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Original Article

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Functional Outcome of Proximal Humerus Fractures Treated with Philos Plating

Dr Anil Kumar SV[1], Dr Rahul Sunil Raykar[*2], Dr Amith D[2]

[1] Associate Professor, Dr Br Ambedkar Medical College
[2] Junior Resident in Orthopaedics, Dr Br Ambedkar Medical College

ABSTRACT

Background and Objectives: Fracture of the proximal humerus is associated with severe morbidity to the patient condition. The incidence of this fracture is anticipated to rise as population longevity with the same causing osteoporosis of bones increasing the susceptibility to fractures. From a practical and aesthetic perspective, achieving effective fracture realignment is crucial. There is a lot of confusion about the best way to treat different types of fractures due to the wide range of treatment options available for these injuries. Open reduction with Proximal Humerus Interlocking System is presently the gold standard. The goal of this study was to evaluate the outcome of PHILOS plating for proximal humerus fractures

Methods: The current study was a prospective analysis of 20 proximal humerus fracture cases that were admitted to Dr. B. R. Ambedkar Medical College between September 2020 and August 2021. Patients with proximal humerus fractures over the age of 18 were included as cases, and cases were chosen in accordance with inclusion and exclusion criteria. Patients who were medically unfit, unwilling for surgery, or who had open fractures when they arrived were excluded from the study.

Results: This study comprises the sample of 20 patients, in which 12 were females and 8 were males. The age distribution was varied from 18 years to 74 years with an average age of 51 years.

Out of 20 patients, 6 patients were victim of road traffic accident in which one associated with fracture neck of femur on ipsilateral hip, 10 patients had self fall, 4 patients were fell from height (minimum 10 feet) and one was victim of an epileptic attack.

Longest duration of follow up was 21 months with a mean follow up of 12 months. final follow up assessment with 'The Constant Criteria' Of the 20 cases,7(35%) patients had excellent result, 10(50%) good , 2(10%) moderate , 1 (5%) poor

Conclusion: Open reduction and PHILOS plating for proximal humerus fractures has shown to achieve good anatomical and functional outcome. The complications arising from the procedure were within acceptable limits. The surgical procedure continues to be at the forefront of the management of Proximal Humerus Fractures.

Key Words: *Proximal humerus Fracture; Philos Plating; Open Reduction*

***Corresponding Author**
Dr Rahul Sunil Raykar[*]
Junior Resident in Orthopaedics, Dr Br Ambedkar Medical College

INTRODUCTION

Proximal humerus fractures constitute about 5% of all fractures and are the third most common fractures in patients over the age of 65 [1]. They are frequently related to osteoporosis and low-energy trauma, presenting a considerable challenge to orthopedic surgeons due to the complex anatomy of the shoulder joint, and the wide variety of fracture patterns [2].

The treatment of proximal humerus fractures has been a matter of debate, and the choice of treatment is typically influenced by factors such as the patient's age, bone quality, fracture pattern, comorbidities, and the surgeon's expertise [3]. Conservative management, which includes physical therapy and analgesics, has traditionally been the mainstay of treatment for displaced proximal humerus fractures [4]. However, surgical intervention may be necessary in more complex cases or when conservative treatment fails.

Surgical options for the management of proximal humerus fractures include closed reduction and percutaneous pinning, open reduction and internal fixation (ORIF), intramedullary nailing, hemiarthroplasty, and reverse total shoulder arthroplasty [5]. Among these, ORIF using the Proximal Humerus Internal Locking System (PHILOS) plate has gained popularity in recent years [6]. The PHILOS plate, a type of locking compression plate, allows for stable fixation of the fracture fragments, thus facilitating early mobilization and improved functional recovery [7].

While the PHILOS plating system has been touted for its ability to achieve stable fixation even in osteoporotic bone, there is a paucity of high-level evidence supporting its efficacy (8). Some studies have reported satisfactory results in terms of functional recovery, pain reduction, and improved quality of life (6,7). However, other studies have reported high rates of complications such as screw perforation, a vascular necrosis of the humeral head, implant failure, and the need for revision surgery [8, 9].

AIM

The study's objective is to evaluate the functional outcomes of individuals who underwent PHILOS plate fixation for proximal humerus fractures.

OBJECTIVES

1) To assess the functional results of the Proximal Humerus Locking Plate following displaced proximal humerus fracture.
2) To increase the stability of humeral bones that are osteoporotic.
3) To secure an anatomical reduction with several locking screws that have angular stability while maintaining the biological integrity of the humeral head.

