

Original Research Article

Use of proximal humerus internal locking system plate in proximal humerus fractures and its relation with the functional outcome

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ABSTRACT

Background: Proximal humerus fractures are the fractures occurs at or proximal to the surgical neck of the humerus, which accounts for 7% of all fractures and 80% of all humeral fractures. Now a days most of these fractures are managed with internal fixation because of better availability of anatomical plates. The aim was to assess the functional outcome and complications of proximal humerus fractures treated with proximal humerus internal locking system (PHILOS).

Methods: This is a prospective study of 30 patients with two, three, and four parts proximal humerus fractures treated with proximal humerus internal locking sysyem from 2016 to 2018 with 25 to 80 years of age in a tertiary care hospital. Functional outcome is assessed by using constant murley shoulder scoring system.

Results: Functional outcome as per constant score, 10 patients (33%) got excellent outcome, 06 patients (20%) got very good outcome, 07 patients got (23%) good outcome, 05 patients got (17%) fair outcome and 02 patients got (07%) poor outcome. Complications observed were superficial infections, implant failure and axillary nerve neuropraxia.

Conclusions: Open reduction and internal fixation by using PHILOS is the ideal method in treating displaced proximal humerus fractures mainly in two and three part proximal humerus fractures which provides stable fixation and less complications.

Keywords: Proximal humerus fractures, PHILOS plate, Internal fixation, Functional outcome

INTRODUCTION

Proximal humerus fractures are the commonest fractures affecting the shoulder girdle in adults.¹ These are the second most frequent upper extremity and third common non vertebral osteoporotic fractures after proximal femur and distal end radius fractures. The vast majority of these fractures are treated conservatively. However surgical management with internal fixation is becoming more

frequent compared to prosthetic replacement with the evolution of pre contoured anatomical and fixed angle implants.² Elderly peoples are more prone for these fractures because of low bone mass and increased risk of falls. Fractures are more frequent during winter months possibly because of increased incidence of falls.³ Proximal humeral fractures pose an increased risk of subsequent distal radius and proximal femur fractures.⁴ Patients with these fractures have a greater than 5 times

risk of suffering a hip fracture within 1 year.⁵ In patients with age more than 60 years, more than 90% of the fractures results from fall from standing height as compared to fractures in younger individuals which occurs due to high energy trauma such as road traffic accidents, sports or assaults.^{6,7}

Proximal humerus fractures are as consequences of three main loading modes compressive loading of the glenoid on to the humeral head, bending forces at the surgical neck and tension forces of the rotator cuff at the greater and lesser tuberosities.

Use of 2D and 3D CT scans done preoperatively helps to understand the fracture anatomy, degree of osteopenia, location of impaction, and the amount of comminution which helps during the fracture fixation and it prevents excessive consumption of operative time.

Most of the displaced proximal humerus fractures requires operative treatment because non operative treatment leads to chronic shoulder pain and restricted shoulder movements which impairs the daily activities of the patients.

Open reduction and internal fixation of proximal humeral fractures with PHILOS plate provides the stable construct as compared to the other surgical options like k-wire fixation and intra medullary nailing which are less stable.⁸

This study was done to assess the functional outcome, complications and surgical techniques in proximal humerus fractures treated with proximal humerus internal locking system (PHILOS) plate.

METHODS

This prospective study was conducted at Grant Medical College and Sir J.J. Group of Hospitals, Mumbai from 2016 to 2018, over a period of 2 years. Fractures are classified according to Neer's classification and functional outcome assessed by using Constant Murley shoulder score. All the data was analysed using microsoft excel and Epi-Info software.

Inclusion criteria

Patients with closed proximal humerus fractures (2, 3 and 4 part fracture) and patients who are medically fit for surgery and age more than 20 years.

Exclusion criteria

Patients with open fractures, pathological fractures, infections and those who are medically unfit patients.

Patient evaluation

On admission detailed history and examination of the patient done after hemodynamic stabilisation includes

screening for head, pelvic, abdominal and chest injury and are subjected to routine pre-operative investigations. X-ray of the involved shoulder anteroposterior view and axillary view taken and the fracture is classified as per Neer's classification, fracture is immobilised initially with universal shoulder immobiliser (USI). Patients with three and four part fractures are subjected to 2D and 3D CT scan for better delineation of the fracture morphology.

