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ORIGINAL ARTICLE

A STUDY OF FUNCTIONAL OUTCOME OF FRACTURES OF UPPER END HUMERUS TREATED BY PHILOS PLATE

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ABSTRACT: Proximal humeral fractures account for about 5% of all injuries to the appendicular skeleton. The majority of proximal humeral fractures are either un-displaced or minimally displaced which can be managed conservatively. Only 20% of proximal humeral fractures need surgical intervention. Many surgical techniques have been described. Over the last 3 decades, various modalities of fixations have been evolved for the treatment of these injuries (trans-osseous suturing, percutaneous pinning, tension band wiring, plating, nailing, arthroplasty). The proximal humerus internal locking system (PHILOS) plate, a fixed-angle construct has been developed to maintain angular stability under load and to improve screw fixation in osteoporotic bones. In our study 29 patients with unstable proximal humerus fractures were treated with open reduction and internal fixation using PHILOS plate. In 85% of cases the results were excellent to good. In this study, we observed that the locking compression plate is an advantageous implant in the treatment of these cases due to its angular stability particularly in comminuted fractures and in osteoporotic bones.

KEYWORDS: Fractures, Upper end humerus, Locking plate.
MeSHTERMS: Fractures, Upper end humerus, Locking plate.

INTRODUCTION: Proximal humeral fractures account for about 5% of all injuries to the appendicular skeleton. The majority of proximal humeral fractures are either un-displaced or minimally displaced which can be treated easily with a sling immobilization. Only 20% of proximal humeral fractures need operative treatment.[1]

Many surgical techniques have been described, but no single technique is considered to be the standard of care[2]. The goal of surgical fixation should be stable reduction and fixation allowing early mobility. Over the last 3 decades, various modalities of fixations have been evolved for the treatment of proximal humerus fractures (transosseous suturing, percutaneous pinning, tension band wiring, plating, nailing, arthroplasty). The treatment is more difficult for articular fractures which carry a high risk of humeral head osteonecrosis.

The type of fixation used depends on the patient's age, activity and bone quality, the fracture type and the surgeons' technical ability. If the fracture reduction is achieved by manipulation but cannot be maintained, percutaneous K- wire fixation is performed. The proximal humeral internal locking system (PHILOS) plate, a fixed-angle construct has been developed to maintain angular stability under load and to improve screw fixation in osteoporotic bones.

This study is conducted to analyze the outcome of unstable proximal humerus fractures treated with proximal humeral internal locking system (PHILOS).

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MATERIALS AND METHODS: This study includes 29 patients with unstable proximal humerus fractures selected from a group of 82 cases of upper end humerus fractures admitted to the department of Orthopaedics, Gandhi Hospital, Secunderabad during November 2012 to January 2015.

The key to good results in any surgery is appropriate patient selection.[3,4] In our study we performed open reduction and internal fixation with PHILOS plate, only in whom it was indicated. We excluded the cases which can be managed by conservative method, by closed reduction/ percutaneous pinning and the cases which were not re constructible by any means, needing replacement.

In our study we used Neer's classification and our cases include NEER's 2 part, 3 part and 4 part proximal humerus fractures. We excluded all Pathological fractures and those associated with co-morbid medical conditions.

SURGICAL TECHNIQUE: Under general anaesthesia/regional block, with the patient placed in supine position on the operating table with a sand bag under the spine and medial border of scapula to push the affected side forward while allowing the arm to fall back ward, through Delto-pectoral approach.[5,6] the fracture was exposed and reduced with minimal soft tissue dissection. Briefly the anatomical relationship between humeral head and greater tuberosity was reduced and fixed temporarily with K- wires. In case of rotation or displacement of the humeral head, a joystick technique was used. Then the shaft fragment was reduced by abduction, traction and rotation of the arm. After checking the reduction under image intensifier, definitive fixation with locking plate was done with plate positioned lateral to bicipital groove sparing tendon of long head of biceps and 1 cm distal to greater tuberosity. All the four head screws were inserted into the head fragment, which were multidirectional, with the tips of the screws 5-10 mm from the articular surface. Calcar screws and distal shaft screws were applied. In case of severe comminution or instability, the rotator cuff, the greater tuberosity, and the lesser tuberosity were fastened to the plate using non-absorbable sutures. Range of motion of shoulder was checked on the table for impingement.

Passive range of motion and pendulum excises were begun in the immediate post-operative period. The active range of motion was started at 1-2 weeks post-operatively, depending on the stability of fixation and bone quality.

All the patients were followed up at weekly intervals in the first one month and thereafter at 3 weeks interval for the next 6months.

RESULTS: In our study maximum number of cases i.e. 63% patients were in the age group of 35- 45 years with mean age of 39 years. 18 patients were male and 11 were female. In majority of the cases the mechanism of injury was RTA. Out of 29 patients, 25 cases were operated within one week of injury and 4 in the 2nd week.

The final results were evaluated based on ULCA shoulder score. In 85% (25) of cases the results were excellent to good and in 15% (4) cases fair results were noted. There were no poor results.