MATERIALS AND METHODS

This is a prospective study, conducted at D.R.B.R.A.M.C & Hospital, Bangalore in Department of Orthopaedics & Traumatology on those who were admitted with displaced fracture of Proximal Humerus from august 2020 to September 2021. Before including them in this study, informed consent was obtained from them in the language in which they were well versed, and ethical committee clearance was obtained for the same.

MATERIALS

Twenty patients were admitted with displaced fracture of Proximal Humerus to Orthopaedic ward in the Department of Orthopaedics D.R.B.R.A.M.C Hospital, Bangalore and involved in this study prospectively based on the following criteria.

Inclusion criteria:

1) Patients with displaced proximal humerus fracture, on basis of Neer's classification.
2) Failure of conservative treatment.
3) Associated dislocation of shoulder.
4) Patients undergoing revision surgery for failure of other implants.
5) Patients who have given consent to this study.

Exclusion criteria

1) Metastatic & pathological fractures
2) Patients less than 18 years.
3) Those who are not willing for surgery
4) Part fracture in elderly

Age, profession and sex of the patient, mode of injury, severity of the injury, associated injuries, time since injury and their function demands were noted down. Confirmed with radiographic evaluation including standard & special view, Intra-articular extent of fracture geometry were assessed with thin slice of CT scan in doubtful cases.

Fracture was classified using NEER'S Classification and planned pre-operatively according to it. Patient was treated with analgesics, U- slab till surgery. Co-morbidities were treated accordingly.

Intra-operative events, difficulties and complications, post operative radiological evaluations and bony union were noted. Patients were followed up at 2 weeks, 6 weeks, 3, 6 and 12 months with radio graphical evaluation and clinical examination and outcome. All patients at their final assessment, underwent radiological and functional evaluation using the CONSTANT score.

OBSERVATION AND RESULTS

Our study enrolled a total of 20 patients who presented at the outpatient department of our hospital with proximal humerus fractures.

The majority of these patients were female (60%), and a large proportion was in their 50s (40%). The most common cause of these injuries was a free fall to the ground level, which accounted for 50% of the cases. Interestingly, one patient had a proximal humerus fracture due to a post-epileptic fall.

There were no reports of bilateral fractures. It was observed that 18 of the patients were right-handed, while only 2 were left-handed. Importantly, the dominant arm was involved in 75% of the patients. Of note, 50% of the female

patients were postmenopausal women with osteoporosis. Also, 80% of the patients were hospitalized within five days of the injury, and 30% had previously received native care, including massage, splints, or attempted repositioning.

Eight patients presented with concurrent fractures in bones other than the proximal humerus. All patients had experienced closed trauma. Neer type 2 fractures were the most common, accounting for 60% of the patients.

Among the injuries, fractures of the greater tuberosity were the most prevalent type in bipartite fractures. Only 5% of the patients presented with 4-component fractures. There were two cases (10%) of fracture dislocations. None of the patients required postoperative immobilization with a plaster of Paris (POP). On average, patients were admitted for surgery a few days post-injury.

The healing process for all fractures was within an average of 10 weeks. There was no evidence of implant loosening or failure. During follow-up, 60% of patients reported experiencing no pain. The average active elevation range was 126.25 degrees, while the average range of active external rotation was 47 degrees. The mean range of abduction was 123.25 degrees. A high proportion of patients (85%) displayed normal shoulder strength.

Interestingly, patients with 2-part fractures had better functional outcomes compared to those with 3-part and 4-part fractures.

Table 1: Post op immobilization

S.no	Immobilization	No of pts
1	Post op	0
2	arm sling	12
3	Shoulder immobiliser	5
4	Cuff and collar	3

Table 2: Tabulation of the complications

COMPLICATIONS

Post-surgery, complications were encountered in some of the patients. The early and late complications that occurred are summarized separately below. Of the 20, 2 patients (25%) developed early complications which are as follows.

EARLY COMPLICATIONS

S.no	Complications	No of pts
1	Skin necrosis	1
2	Wound gaping	1
3	Deltoid atony	1

LATE COMPLICATIONS

S.no	Late complications	No of pts
1	Malunion	1
2	Joint stiffness	2
3	Instability	1
4	Non union	0
5	Infection	0
6	Heterotropic ossification	1

The patients were followed up at regular intervals every two weeks interval during the first 3 months and every 1 month thereafter. The minimum follow-up period was four months and maximum follow up period was 8 months.