Surgical technique

Patients were operated in beach chair/supine position by using deltopectoral approach. After opening of the fracture site, fracture fragments are temporarily fixed with k-wires after reducing the fracture. PHILOS plate is placed lateral to the bicipital groove and sufficiently inferior to avoid subacromial impingement. Multiple locking screws are used in different direction in the humeral head till the subchondral bone to prevent rotation and for stability and calcar screw to prevent varus collapse. Plate is fixed to the shaft with locking and cortical screws. Final fixation was checked under C-arm and wound closed in layers.

Post-operative protocol

Operated limb is supported with elbow pouch and sling, intravenous antibiotics given for 3 days, passive range of motion and pendulum exercises are started at post-operative day 2. Depending on the fracture stability and bone quality active range of motion started between 2 to 4 weeks.

Follow up

Patients are followed at 3 weeks, 6 weeks, 3 months and 6 months and 1 year, assessed for radiological and clinical union, checked for shoulder range of motion, observed for complications like nonunion, malunion, implant failure, humeral head collapse and infection.

Functional outcome assessed by using constant shoulder score, which contains maximum score of 100 and the outcome is graded as excellent (score >70), very good (60-69), good (40-59), fair (30-39) and poor (<30).

Findings are analysed using microsoft excel and presented in numbers and percentages.

RESULTS

We studied 30 patients with proximal humerus fractures with age range from 25 to 80 years with mean age of 46 years. Patients with age less than 30 years were 10 (33.34%), 8 (26.66 %) patients were between age 30-60 years and 12 (40%) patients were above 60 years age, in this 17 patients were male and 13 were females (Table 1). The mode of trauma was fall from standing height in 18 (60%) patients, high energy trauma like road traffic accidents in 12 (40%) patients. Left sided fractures were

more i.e., 18 (60%) patients and others had right sided involvement 12 (40%) patients.

Table 1: Age distribution.

Age (years)	Number	%
<30	10	33.34
30-60	8	26.66
>60	12	40

Table 2: Fracture distribution (according to neers classification).

Fracture type	Number	%
Two part	17	56.67
Three part	9	30
Four part	4	13.33

There were 17 (56.67%) two part fractures, 09 (30%) three part fractures and 04 (13.33%) four part fractures included in the study (Table 2).

Intra operative complication was the difficulty in reduction mainly in the four part fractures and post-operative complications include superficial infections in 2 (06.67%) cases, implant failure in 01 case and axillary nerve neuropraxia in 01 case.

In our study, 10 (33%) patients got excellent outcome, 06 (20%) got very good outcome, 07 (23%) got good outcome, 05 (17%) got fair outcome and 02 (07%) got poor outcome as per the constant murley shoulder score (Figure 1).

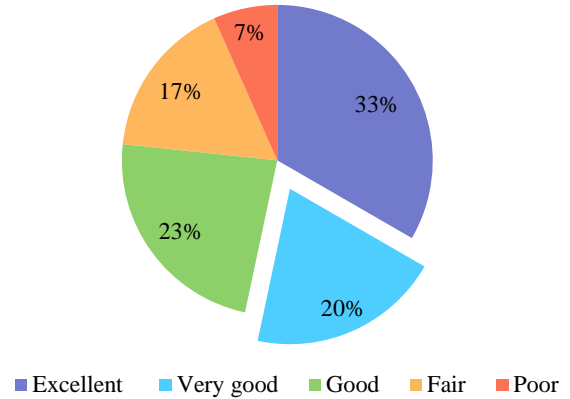


Figure 1: Functional outcome.

The mean constant score was 63.2, the mean constant score in age less than 60 years were 73.4 and in age more than 60 years were 51.3.

