

Short term functional outcomes of proximal humerus fractures treated with philos plating

Archan Desai¹, Madhav Khadilkar¹, Anuranjan Singh¹, Amit Mahajan¹

Abstract

Introduction: Proximal humerus fractures account for 7% of all fractures. In patients above 65 years of age proximal humerus fractures are second most frequent upper extremity fracture. There are various modalities to treat this fracture. This study is aimed at evaluating the functional outcome at the end of 6 months after PHILOS plating for proximal humerus fractures.

Aim: To determine the short-term (6 months) functional outcomes of proximal humerus fractures treated with Proximal Humerus InterLocking System (PHILOS plating).

Materials and Methods: This study is an observational, prospective, hospital-based study undertaken in Department of Orthopaedics in a teaching institution of a tertiary hospital in Pune during a period of 18 months from October 2018 to April 2020. Overall, 31 patients were enrolled for the study with a mean age of 54.41 years.

Results: The Mean Constant score in our study was 67.23 (range 45-94.8 points) which falls under the moderate category. Out of the 31 patients, 5 patients had excellent score, 7 had good score, 11 had moderate score and 7 had poor outcome score and 1 patient was lost to follow up. The mean complication rate was 25.6% and stiffness was found to be the most common complication.

Conclusion: The PHILOS plate is an ideal construct and a stable implant to use for fractures of the proximal humerus in Neer's 2-part, 3-part, and 4-part and in proximal humerus fractures of elderly patients hence allowing early mobilization of the shoulder.

Keywords: PHILOS, Proximal Humerus, Plating, Shoulder

Introduction

Proximal humerus fractures are defined as "fractures occurring at or proximal to the surgical neck of humerus." Currently out of all fractures, 7% account for proximal humerus fractures. These are second most frequent fractures in upper extremity in patients above 65 years of age. They are the third most common non vertebral osteoporotic fractures after proximal femur and distal radius fractures.[1] Out of the various classifications, Neer's classification is widely used. The Neer's classification depends on number of fracture segments and the displacement. Proximal humerus fractures are classified into one, two, three and four part fractures. Modalities used for treating these are conservative management, closed reduction, percutaneous fixation, closed reduction and intramedullary nailing, trans osseous suture fixation, open reduction and internal fixation with various different types of plates [PHILOS (proximal humeral internal locking osteosynthesis system), T plate, L plate, Buttress plate, Clover leaf plate] or tension band wire and arthroplasty [2][3][4]. Main concern with any modality is functional outcome, especially the range

of movement. Any fracture around the upper end of humerus leads to severe restriction of overhead abduction and rotations. PHILOS stands for Proximal Humerus Interlocking System. It is indicated in two, three, four-part fractures including fractures involving osteoporotic bones. These precontoured locking compression plates prevent metaphyseal subsidence as they are fixed angle devices. Such a fixation provides anatomic fixation with angular stability. The fixation provided by PHILOS is strong and allows early mobilization of affected joint, hence theoretically achieving a good range of movement. This study is aimed at evaluating the functional outcome at the end of 6 months after PHILOS plating for proximal humerus fractures.

Material and Methods

This study is an observational, prospective, hospital-based study and it was undertaken in Department of Orthopaedics in a teaching institution in Pune during a period of 18 months from October 2018 to April 2020. The study is carried out in a tertiary hospital. 31 patients with fracture of neck of humerus were selected. Out of the 31 patients, one patient was lost to follow up.

Inclusion Criteria:

1. All patients with fracture of neck of humerus.
2. Any patient with age more than 18 years included.

Exclusion Criteria:

1. Patients having pathological fracture.

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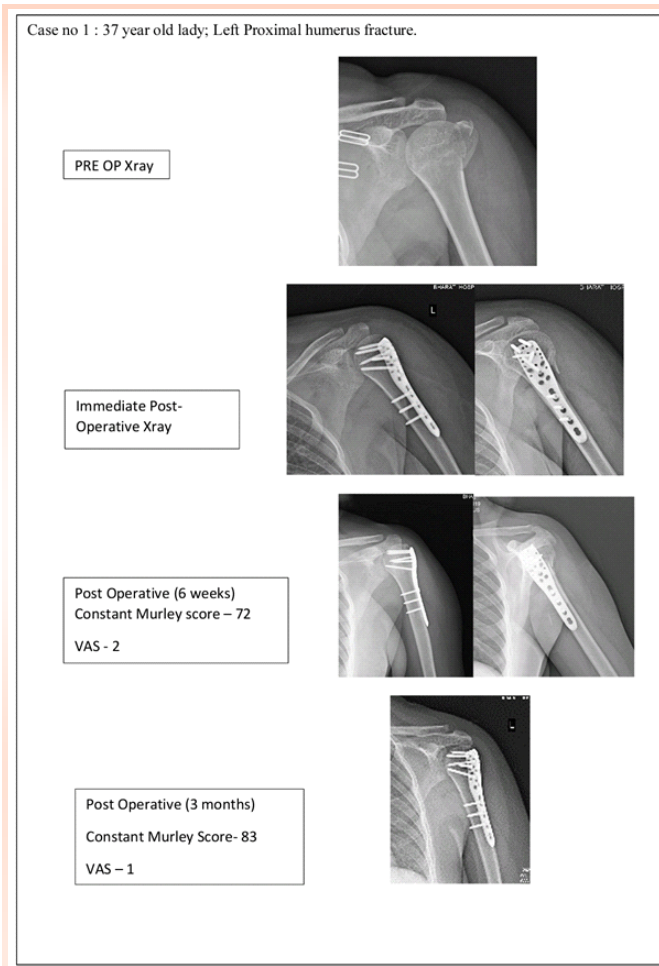
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2. Patients having rheumatoid arthritis or inflammatory arthropathy.
3. Patients having compound fractures.
4. Patients with other fractures of ipsilateral shoulder girdle

Methodology

1. Patient assessment was done on the basis of Constant-Murley score at 1.5 months, 3 months and 6 months after surgery.
2. Constant Murley score comprises of the following variables:
 - a. Range of motion (40 points): Forward elevation, internal rotation, external rotation, abduction.
 - b. Strength (25 points)
 - c. Pain (15 points)
 - d. Activities of daily living (20 points)
3. Fresh x-ray was done post operatively, at 1.5 months, 3 months and 6 months to assess fracture union.

Operative technique

The conventional deltopectoral approach was used in all our cases and the patient was given beach chair position. K wires were used to reduce and temporarily fix the fracture. The plate was positioned distal to the tip of the greater tuberosity. The Proximal locking screws were extended till subchondral area. The reduction, stability of the construct, plate position, position and length of the screws to avoid penetration of the locking screws into the glenohumeral joint in all the cases were



confirmed using an image intensifier. The wound was closed in layers with proper wound dressing.

Postoperative management

The operated limb was supported using arm sling pouch. Appropriate surgical prophylactic antibiotics (INJ Cefuroxime 1.5 grams IV) and analgesics were used. Passive range of motion and pendulum exercises were started immediately postoperatively.

Follow up

All patients were followed at 2 weeks for suture removal and then at 6 weeks, 3 months and 6 months. The active range of motion were started at 1-2 weeks postoperatively, depending on stability of fixation and bone quality. The sling was discontinued by 6-8 weeks depending upon fracture stability.