The results were evaluated during follow up by taking into consideration the following factors:

1) Pain
2) Range of motion
3) Strength
4) Stability
5) Function
6) Radiological documentation of fracture union
7) Anatomic restoration

Constant and Murley Score:

Constant and Murley' s score was used to assess the functional outcome of our patients.

PAIN

Post op pain was recorded on a scale of 0-5points, where points were given according to the following criteria

Table 3: Pain scale

Pain scale	Points
No pain	5
Mild pain	4
Pain after unusual activity	3
Pain at rest	2
Marked pain	1
Completely disability	0

11(55%) patients said that may had no pain and 6 (30%) patients had only mild pain, 3(15%) patients had pain after unusual activity. None of our patients had pain at rest or disabling pain.

Table 4: Evaluation of Pain

SL. NO	pain	No of pts
1	No pain	11
2	Mild pain	6
3	Pain with unusual activity	3
4	Pain at rest	0
5	Marked pain	0
6	Complete disability	0

FUNCTIONAL OUTCOME

Functional outcome was evaluated with ability to perform day to day activities. Points were given according to the following scale

4 - Normal
3 - Mild compromise
2 - with difficulty
1 - with aid
0 - unable
NA - not available

Functional results were graded by following criteria:

Good functional result 3.5 - 4.0 points
Fair 2.5 - 3.4 points
Poor < 2.5 points

11 (55%) of the 20 patients had good functional result, 8 (40%), had fair functional results and 1(5%) had poor functional result

Table 5: Functional Outcome

S.no	Functional outcome	No of pts
1	Good	11
2	Fair	8
3	Poor	1

MUSCLE STRENGTH

Muscle strength was evaluated for the muscles around the shoulder and points allotted accorded to strength as follows;
Normal -5
Against Resistance -4
Against Gravity -3
With Elimination of Gravity -2
Flicker -1
Paralysis - 0

17 (85%) of patients had normal muscle strength in all the muscle groups evaluated and 2 (10%) patients had good muscle strength and 1 (5%) patient had fair muscle strength.

Table 6: Muscle Strength

S. no	Muscle strength	No of pts
1	Normal	17
2	Against resistance	2
3	Against gravity	1
4	Eliminate gravity	0
5	Flicker	0
6	Paralysis	0

RANGE OF MOTION

Range of Motion was evaluated during each follow up and the improvement was recorded. The following table shows average range of motion (ROM) observed.

Active forward elevation was defined as the angle between the humerus and the upper part of the thorax in the sagittal plane.

External rotation was measured with the arm at patients side. Internal rotation was recorded as the posterior body segment that could be reached by the thumb with the elbow in a flexed position.

Table XXII: Range of motion

S. no	Motion	Range in degree	Average
1	Elevation	90-170	126.25
2	Abduction	70-100	123.35
3	External rotation	35-60	47
4	Internal rotation	T3-L4	T11
5	Extension	30-55	43
6	Flexion	80-120	93.85

Radiological Outcome:

Quality of reduction, fracture alignment, restoration of articular congruity, fracture union, PHILOS plate deviation, screw penetration, backout, implant loosening and failure were assessed radio logically during follow up.

All fractures united and the average time taken for union was approximately ten weeks. One patient with three part fracture went for malunion. No cases of implant deviation, screw penetration, screw back out, impingement and failure was encountered.

OVERALL RESULTS

The overall results were rated according to the following criteria:
Maximum no: of points - 100
Excellent - more than 86.
Good - 71-85
Moderate: 56-70;
Poor: 0 – 55

Table 7: Overall Results

S. no	Rating	No of pts	Percentage
1	Excellent 86-100	7	35
2	Good 71-85	10	50
3	Moderate 56-70	2	10
4	Poor 0-55	1	5

DISCUSSION

In this prospective & retrospective study we have analysed 20 cases of Proximal Humerus Fractures treated surgically using PHILOS plates in our hospital.

There was female preponderance in our study 12 (60%) similar to the conclusion of the study conducted by Kristensen involving 595patients of proximal humeral fractures, there was female preponderance.

In Kristiansen et al study of 565 proximal humerus fractures in 5,00,000 people, women were involved in 77% of fracture in all age groups. This is thought to be a result of advanced osteoporosis.

