

A Study Assessing Functional Outcome of Management of Proximal Humeral Fractures with Philos Plate fixation

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Abstract

Aim: The aim of the present study was assess the functional outcome of management of proximal humeral fractures with Philos plate fixation.

Methods: This was a prospective cohort study conducted in 50 patients with fractures of the proximal humerus at Department of Orthopaedics, SKMCH, Muzaffarpur, Bihar, India. The indications of operative treatment were based on Neer's classification of proximal humerus fractures.

Results: In the present study, maximum numbers of patients were in their 5th decade of life, with a mean age of 53.47 years. There was a male preponderance, accounting for 60% of the patients. The majority of patients (26 cases) sustained injury due to road traffic accidents, followed by fall on an outstretched hand (18 cases) and assaults (6 cases). There were 25 (50%) patients with two-part, 18 (36%) patients with three-part, and 7 (14%) patients with four-part fractures. The final outcome of the procedure was graded as excellent, good, moderate, and poor depending upon the scores of 86-100, 71-85, 56-70, and 0-55, respectively. As per parameters of the Constant scoring system, the overall results were assessed to be excellent in 25 patients, good in eight patients, and moderate in ten patients. Six patients had poor functional results. No intraoperative or immediate postoperative complications in the form of neurovascular injuries/complications related to general anaesthesia were observed in the present study. Out of the six cases of four-part fracture dislocations, AVN of the humeral head was observed in two patients. One of these two patients had AVN of the head along with nonunion of the fragment with the shaft.

Conclusion: The present study indicated that it is a promising implant and provides a good functional outcome in proximal humerus fractures. Along with providing a buttressing effect laterally, it can also provide inferomedial support by locking screws, which prevent varus displacement of proximal fragment in the presence of medial comminution.

Keywords: humerus fracture, Philos, proximal humeral locking plate

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Introduction

Proximal humeral fractures are the second most common fractures of the upper extremity accounting for 4% to 5% of all fractures. [1] Majority of undisplaced proximal humeral fractures can be treated with a sling immobilization and physical therapy. [2] However, approximately 20% of displaced proximal humeral fractures require surgery. [3] Conservative treatment is usually associated with nonunion, malunion and avascular necrosis resulting in a painful dysfunction. [4,5]

The surgical modalities used are transosseous suture fixation, closed reduction and percutaneous fixation, open reduction and internal fixation with conventional plates, locking plate fixation and hemiarthroplasty which have shown to have mixed

results. [3,6] Pre-countoured locking compression plates are fixed angled devices which prevent subsidence in the metaphyseal areas. [7-9] These plates alleviate the risk of malreduction and preserve the blood supply to the bone.

Treatment options vary greatly from conservative management, closed pinning, stacked intramedullary nails, plating and hemi-arthroplasty. Fractures which are minimally displaced or simple 2 part fractures can be conservatively managed, whereas displaced fractures of 2 or more parts needs to be surgically fixed for better functional outcome. The age of the patient, physical activity and medical fitness also influence treatment choice. A review of current results shows that there is no universally

accepted form of treatment. Conservative management may result in non-union, mal-union, avascular necrosis and a painful joint. [10,11] Thirteen to 16% of proximal humeral fractures consist of 3 or 4 part fractures. Treatment options for these displaced fractures include open reduction and fixation. Neer recommended open reduction and internal fixation for displaced two and three parts fractures. [12] In a three or four part fracture dislocation when the head of the humerus is entirely devoid of any blood supply shoulder arthroplasty is an option.

Now with the era of the locking-compression plate there are promising results for displaced osteoporotic proximal humeral fractures. [13,14] The mechanical advantage of a locking compression plate is that it improves fracture stability due to the fixed-angle construct in which there is no movement between individual parts resulting in an increased resistance to pull-out. Hence, the locking of the screw to the plate mechanically recreates a point of cortical bone contact, which may be useful in poor-quality cancellous bone of the proximal humerus. [15]

The aim of the present study was assess the functional outcome of management of proximal humeral fractures with Philos plate fixation.

