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Evaluation of postoperative complication after PHILOS plating for treatment of displaced proximal humerus fractures

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Abstract

Objective: Evaluation of the complications from surgical treatment using a proximal humerus locking plate among patients with fractures of the proximal humerus.

Methods: This is a non Randomised Retrospective and Prospective study carried out from 1 July 2017 to 30 December 2018. In this study a cohort of 30 patients from this institute and other hospital, all skeletally matured patients aged 18 years and above with proximal humerus fractures with two, three, four part fracture were treated using the PHILOS plate. There were 19 male patients and 11 female patients, with a mean age of 49.5 years (range: 18 to 81 years). All the cases had a mean postoperative follow up period of 15 months. Eight fractures were classified as presenting in two parts, 13 as three, 9 as four.

Results: In this study, twelve were considered to have achieved excellent results, nine good, eight fair and one poor, according to the UCLA score. In our study of PHILOS plating most common complication was varus malunion and least common complication was implant failure.

Conclusion: The functional results from treating fractures of the proximal extremity of the humerus using a locking plate depended on correct anatomical reduction of the fracture and stable fixation of the implant. Complications still occur frequently, particularly because of intraoperative technical difficulty, fracture severity and possible inexperience of the surgeon.

Keywords: PHILOS Plate, proximal humerus

Introduction

Proximal humeral fractures are now recognized as an increasingly common fracture, accounting for 4% to 5% of all fractures^[1, 2]. It is the third most common fracture in people above 65 years of age, after fractures of the hip and distal radius^[3]. These fractures have a bimodal distribution occurring either in young people following high energy trauma or in those older than 50 years with low velocity injuries like simple fall^[3]. They occur most commonly in elderly patients, after cancellous bone of humeral neck has weakened by senility. Proximal humerus fractures are the result of an indirect force such as a fall onto the outstretched arm rather than a direct blow to the shoulder. The origin of a proximal humerus fracture is due to a combination of factors, which include relatively osteoporotic bone (in the elderly), direct contact against the adjacent acromion and glenoid rim, and forceful pull of the rotator cuff muscles and extrinsic muscles such as the pectoralis major^[4].

Traditional internal fixation stabilisation methods for proximal humeral fractures include semi-rigid (percutaneous k-wiring, screw fixation, tension band wiring) and rigid (conventional plates and screws, intramedullary nailing)^[5-16] means. The proximal humeral internal locking system (PHILOS) is a new implant designed for the fixation of proximal humeral fractures and is one of a new generation of locking plates^[17, 18]. Its shape is anatomical, conforming to the proximal humerus. In the humeral head component of the plate, locking screws are inserted in multiple directions into the humeral head. In the shaft component of the implant combi-holes provide the option of locking or nonlocking screws to be inserted. Smaller holes allow the passage of sutures or wires to help reattachment of the greater and lesser tuberosities. The implant comes in short and long sizes with three and four shaft combiholes, respectively. The aim of this study was to describe early results of this implant, in particular potential implant related complications.

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Material & method

This is a non Randomised Retrospective and Prospective study carried out at Department of Orthopaedics & traumatology, Index Medical College, Hospital & Research Centre, Indore from 1 July 2017 to 30 December 2018. In this study a cohort of 30 patients (nineteen male and eleven female) from this institute and other hospital, all skeletally matured patients aged 18 years and above were included. Eight fractures were classified as presenting in two parts, thirteen as three, nine as four part. In this study a mean age is 49.5 years (range: 18 to 81 years). All the cases had a mean postoperative followup period of 15 months All patients with proximal humerus was admitted to the hospital, all history and clinical details were recorded in history sheet according to planned Proforma. Radiographic evaluation was done and fractures were classified according to Neer's classification. All routine investigations were done with complete medical and anaesthetic fitness for surgery. All patients were treated by open reduction and internal fixation by PHILOS plating. Patients with One part fracture, pediatric age group, Pathological fractures, Compound fractures, uncontrolled diabetes, patients on chronic steroid therapy and Immuno-compromised patients were excluded from study.