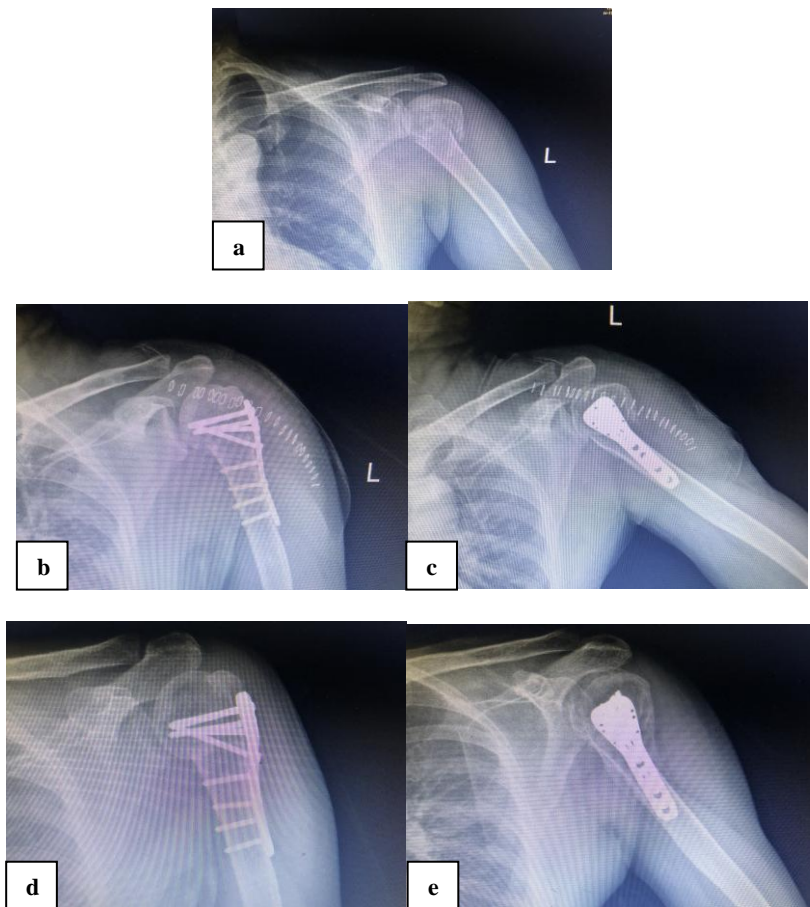


Figure 2: (a) Pre-operative X-ray, (b, c) immediate post-operative X-ray and (d, e) one year post-operative X-ray.

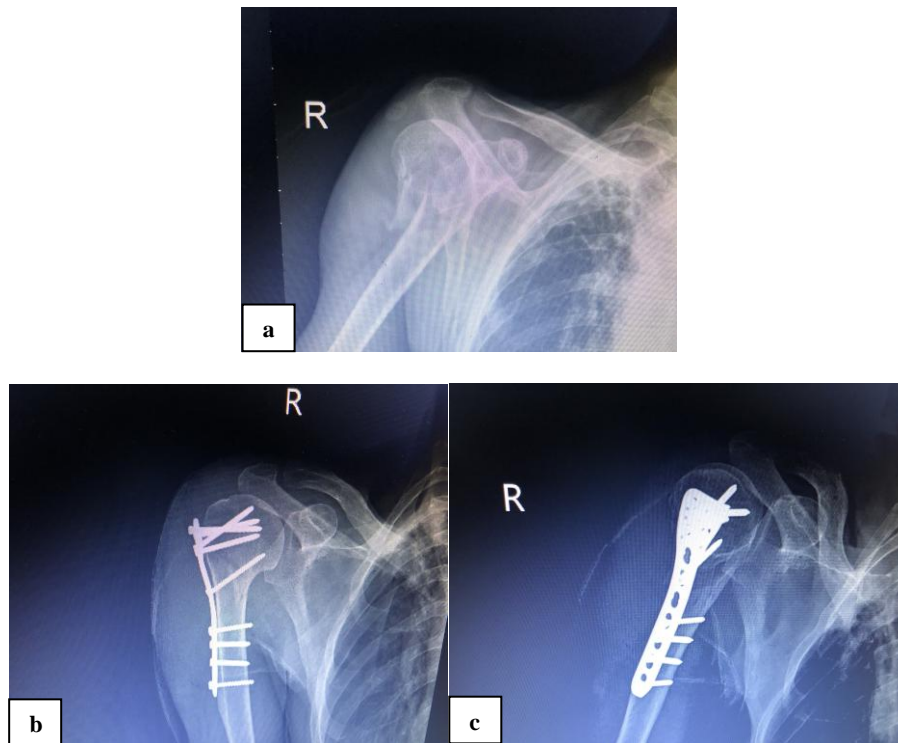


Figure 3: (a) Pre-operative X-ray, (b and c) immediate post-operative X-ray.