Materials and Methods

This was a prospective cohort study conducted in 50 patients with fractures of the proximal humerus at Department of Orthopaedics, SKMCH, Muzaffarpur, Bihar, India for one year. The indications of operative treatment were based on Neer's classification [16,17] of proximal humerus fractures. All the adult patients with closed two- and three-part fractures of the proximal humerus, irrespective of age, who reported within 3 weeks of injury were included in the study. In patients with four-part fracture, fixation was performed only when the patients' age was < 60 years. Patients with open and pathological fractures of the proximal humerus were excluded from the study. Skeletally immature patients with proximal humerus fractures were excluded from the study as well. Patients with a past history of surgery in the affected shoulder were also excluded. All the patients were subjected to radiographic evaluation. Fine-cut coronal and sagittal computed tomography scans of the shoulder were performed when intra-articular involvement was suspected, including articular comminution of the humeral head or suspected glenoid involvement, and when it was difficult to evaluate on plain radiographs. The information obtained from both plain radiographs and computed tomography regarding the characteristics of the fractures was used for fracture classification as well as for the intraoperative reduction manoeuvre.

Operations

The standard deltopectoral approach was used in all cases. Two surgeons including the senior author were involved in most of the cases. Fracture fragments were identified and stay sutures were placed in the rotator cuff. After freshening the fracture fragment, fractures were reduced. Temporary fixation with K-wires was performed to hold the fracture reduction. After temporary fracture reduction was achieved, the precontoured locking plate was positioned 5e10 mm lateral to the intertubercular sulcus and 10 mm caudal to the tip of the greater tuberosity. Tuberosity fixation was carried out through plate holes and sutures. Proximal locking screws were extended till subchondral purchase. The distal humeral screws were having bicortical purchase.

An image intensifier was used to check the quality of the reduction, stability of the construct, plate position, and length of the screws to avoid penetration of the locking screws into the glenohumeral joint in all the cases. The range of motion was also checked for any impingement. Once adequate fixation was confirmed, the wound was closed in layers.

Postoperatively, the arm was immobilised using a shoulder immobiliser. Wound inspection was performed on the 2nd post-operative day, and the drain was removed after 48 hours. Sutures were removed on the 14th postoperative day. All patients were started on pendulum exercises and gentle range of motion exercises from the 2nd postoperative day, depending on the pain tolerance of the patients. The patients were followed up for a period of 18e36 months. They were reviewed on the 3rd postoperative day and 14th postoperative day, and then at 6 weeks, 3 months, 6 months, 12 months, 24 months, and 36 months. At each follow-up visit, the patients were examined clinically and radiologically. Clinical examination included evaluation of the status of surgical wound, severity of pain, swelling, tenderness, distal neurovascular deficit, deep infection, and range of movement. X-rays of the true anteroposterior view, anteroposterior view with the humerus in internal rotation and external rotation, and lateral scapular view of the proximal humerus were taken to see fracture reduction, position of plate, fracture healing, tuberosity attachment (union), nonunion, malunion (varus deformity), and avascular necrosis (AVN). At 3 months, 6 months, 12 months, 2 years, and 3 years, in addition to the abovementioned evaluations, the patients were assessed by Constant and Murley shoulder scores [18] which depends on severity of pain, activities of daily living, and range of motion in terms of forward elevation, lateral elevation, internal rotation, external rotation, and strength.

Results

Table 1: Age and sex distribution of patients

Age groups in years	Male	Female	Total
< 40	7	3	10
41-50	4	4	8
51-60	14	6	20
61-70	3	4	7
> 70	2	3	5
Total	30	20	50

In the present study, maximum numbers of patients were in their 5th decade of life, with a mean age of 53.47 years. There was a male preponderance, accounting for 60% of the patients.

Table 2: Mode of trauma and Neer's classification

Mode of trauma	N	%
RTA	26	52
Fall	18	36
Assault	6	12
Neer's classification		
Two part	25	50
Three part	18	36
Four part	7	14

The majority of patients (26 cases) sustained injury due to road traffic accidents, followed by fall on an outstretched hand (18 cases) and assaults (6 cases). There were 25 (50%) patients with two-part, 18 (36%) patients with three-part, and 7 (14%) patients with four-part fractures.