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Varus malalignment with loss of reduction was observed in one case, where the calcar screw was not properly applied which was revised. Superficial infection was noted in 2 cases. In one case the plate was placed too proximally and the screws were entering the joint space, which was corrected by revision surgery. In one case secondary perforation of screws into the glenohumeral joint was noted, which were taken out.

DISCUSSION: Most fractures of proximal humerus occur through osteoporotic bones in older patients due to fall onto an outstretched hand. High energy trauma may result in such fractures at any age. Once the fragments separate, muscle forces contribute to their displacement. The shaft is generally drawn anteriorly and medially by the pectoralis major. Greater tuberosity may be pulled posteriorly by infraspinatous and superiorly by supraspinatus. The subscapularis tends to retract medially.

There are many factors which determine the type of management and in turn influence the outcome. They include number of fractured fragments, displacement of tuberosities, presence of posteromedial spike in the articular fragment, degree of osteoporosis and comminution. Increased number of fragments and dislocation of the articular fragment lead to high incidence of avascular necrosis (AVN) of head of the humerus. The presence of posteromedial spike in the articular fragment reduces the chance of avascular necrosis (AVN). Degree of osteoporosis and the extent of soft tissue injury will decide the implant to be used.[7,8]

Conservative management is preferred in elderly patients with co-morbid illnesses, in un-displaced or minimally displaced fractures, and in impacted fractures. Surgery is indicated[9] in cases where the displacement of a fracture fragment is more than one centimetre or angulation between the fragments is more than 45^0. There are varied options in the surgical management of proximal humerus fractures which include, Closed reduction and K-wire fixation, Transosseous suturing, Tension band wiring, Fixation with plate and screws, Proximal humerus nail and Replacement surgery. The objectives of surgical fixation of proximal humerus fractures are to obtain and maintain the satisfactory reduction and to regain the functional range of mobility at the earliest possible.

If the fracture reduction is achieved by manipulation but cannot be maintained, percutaneous K- wire fixation[10] is the best option provided with a good bone stock in minimally comminuted fratures. It avoids further damage to the soft tissue envelope and blood supply to the humeral head, hence the incidence of osteonecrosis is less. Head splitting fractures involving more than 40% of the articular surface, Four part fractures with complete dislocation of articular surface and all other non reconstructible fractures, can be best treated by replacement surgery. If the fracture reduction and maintenance is not possible by closed methods, open reduction and internal fixation is the method off choice. Various plates[11] are used for the proximal humerus fracture fixation like conventional clover-leaf plate, AO 'T' plate, Angled blade plate, Locking compression plate, etc.

Of these the Proximal humeral internal locking system (PHILOS) plate is anatomically shaped to accommodate the junction of the humeral head and the shaft. In the area of the humeral head, in addition to the holes for the locking head screws, the plate has small holes in order to fix the rotator cuff with sutures or circlage wires.[12] The plate sits firmly on the bone due

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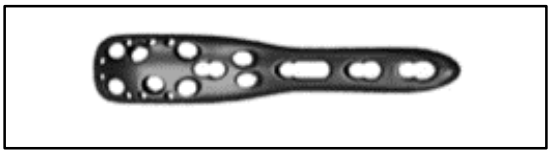
to the converging/diverging screw orientation in the area of the humeral head and the locked screw anchorage.



The PHILOS plate acts as an external fixator, placed internally. The function of screws in the plate is more like that of external fixator pins. The basic advantage of the PHILOS plate is its angular stability. In locking plate the screws are locked to the plate, thus forming a fixed-angle construct. In the conventional plate there is friction caused by compression between the bone and the plate, but in contrast in locking plate, compression between bone and plate is avoided, thereby biological integrity of periosteum is maintained.

We found that the proximal humeral internal locking system (PHILOS) is effective in the treatment of unstable proximal humerus fractures. Certain measures taken while doing surgery, definitely will help in reducing the rate of complications. More accurate length measurement and shorter screw selection will prevent primary screw perforations. Awareness of obtaining an anatomic reduction of the tubercles and restoring the medial cortical support will reduce the incidence of secondary screw perforations. Loss of fracture reduction was linked to the presence or absence of medial cortical support. Hence the placement of one or two screws running tangentially to the medial curvature of the humeral surgical neck, commonly referred as calcar screws, will prevent the loss of reduction.

In this study, we observed that the locking compression plate is an advantageous and efficient implant due to its angular stability particularly in comminuted fractures and in osteoporotic bones. A sound technique of fixation, with anatomical reduction ensures better functional results.