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 a vascular necrosis of the humeral head by maximal protection of the soft tissues surrounding the shoulder joint.

Poor results in these complex fractures are due to following causes:

1) Inadequate fracture reduction especially medial cortex
2) Unstable fixation
3) Incorrect positioning of the fixation devices

In the study by Kristiansen et al [10] involving 565 proximal humerus fractures in 5,00,000 people, women were involved in 77% of fractures in all age groups. This is thought to be a direct result of advanced osteoporosis, and our study shows similar results to the results of these studies.

In our study, the average age of the patients was 52 years which was corresponding to the reports by Hawkins and Bell, and Flatow et al [11] and Cornell et al [12]. In our study, the most common mode and mechanism of Injury was free fall at ground level, fall from height and road traffic accident, which is comparative to the results of the study conducted by Flatow et al [11] as fall on the outstretched arm was the predominant mechanism of injury. Since Indian people have poor quality of bone stock, slight differences are expected.

Neer Classification is the most widely used scheme for proximal humeral fractures. It has gained universal clinical acceptance by orthopaedic surgeons and radiologists and is considered to have significant implications for both treatment options and outcomes. In our study also, we have followed Neer's 4- part classification.

In order to properly employ this classification, precise radiographic evaluation is of paramount importance [12]. and it is found that Neer's 3 view trauma series to be of greatest value in evaluating these fractures. The importance of these series has been shown by Richard J, Hawkins S and R.L. Angel [13]. with LCP for two part greater tuberosity fracture.

There was a predominance of 2-part fracture in our study in 12 patients (60%), of which greater tuberosity fracture were the most common.

Flatow et al, in a series of 12 patients, reported 50% excellent results and 50% good results in patients treated by ORIF Closed treatment of 3-part fracture is often associated with moderate pain, poor range of motion and disability. ORIF was associated with good to excellent results in more than 80% of patients in a report by Hawkins et al and recommended surgical treatment for healthy active individuals who have three part fractures of the proximal humerus. Cornell and Levine reported good results with screw tension band technique for 3-part fractures. Prosthetic replacement for 3-part fracture has been used by several authors.

In the treatment of 4-part fracture and fracture dislocations, less than 10% good or excellent results are obtained by open reduction and internal fixation [13]. Isolated reports of revascularization of head of humerus following ORIF indicate satisfactory healing.

In the 20 patients, the neck-shaft angle at (Day 1) post op was in the range of 130^0 to 137^0 , with an average angle of 133.2^0 . Post-surgery, after 3 weeks this neck-shaft angle reduced to the range of 124^0 to 132^0 (Day 21 follow-up), with an average of 128.5^0 and this did not make any difference in the final outcome It was observed that people with age < 50 years had a better range of movement (eg. abduction and forward flexion of the shoulder joint) ranging over 120^0 .

In patients aged > 50 years, the range of movement was restricted to an average of 100^0 which corelates with the study done by Gracitell, Mauro Emilio Conforto et al [14] In our study patients who had attended regular physiotherapy sessions and who adhered to 3 phase rehabilitation protocol had better DASH score and range of movement than patient who did independent exercises at home.

Comparable studies of internal fixation of Proximal humerus fractures demonstrate similar short term results. Although the follow-up period of our series was short, studies have shown that early function is comparable to final long term outcome. The outcome seems to correlate with fracture severity, anatomic reduction, etiology, bone quality, length of time elapsed from injury to surgery, concomitant injuries and the exact positioning and fixation of the implant [11].

A meticulous anatomical reduction with appropriate plate positioning led to a significantly better result. The Constant-Murley score was significantly lower if anatomical reconstruction did not succeed or a non anatomical reconstruction was accepted intraoperatively, and/or when the plate was not correctly positioned on the shaft at the proper height to avoid subacromial impingement.

The 4.5 % (1/20 patients) infection rate in our series is comparable to the 2.5% (2/41 patients) patients of Paavolainen et al(1983).

PHILOS results: The average constant score in our study with 20 patients was 81.7 which is slightly better than the the study by Koukakis et al In summary, fractures of Proximal Humerus may be extremely demanding. There are many pitfalls for the unwary patient and surgeon to avoid during the course of treatment. Emphasis is placed on complete and accurate diagnosis and formulation of safe and simple techniques for restoration of anatomical stability, fracture union, cuff integrity, range of motion and adequate muscle strength.

