced proximal humerus fracture managed operatively with proximal humerus locking plate with age of patient > 18 years were included. On follow-up patients were examined for local infection, range of motion and pain and functional assessment was done using Neer score. Radiographic assessment was done and it was correlated with functional outcomes, pain and shoulder range of motion. **Results:** Out of total 50 patients, 44% belong to age group 41 to 60 years with mean age of 52.71±7.27 years. 64% were male patients. 22(44%) patients had Neer's 4-part fracture (one - nonunion) and 19(38%) had Neer's 3-part fracture. 14% patients had excellent scores, 18% had good scores and 36% had moderate scores. Mean constant score for Neer two-part fracture was 73.41 (range 52-88), for Neer's three parts fracture was 64.58 (range 29-86) and for Neer's four parts fracture was 57.49 (range 36-77). Mean constant score for middle age group (18-40) was 73.2 (range 68-87), for old age group (41-60) was 63.5 (range 32-88) and for very old age group 61-80 years) was 58.22 (55-62). The most common complication seen was stiffness of the shoulder in 6% (n=3) subjects followed by avascular necrosis seen in 4% (n=2) subjects. **Conclusion:** Overall functional outcomes of PHILOS plates are good. Proximal humerus locking plate is a preferred option for management of all types of Neer's fracture types of proximal humerus and fracture dislocation of proximal humerus.

KEYWORDS : Functional Outcome, Displaced Proximal Humerus Fracture, Proximal Humerus Plating, Neer Score, Radiographic Assessment

INTRODUCTION:

Nearly 4% to 5% of all fractures, or about 25% of all humerus fractures, are proximal humerus fractures. People who are 60 or older often get these breaks. Along the physal lines of union, the proximal humerus usually breaks into four pieces: two tuberosities, the head of the humerus, and the shaft. Most tuberosity fractures happen because the head piece moves, and their initial degree of movement is small compared to their normal anatomic position⁽¹⁾. Proximal humerus involves head, greater tuberosity, lesser tuberosity and proximal 1/4th of the shaft. Most common in elderly patients due to osteoporosis and less frequently in young adults due to high energy trauma.⁽²⁾

Usually, high energy trauma associated with dislocation. These fractures challenge the treating orthopedic because of its osteoporotic quality in the elderly people and the deforming forces of the muscles attached. Most of proximal humerus fractures, in younger as well as in the elderly patients, are stable & slightly or non-displaced, can be treated non operatively.⁽³⁾ Treatment choices range from doing nothing to closed pinning, intramedullary nails stacked on top of each other, plating, and hemi-arthroplasty. Fractures with little movement or only two broken pieces can be treated without surgery, but fractures with >2 broken pieces that move need surgery for the best functional result⁽⁴⁾.

When the quality of the cancellous bone in the proximal humerus is low, as it often is in older patients, there is a high chance that the conventional plating method won't work⁽⁵⁾. The Proximal Humerus Internal Locking System (PHILOS) plate was made to help prevent these problems, especially in older people who have osteoporosis. Even a fracture with only a small amount of movement can be handled with a PHILOS plate. This allows the fracture to be moved as soon as possible, preventing shoulder stiffness⁽⁶⁾. Highly broken-up 3 and 4-part fractures can be fixed with rotator cuff sutural ties and a plate, which improves the patient's ability to use the arm. This study enlightens the functional outcome of management of the fracture of humerus involving the proximal part, with PHILOS plate.

MATERIALS & METHODS:

After approval from institutional ethical committee, present retrospective study included 50 cases of proximal humerus fractures treated surgically with Proximal Humerus Inter Locking System (PHILOS) plate in a Tertiary care hospital attached to a medical college. Patients with all displaced proximal humerus fracture

managed operatively with proximal humerus locking plate with age of patient > 18 years were included. Patients with metastatic and pathological fractures, un-displaced fractures which treated conservatively and open fracture were excluded.

Demographic data, date of injury, date of surgery, time interval between injury and surgery, surgical approach and fixation, wound complications before and after surgery were recorded. On follow-up patients were examined for local infection, range of motion and pain and functional assessment was done using Neer score⁽⁷⁾. Neer score is shoulder score by American Academy of Orthopedic Surgeons. This Scoring system combines assessment four parameters namely Pain, Function, Range of motion, and Anatomy. The maximum score is 100. Radiographic assessment was done for alignment, fracture union, implant loosening, loss of reduction, evidence of avascular necrosis and it was correlated with functional outcomes, pain and shoulder range of motion.