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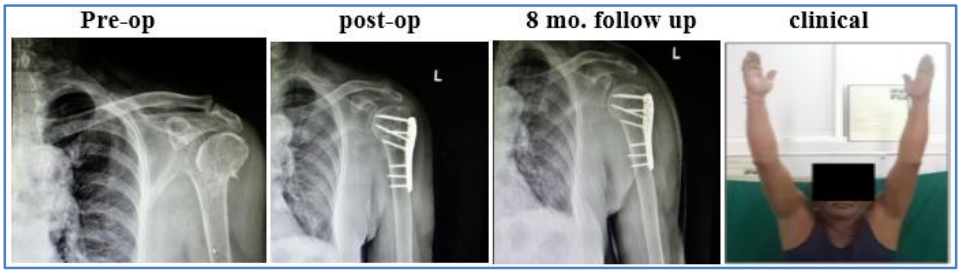
Case 1:



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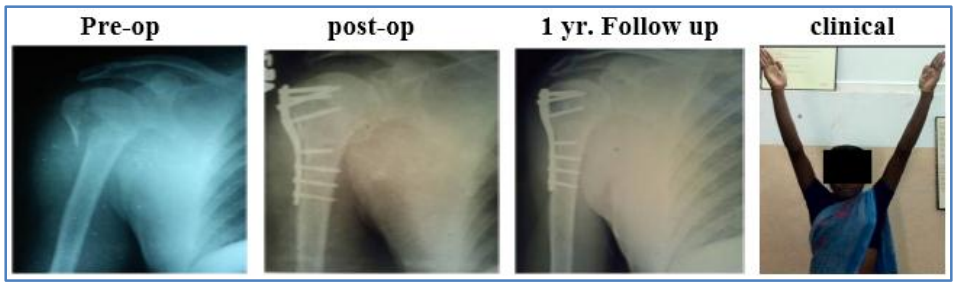

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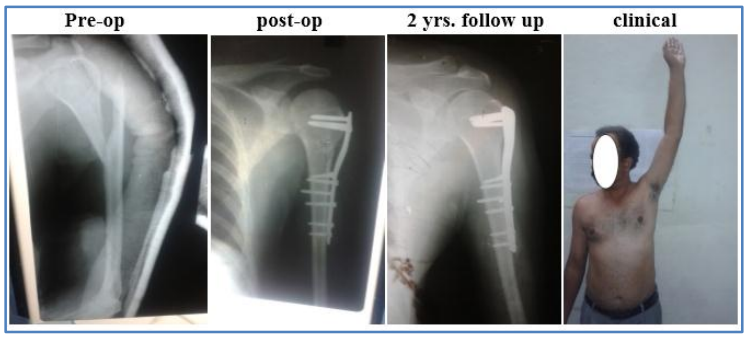

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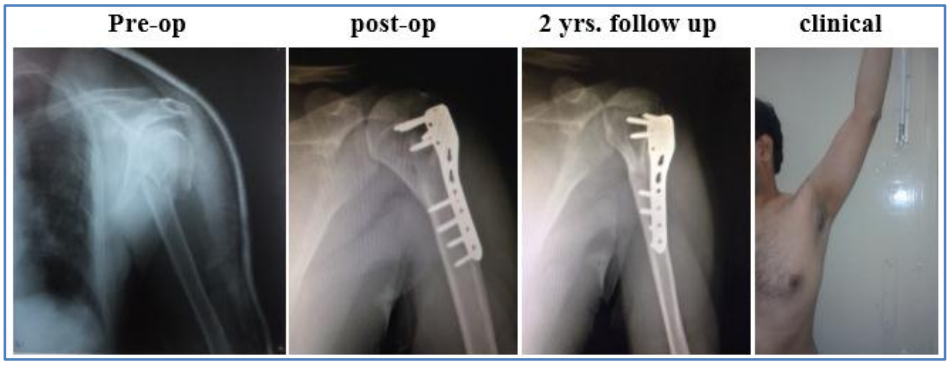

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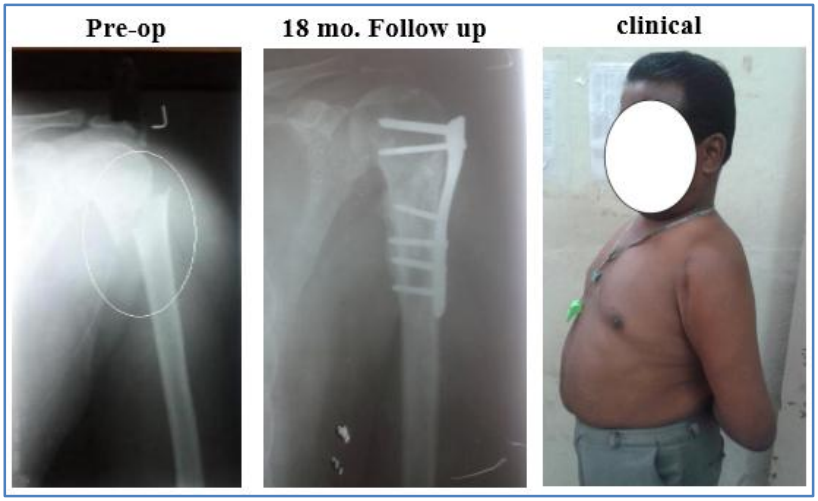

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