Table 3: Final functional outcome of patients in terms of constant score

Constant score	N	Two-part	Three-part	Four-part
Excellent (86-100)	25	15	10	0
Good (71-85)	8	5	3	1
Satisfactory (56-70)	10	3	5	2
Poor (0-55)	6	2	0	4
Total	50	25	18	7

The final outcome of the procedure was graded as excellent, good, moderate, and poor depending upon the scores of 86-100, 71-85, 56-70, and 0-55, respectively. As per parameters of the Constant

scoring system, the overall results were assessed to be excellent in 25 patients, good in eight patients, and moderate in ten patients. Six patients had poor functional results.

Table 4: Surgical complications

N	Type of fracture	Complications
2	4-part	AVN of the humeral head
1	2-part	Superficial infection and wound dehiscence
1	3-part	Subacromial impingement
1	3-part	One screw loosened
1	2-part	Secondary varus of 8° and
1	4-part	11°, respectively and Loss of reduction

No intraoperative or immediate postoperative complications in the form of neurovascular injuries/complications related to general anaesthesia were observed in the present study. Out of the six cases of four-part fracture dislocations, AVN of the humeral head was observed in two patients. One of these two patients had AVN of the head along with nonunion of the fragment with the shaft.

Discussion

Proximal humerus fractures comprise upto 4-5% of all fractures [19,20] and they are the most common of humerus fractures (45%). The increased incidence of proximal humerus fracture in older population is related to osteoporosis. [21] Proximal humerus fractures are the 3rd most common fracture in elderly patients [22,23] Due to osteoporotic

bones, fixation of proximal humerus fractures especially in the elderly patients is difficult and is associated with high complication rates. [21]

The AO/ASIF proposed a classification scheme based on vascular supply to the articular surface of the proximal humerus to predict the risk of avascular necrosis. [24] The final management decision should not be based solely on the presence of number of fracture fragments as dictated by the classification systems described. Instead, they must be individualized on the basis of age, associated injuries, and functional demands of the patient and fracture characteristics. In elderly patients, restoration of muscle power to the injured arm is not the prime objective. The main requirement is to achieve activities of daily living which do not need much strength, but require a reasonable range of movement. [25] In the present study, maximum numbers of patients were in their 5th decade of life, with a mean age of 53.47 years. There was a male preponderance, accounting for 60% of the patients.

The majority of patients (26 cases) sustained injury due to road traffic accidents, followed by fall on an outstretched hand (18 cases) and assaults (6 cases). There were 25 (50%) patients with two-part, 18 (36%) patients with three-part, and 7 (14%) patients with four-part fractures. The final outcome of the procedure was graded as excellent, good, moderate, and poor depending upon the scores of 86-100, 71-85, 56-70, and 0-55, respectively. As per parameters of the Constant scoring system, the overall results were assessed to be excellent in 25 patients, good in eight patients, and moderate in ten patients. Six patients had poor functional results. Misra A et al [26] in their series of patients treated with internal fixation, 76% had better pain relief and 67% patients had good functional range. Lu et al [27] treated 39 proximal humerus fractures including isolated 2-part GT fractures with ORIF after a delay of 21-120 days from initial injury, ROM were improved except for internal rotation and all of the evaluated scores including visual analogue score, Constant – Murley score, university of California Los Angeles (UCLA) scoring system and Simple Shoulder score demonstrated great reconstruction. In our study patients were operated with in a week and delay within a week does not effects the shoulder outcome to a statistically significant value, although a trend towards decrease in long term outcome was noted with increasing preoperative surgical delay.

Conclusion

The ideal treatment of displaced proximal humeral fractures remained controversial for several years. The current trends show a shift towards the use of specially contoured proximal humerus locking plates. The present study indicated that it is a promising implant and provides a good functional outcome in proximal humerus fractures. Along with

providing a buttressing effect laterally, it can also provide inferomedial support by locking screws, which prevent varus displacement of proximal fragment in the presence of medial comminution. Superior functional and radiological out- comes in patients with displaced proximal humeral fractures indicate that a proximal humerus locking plate is likely to be a better option in the management of these fractures.

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