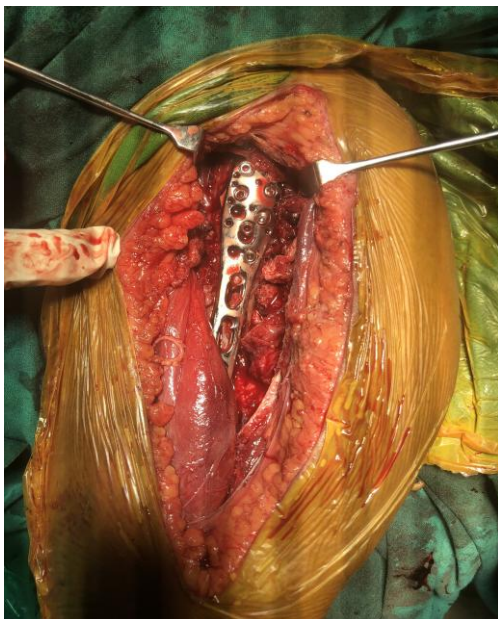


Figure 4: Intra-operative image.

DISCUSSION

Management of displaced and comminuted proximal humerus fractures are complex and requires good knowledge about the fracture anatomy, bone quality and the anatomical pre contoured locking plates.

Multiple techniques were described for the treatment of proximal humerus fractures previously, but these techniques were associated with, more number of

complications like screw back out, unstable fixation, implant loosening, implant failure and avascular necrosis.⁹⁻¹¹

Proximal humerus internal locking system (PHILOS) is a fixed angle devise, anatomical plate which fits with the proximal humerus anatomy and has a locking screws which prevents screw back out and implant failure mainly in the old osteoporotic patients, this plate has the calcar screw which prevents varus collapse of the humeral head after fixation and this also gives stable fixation which helps in early mobilisation of the shoulder.

In our study mean age of the patients was 46 years (range from 25 to 80 years) which is similar to study by Pathak et al, we had more number of patients with the age more than 60 years (40%), less than 30 years was 33.33% and 30 to 60 years was 26.66% which is similar to Aggarwal et al probably due to more number of falls in osteoporotic patients.^{12,13} We observed more number of male patients (56.67%), probably because of more outdoor activities by males and also because of osteoporosis. 60% of the patients had left sided fractures which is similar to Gerber et al.¹⁴ 60% of the patients injured by fall from standing height, because of old age and osteoporosis. Two part fractures were more (56.67%) in our study followed by three part (30%) and four part (13.33%) which is similar to the study by Björkenheim et al most probably because of low energy injuries.¹⁵

In our study, 10 (33%) patients got excellent outcome, 06 (20%) got very good outcome, 07 (23%) got good outcome, 05 (17%) got fair outcome and 02 (07%) got

poor outcome as per the constant murley shoulder score. The mean constant score was 63.2, the mean constant score in age less than 60 years was 73.4 and in age more than 60 years was 51.3 which is comparable to study by Thyagarajan et al, low constant score in age more than 60 years probably due to osteoporosis which causes unstable construct of the fixation.¹⁶

Complications were superficial infections, implant failure and axillary nerve neuropraxia which is similar to Aggarwal et al.¹³ Superficial infection was treated with debridement and antibiotics, one case of implant failure was managed with hemiarthroplasty and axillary nerve injury was completely recovered in 6 weeks.

CONCLUSION

Open reduction and internal fixation by using proximal humerus internal locking system (PHILOS) is the ideal method in treating displaced proximal humerus fractures mainly in two part and three part fractures and also in four part fractures if the surgeon is experienced. PHILOS is a fixed angle pre contoured anatomical devise which gives stable fixation which helps in early mobilisation and associated with less complications.

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Conflict of interest: None declared

Ethical approval: The study was approved by the institutional ethics committee

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