Descriptive analysis was used to present the collected data. Because of limited sample size and non-normal distribution of data, non-parametric statistical methods were employed. Results were collected and categorized with respect to Neer's criteria. Student t test was used to obtain mean Neer score and used Chi-square test to obtain the power of significance 'p' value. All analysis was performed using STATA software.

RESULTS:

Clinico-demographic Characteristics Of The Patients:

Out of total 50 patients with proximal humerus fractures, majority, 44% belong to age group 41 to 60 years followed by 30% from 51 to 70 years. Mean age of the patients was 52.71±7.27 years ranging from 18 to 67 years. 64% were male patients. Right side was involved in 72% and left side in 28% patients.

Table 1. Clinico-demographic Characteristics Of The Patients:

Clinico-demographic characteristics		Frequency	Percentage
Age Groups	18-40 years	13	26%
	41-60 years	22	44%
	61-80 years	15	30%
Gender	Male	32	64%
	Female	18	36%

Side Involved	Right	36	72%
	Left	14	28%
Mode of Injury	RTA	21	42%
	Fall from height	17	34%
	Animal Attack	12	24%
Co-morbidities	Diabetes Mellitus	6	12%
	Hypertension	3	6%
	Coronary Artery Disease	2	4%
	Rheumatoid Arthritis	2	4%
	No Co-morbidities	33	66%
Total		50	100%

Mode of Injury was RTA in 42% patients, fall from height in 34% and animal attack in 24% patients. 12% patients had Diabetes Mellitus, 6% Hypertension, Coronary Artery Disease and Rheumatoid Arthritis were present in 4% patients each. 66% patients didn't have any comorbidities.

Distribution Of The Patients As Per NEER Classification:

The fracture of all 50 patients were classified using NEER'S Classification. 22 (44%) patients had Neer's 4-part fracture (one - nonunion), 19 (38%) had Neer's 3-part fracture and 9 (18%) had Neer's 2 part.

Table 2. Durations Of Surgery And Average Blood Loss:

Surgery Details	Mean	Stand. Dev.	Range
Durations of Surgery (minutes)	91.23	17.84	43 to 167
Average Blood loss (ml)	178.77	25.64	38 to 192

The average duration of surgery is about 91.23±17.84 minutes ranging from 43 minutes to 167 minutes. The average blood loss is about 178.77±25.64 ml ranging from 38 ml to 192 ml.

Post-operative Outcomes:

Out of the 50 patients followed up, 14% patients had excellent scores, 18% had good scores, 36% had moderate scores and 12% had poor outcome scores. Mean score is 64.87±9.36 (range 33-88 points).

Table 3: Constant Score, Neer's Parts Of Fracture And Age Group Of The Patients:

Patients' variables		Constant Score	P value
Neer's Classification	Two Part	73.41 (range 52-88)	<0.001
	Three Part	64.58 (range 29-86)	
	Four Part	57.49 (range 36-77)	
Age group	18-40 years	73.2 (range 68-87)	<0.001
	41-60 years	63.5 (range 32-88)	
	61-80 years	58.22 (55 -62)	

Mean constant score for Neer two-part fracture was 73.41 (range 52-88), for Neer's three parts fracture was 64.58 (range 29-86) and for Neer's four parts fracture was 57.49 (range 36-77). Mean constant score for middle age group (18-40) was 73.2 (range 68-87), for old age group (41-60) was 63.5 (range 32-88) and for very old age group 61 to 80 years) was 58.22 (55-62).

Table 7: Complications:

COMPLICATIONS	Frequency	Percentage
Stiffness of shoulder	3	6%
Avascular necrosis	2	4%
Loosening of implant	2	4%
Penetration of screw into joint space	1	2%
No Complications	42	84%

Amongst 50 operated cases, follow-up revealed no complication in 84% of cases (n=42). The most common complication seen was stiffness of the shoulder in 6% (n=3) subjects followed by avascular necrosis seen in 4% (n=2) subjects. Stiffness of the shoulder improved with physiotherapy.