Surgical technique: - Preoperative planning is done for every cases. We used standard deltopectoral approach. This approach can be a fairly extensile approach, allowing access to the anterior, medial, and lateral aspects of the shoulder. This approach is done in a supine position with a roll or wedge under the medial scapula. An incision is made following the line of the deltopectoral groove size depends on the surgical need and size of patient. The deltopectoral fascia is encountered first; the cephalic vein is surrounded in a layer of fat and is used to identify the interval. The cephalic

vein can be mobilized either medially or laterally, depending on patient factors and surgeon preference. Fibers of the deltoid are retracted laterally and the pectoralis major is retracted medially. The short head of the biceps and coracobrachialis arise from the coracoid process and are retracted medially. The musculocutaneous nerve enters the biceps 5-8cm distal to the coracoid process; retraction of the conjoint tendon must be done with care. The fascia on the lateral side of the conjoint tendon is incised to reveal the subscapularis. External rotation puts the subscapularis fibers on stretch. The subscapularis may be released from its insertion on the lesser tuberosity through the tendon or via an osteotomy. The capsule is then incised (as needed) to enter the joint. Reduce the fracture and provisionally fix it with k-wires; confirm reduction with fluoroscopy. If medial comminution is present, check to ensure that varus malreduction has not occurred. Place the plate onto the greater tuberosity & provisionally fix it with k-wires; confirm correct plate position with fluoroscopy. Place two locking screws through the plate holes into the humeral head and one or two screws into the shaft. Confirm subchondral placement of proximal screws with fluoroscopy. When accurate reduction is confirmed insert remaining screws under direct fluoroscopic control. The wound closure done after putting a suction drain, to be removed 24-48 hours later.

Results & observations

In our study of 30 patients, treated by PHILOS and followed up for minimum 15 month and maximum follow up available is 24 month. In this study, twelve were considered to have achieved excellent results, nine good, eight fair and one poor, according to the UCLA score. In our study of PHILOS plating most common complication was varus malunion and least common complication was implant failure.

Table 1

Complications	No. Of Patients	Percentage
Joint stiffness	2	6.7
Implant failure(Pull out of screws, implant breakage)	Nil	Nil
Primary and secondary screw perforations	2	6.7%
Sub acromial impingement	1	3.3%
Avascular necrosis of humeral head	1	3.3%
Infection, controlled by antibiotic	2	6.7 %
varus Malunion	3	10%
Non-union	Nil	Nil

Discussion

Proximal humerus fractures are more common in older age group [28] because cancellous bone of the humeral neck has

weakened by senility. In our study 60% patients were from 50 to 70 years age group. Numerous age related studies points towards this and our study is consistent with this.

Table 2

Study	Age of patients studied	Mean age
Roland P. Jacob ^[19]	24-81	49.5
C.Gerber,C. M. L.Werner ^[20]	16-73	44.9
Wijgman,W. Roolker ^[21]	19-79	48
Evan L. Flatow, Francis Cuomo ^[22]	34-72	53
P. Moonot <i>et al</i> ^[23]	18-87	59.9
Our Study	18-70	49.5

As with earlier studies, our study showed a higher incidence of proximal humerus fracture in males compared to females. The gender ratio in our study was 1.73:1 which is quite higher than other studies. High ratio can be explained by a more involvement of males in day to day activities as compared to female.

Table 3

Study	Male	Female
Roland P. Jacob ^[19]	1.57	1.0
C. Gerber, C. M. L. Werner ^[20]	1.35	1.0
Evan L. Flatow, Francis Cuomo ^[22]	1.40	1.0
Our study	1.73	1.0

In consistent with the majority of studies in western literature that consider low energy falls as a more common cause for proximal humerus fractures, our study had 80% patients with history of fall. Low energy trauma can cause significant injury in elderly patient with osteoporotic bones.

There are different surgical options for the fixation of proximal humeral fractures, e.g., interfragmentary fixation with sutures, percutaneous pinning, intramedullary fixation and hemiarthroplasties. Fixation of proximal humeral fractures with plates and screws has been associated with complications such as pull out of screws in osteoporotic bone, subacromial impingement and avascular necrosis of the humeral head due to excessive periosteal stripping. Kristiansen and Christensen^[33] had reported a high incidence of fixation failure following use of T-butress plates in fixation of proximal humeral fractures.

Conclusion

Fractures of the upper end of humerus account for 4-5% of all fractures. They occur more frequently in older patients after the cancellous bone has become weakened by senility and osteoporosis. In older patients even less severe trauma (fall) can produce significant injury which is the most common cause. In our study 60 % belongs to 51 to 70 years age group. Fall on ground account for 77% of proximal humerus fractures in our study. PHILOS plates are pre-shaped & pre-contoured plates to match proximal humeral anatomy with multiple proximal locking screw placement options has made fixation of complex fractures easy. It provides rigid fixation, enhanced axial & angular stability & allows early mobilization of the shoulder without compromising fracture union. Proximal humerus locking plate fixation for 2-part and 3-part fractures has better functional outcome Compare to Complicated four Part Fractures. Functional Outcome is better and earlier in Younger Patients. Although outcome is also good in elderly. Age and fracture configuration play a significant role in the clinical outcome of these fractures after internal fixation.

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