Functional outcome evaluation

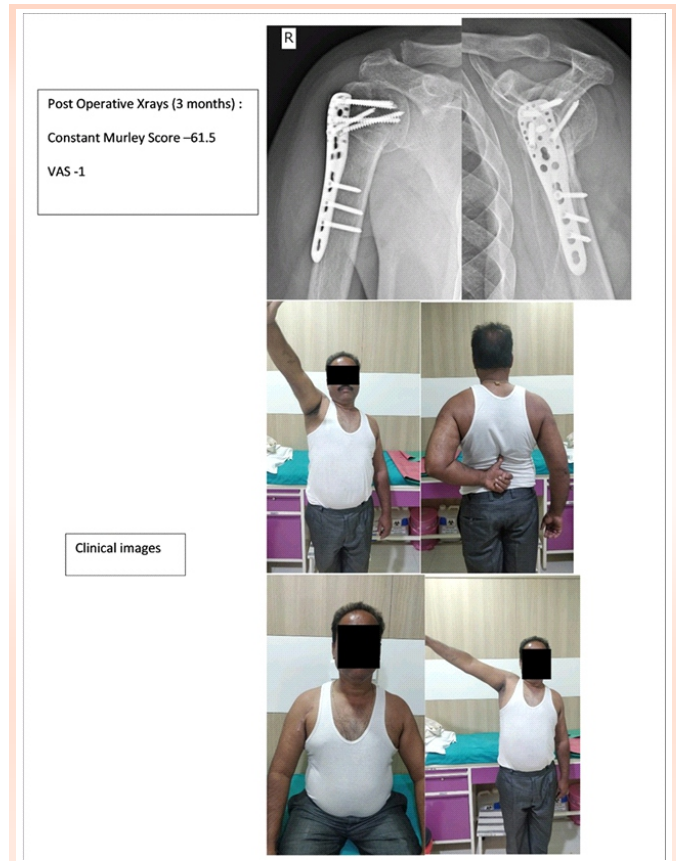
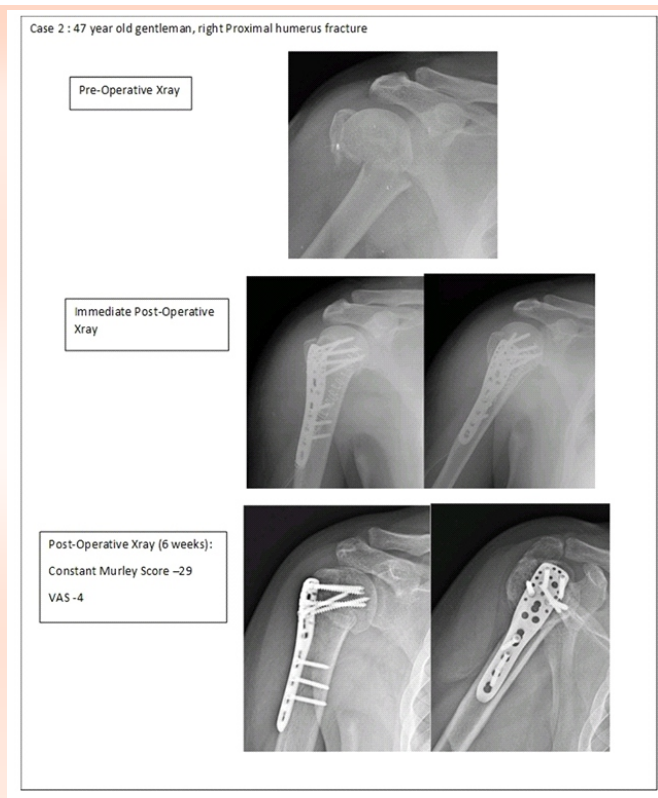
The Constant Murley score for all the patients was calculated, and evaluation of radiographs of the proximal part of the humerus for signs of malunion, non-union or avascular necrosis and bony healing was done at 6 weeks, 3 months and 6 months. The grading of Constant Murley score was done as below:

- 0 to 55 - Poor
- 56 to 70 - Moderate
- 71 to 85 - Good
- 86 to 100 - Excellent

Observations and Results

1. Demographic Details:

- a. There were a total of 31 patients included in the study out of which one patient (3.2%) was lost to follow up.
- b. The average age of all the patients was 54.41 years.
- c. Out of this 18 (58.1%) were male 12 (38.7%) were female. One patient (3.2%) who was lost to follow up was male.
- d. 14 (45%) were left sided fractures and 17 (55%) were right sided fractures.