CONCLUSION

Although our study was relatively short and it was not a randomized controlled study, the results are comparable with other published journals. Accurate anatomical reduction gains and early fracture fixation are more important than the implant used, to get a good final functional outcome, and this factor is independent from the implant design and procedure selected.

The options as to the surgical approach or the type of implant used depend on the pattern of the fracture, the quality of the bone encountered, the patient's goals and the surgeon's familiarity with the techniques. The learning curve with the implants chosen certainly also plays a role. An adequate surgical technique will minimise complications and an aggressive rehabilitation regime will ensure the best possible result.. As PHILOS plate has options of multidirectional screws, it will aid in better stability. Earlier the surgery is done better are the results. Functional outcome is better with isolated fractures than with fracture dislocations. Adherence to regular and graduated rehabilitation program is the key for good functional outcome. Results are best when operative method results in stable fixation that allows early passive mobilization. Functional outcome of 2 part fractures is better than 3 part and 4 part fractures. Radiological outcome assessed by means of quality of reduction and union of fracture in two and three part fractures is better than in four part fractures. Finally, we concluded that proximal humeral fractures when treated surgically especially using PHILOS plate provided better stability and early mobilization, and hence lesser stiffness and greater ROM.

REFERENCES

1. Court-Brown CM, Garg A, McQueen MM. (2001). The epidemiology of proximal humeral fractures. Acta Orthop Scand. 72(4):365–371.
2. Horak J, Nilsson BE. (1975). Epidemiology of fracture of the upper end of the humerus. Clin Orthop Relat Res. (112):250–253.
3. Handoll HH, Ollivere BJ. (2012). Interventions for treating proximal humeral fractures in adults. Cochrane Database Syst Rev. 12:CD000434.
4. Rangan A, Handoll H, Brealey S, et al. (2015). Surgical vs nonsurgical treatment of adults with displaced fractures of the proximal humerus: the PROFHER randomized clinical trial. *JAMA*. 313(10):1037–1047.
5. Bell JE, Leung BC, Spratt KF, et al. (2011). Trends and variation in incidence, surgical treatment, and repeat surgery of proximal humeral fractures in the elderly. *J Bone Joint Surg Am*. 93(2):121–131.
6. Hatzidakis AM, Shevlin MJ, Fenton DL, et al. (2011). Angular-stable locked intramedullary nailing of two-part surgical neck fractures of the proximal part of the humerus. *J Bone Joint Surg Am*. 93(23):2172–2179.
7. Zhu Y, Lu Y, Shen J, Zhang J, Jiang C. (2011). Locking intramedullary nails and locking plates in the treatment of two-part proximal humeral surgical neck fractures: a prospective randomized trial with a minimum of three years of follow-up. *J Bone Joint Surg Am*. 93(2):159–168.
8. Owsley KC, Gorczyca JT. (2008). Fracture displacement and screw cutout after open reduction and locked plate fixation of proximal humeral fractures. *J Bone Joint Surg Am*. 90(2):233–240.
9. Sproul RC, Iyengar JJ, Devcic Z, Feeley BT. (2011). A systematic review of locking plate fixation of proximal humerus fractures. Injury. 42(4):408–413.
10. Nho SJ, Brophy RH, Barker JU, Cornell CN, Mac Gillivray JD. (2007). Management of proximal humerus fracture based on current literature. *J Bone Joint Surg Am*. 89(3):44–58.
11. Owsley KC, Gorczyca JT. (2008). Fracture displacement and screw cutout after open reduction and locked plate fixation of proximal humerus fractures corrected. *J Bone Joint Surg Am*. 90(2):01–06.
12. Hertel R, Hempfing A, Stiehler M. (2004). Predictors of humeral head ischemia after intracapsular fracture of the proximalhumerus. *J Shoulder Elbow Surg*. 13(4):427–33.
13. Gerber C, Lambert SM, Hoogewoud HM. (1996). Absence of avascular necrosis of the humeral head after post-traumatic rupture of anterior and posterior humeral circumflex arteries. A case report. *J Bone Joint Surg Am*. 78(8):1256–59.
14. Ramchander S, Roop S, Rajesh Kumar R, Virender Singh K. Internal fixation of proximal humeral fractures with Locking Proximal Humeral Plate (LPHP) in elderly patients with osteoporosis. J Orthopaed Traumatol. 2008;9(3):149–53.