DISCUSSION

The treatment of complex humeral 3- or 4-part fractures represents a challenge. The surgeon must obtain an exact anatomical reduction and stable fixation, and at the same time minimize the iatrogenic risk of screw penetration and avascular necrosis of humeral head by maximal protection of the periarticular soft tissues. There is consensus in the literature that, regardless of the procedure and the implant chosen, a good functional final result depends mainly on anatomical reduction of the fracture combined with a stable fixation, and early initiation of functional rehabilitation of the shoulder.

In the present study, 44% belong to age group 41 to 60 years and mean age was 52.71±7.27 years. 64% were male patients. Mode of Injury was RTA in 42% patients, fall from height in 34% and animal attack in 24% patients. These results are consistent with previous research by **Kirsch et al⁽⁸⁾** who found that out of 40 cases evaluated, 47.5% included traffic accidents, 50% had a history of falling, and 2.5% had a history of assault. It is consistent with the age incidence in studies done by **Kenneth A et al⁽⁹⁾**, shows mean age 61 years. Study of **Rizwan Shahid et al⁽¹⁰⁾** reveals predominance of proximal humerus fractures in females of elderly age group. Studies also reveal that male to female ratio being 1:0.8.

We observed that out of 50 respondents, 44% patients had Neer's 4-part fracture (one - nonunion), 38% had Neer's 3-part fracture and 18% had Neer's 2 part. According to results of **Rizwan Shahid et al⁽¹⁰⁾** 22% patients had 2-part fracture, 42% had 3 Part fracture and 36% patients were found to have 4 Part fracture. Similar results observed by **Ma Fazal et al⁽¹¹⁾**, 48% had 2-part fracture, 45.5% 3-Part fracture and only 7.5% respondents were found to have 4-Part fracture.

We observed that out of the 50 patients followed up, 14% patients had excellent scores, 18% had good scores, 36% had moderate scores and 12% had poor outcome scores. Mean score is 64.87±9.36 (range 33-88 points). **Ganesan et al⁽¹²⁾** also observed excellent results in 50% of the instances, satisfactory results in 30% of the cases, unsatisfactory results in 10% of the cases, and failure results in 10% of the cases. According to a study by **Jagiasi et al⁽¹³⁾**, the results were outstanding in 40% of the instances, very good in 6.66%, good in 30%, fair in 20%, and poor in 3.33% of the cases. The results of a study by **Vijayanand et al⁽¹⁴⁾** were excellent outcomes in 23 cases, satisfactory in four, unsatisfactory in two, and in one case a failure.

The average clinical result obtained in our study, with a mean Constant-Murley score of 62.67 points is satisfactory. Mean constant score for Neer two-part fracture was maximum, 73.41 (range 52-88), and for middle age group (18-40) was maximum, 73.2 (range 68-87). The mean constant Murley shoulder score, according to a study by **Jagiasi et al⁽¹³⁾**, was 61.8. The mean constant score was 50.53 for people over 45 years of age and 72.91 for people under 45 years of age. A study **Vijayvargiya M et al⁽¹⁵⁾** from Madhya Pradesh noticed that the mean constant score in the delto splitting approach was 70.9 and 74 in a deltopectoral group in a study among 26 cases. All fractures united radiologically and clinically and the constant Murley score at the final follow-up was 72.5.

In this study, the most frequent complications were stiffness of the shoulder in 6% (n=3) subjects followed by avascular necrosis seen in 4% (n=2) subjects. These outcomes are comparable to those of a study conducted by **Pandya et al⁽¹⁶⁾** in Gujarat. In 9.75% of cases, the authors noted shoulder discomfort and malunion. **Thanasas et al⁽¹⁷⁾** in a comprehensive review of 12 studies on proximal humerus fractures reported stiffness in 7% (3/41) of respondents.

CONCLUSION

Proximal humerus locking plate is a preferred option for management of in types of Neer's fracture types of proximal humerus and fracture dislocation of proximal humerus. PHILOS provides an angle stable construct with a combination of both divergent and convergent screw orientation and hence decreasing pull out of screws and decreasing chances of failure of fixation. In the present study of 50 patients treated with PHILOS plating, 14% patients had excellent scores, 18% had good scores, 36% had moderate scores and 12% had poor outcome scores. Therefore, based on these findings it can be concluded that the overall functional outcomes of PHILOS plates are good.

However, complications are not uncommon with PHILOS plates. An adequate surgical technique will minimize complications and an aggressive rehabilitation regime will ensure the best possible result.

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