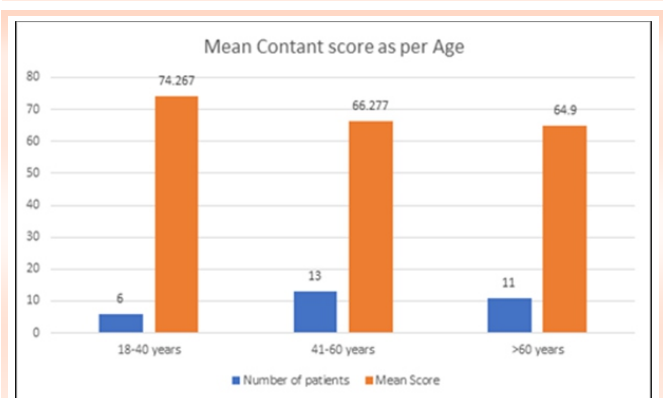
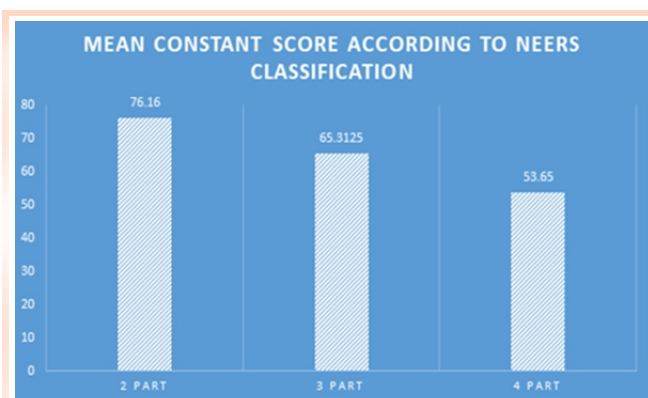
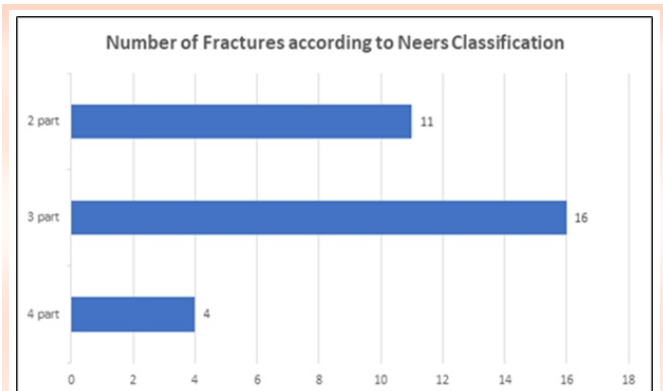
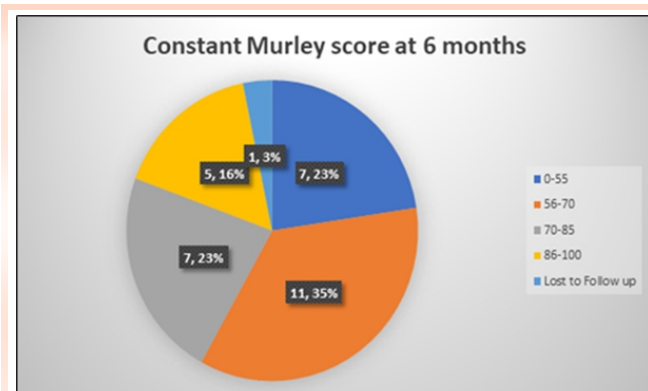
2. Clinical Outcome:

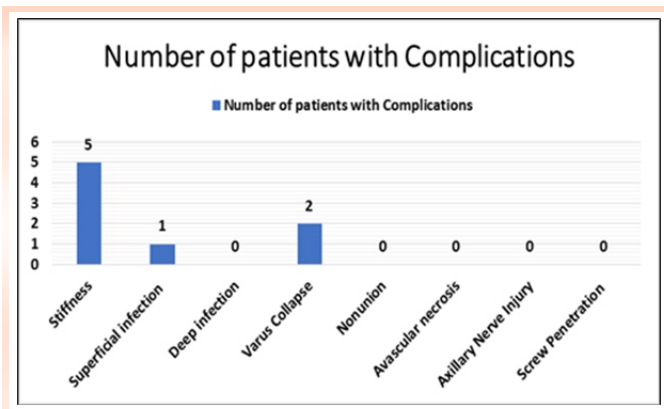
A. Considering the clinical outcome of these patients using the Constant Murley Score;

- 5 (16.12%) patients had excellent scores,
- 7 (22.6%) had good scores,
- 11 (35.5%) had moderate scores and
- 7 (22.6%) had poor outcome scores.
- 1 (3.2%) was lost to follow up.

B. Mean Constant score (According to number of fracture fragments/parts)

- For Neer two-part fracture was 76.16 (range 48 – 94.8) - 11 patients
- For Neer's three parts fracture was 65.31 (range 45 – 90.4) - 16 patients





c. For Neer's four parts fracture was 53.65 (range 46 - 65.6) - 4 patients

C. Mean Constant Score (According to Age of Patient)

a. for young adults (18-40 years) was 74.267 (range 53-94.8),

b. for middle age group (41-60 years) was 66.277 (range 46 - 90.4) and

c. For old age group (>60 years) was 64.9 (range 45-93)

D. Complications - (overall 25.6%)

a. Stiffness - 5 patients (16%)

b. Infection -

i. Superficial infection - 1 patient (3.2%)

ii. Deep Infection - 0 patient

c. Varus collapse - 2 patients (6.4%)

d. Nonunion - 0 patients

e. Avascular necrosis - 0 patients

f. Axillary nerve injury - 0 patients

g. Screw penetration - 0 patients

Discussion

Proximal humeral fractures constitute approximately 7% of all fractures of long bones. There is a challenge in the complex humeral 3- or 4-part fracture treatment. Inadequacy of fracture reduction (especially of the medial cortex), unstable fixation and improper positioning of the plate are the reasons for poor outcomes in these complex fractures. Apart from the above three points, in our study, we found that age of the patient and severity of fracture in terms of number of fragments also determined the functional outcome. Conventional plates have shown poor functional outcomes especially in old age groups with osteoporosis. Higher number of screw back outs or cut outs were noted. (5) This is because the fragments due to osteoporosis are highly fragile, therefore difficult to hold, thereby affecting proper reduction. The failure in fixation and collapse of head of humerus is reduced as screws can be locked in multidirectional construct, spanning not only the center, also through sphericity of head. The fraction of backing out or cutting out of screws has also reduced. We can even suture tendons with the eyelets of plate thereby reducing the smaller fragments of osteoporotic bone. The present study for displaced proximal humerus fractures following internal fixation with PHILOS plate was undertaken to assess the efficacy and the functional outcome.

In our study with 67.23 points of a mean score of Constant-

Murley, the clinical results were average, which falls in moderate category and is satisfactory. Similar short-term results of proximal humerus fractures were demonstrated by comparable studies of internal fixation. The outcome of our study seems to correlate with fracture severity, age, anatomic reduction, bone quality and the exact positioning and fixation of the implant. The range of motion of the shoulder shows gradual improvement with time. These findings suggest overall good results can be achieved for displaced proximal humerus fractures with use of that internal fixation with PHILOS plate. Esser [13] studied three and four-part fractures of proximal humerus fractures and excellent results were reported in almost all patients, treated with a modified clover leaf plate. The patients with fractures of the proximal humerus were prospectively evaluated by Koukakis A et al. [14] with conclusion that a stable fixation with acceptable functional outcome provided by the plate design and eliminates most of the hardware problems. Egol KA et al. [15] had done a retrospective analysis of early complications in proximal humerus fractures which were treated with locked plates in 51 patients. Radiographically, union was noted in 92% of the patients 3 months after surgery, and 2 patients had signs of osteonecrosis in the last follow-up. Screw penetration was reported to be the major complication.

In Proximal humerus fractures, the surgeon faces challenging problems because of the high complication rate for these fractures. Yang et al [16] found an overall complication rate of 35.9. The complication rate in our study was 25.6% which mostly comprised of Shoulder stiffness. All the fractures united by the end of 6 months and we had no cases of nonunion. We did not have any patients with avascular necrosis of humeral head or shoulder arthritis post-surgery and none of the patients presented with implant back out or screw penetration. There was a single patient with superficial surgical site infection which was treated with oral antibiotics and did not warrant implant removal. There were no patients with deep infection.

These were the complications

a. Stiffness - 5 patients (16%)

b. Infection -

i. Superficial infection - 1 patient (3.2%)

ii. Deep Infection - 0 patient

c. Varus collapse - 2 patients (6.4%)

d. Nonunion - 0 patients e. Avascular necrosis - 0 patients

f. Axillary nerve injury - 0 patients

g. Screw penetration - 0 patients

Stiffness was noted in 5 patients. The Constant score of these patients were 45, 46, 46, 48 and 50 (poor outcomes). We had varus collapse in 2 patients. One of which had a Constant score of 56 and the other had a score of 76. Five out of 47 patients had varus malunion in one study by Aggarwal et al. [17]

Limitations of our study were a small sample size of 31 patients and short duration of study which is of 6 months. A greater sample size would have yielded a better result. A longer study would have brought out different set of complications like

avascular necrosis of humeral head and secondary screw penetration or implant failure.

Conclusion

PHILOS plate has threads in its holes, which locks with the threads of its screw heads providing a high degree of axial and angular stability which eliminates screw loosening or back out. The multidirectional orientation of the screws engaging in the humeral head prevents back out and failure of fixation. In

conclusion, the PHILOS plate is an ideal construct and a stable implant to use for fractures of the proximal humerus in Neer's 2-part, 3-part, and 4-part and in proximal humerus fractures of elderly patients hence allowing early mobilization of the shoulder. In terms of functional outcomes, in our study we found moderate result (67.23 points out of 100) as per Constant Murley score.

Declaration of patient consent : The authors certify that they have obtained all appropriate patient consent forms. In the form, the patient has given the consent for his/ her images and other clinical information to be reported in the journal. The patient understands that his/ her names and initials will not be published and due efforts will be made to conceal their identity, but anonymity cannot be guaranteed.

Conflict of interest: Nil **Source of support:** None

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