

Functional Outcome of Displaced Proximal Humerus Fractures Treated By Proximal Humerus Locking Plate in Adults

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ABSTRACT

INTRODUCTION: Fractures of the proximal humerus are common, accounting for 4–5% of all fractures. The management of proximal humerus fracture is always demanding and plate fixation has been standard for stabilization. Because of the complexity and variety of these fractures, the complication rate is high; in particular, loss of reduction and penetration of the proximal screws

METHOD: This retrospective study was carried out in the department of Orthopedics National Trauma Center, Kathmandu from March 2017 to September 2019. Within this period, 36 patients of proximal humerus fracture were selected as per inclusion criteria.

RESULT: The mean constant score was 67.28 (range 38-92). Out of 36 patients, 7 patients had excellent scores, 9 had good scores, 11 had moderate scores, 5 had poor Scores and 4 were lost during follow up. The major complication associated were avascular necrosis (n=2) and chronic osteomyelitis (n=1).

CONCLUSION: The complex, high energy and osteoporotic proximal humerus fracture using proximal humerus locking plate provides stable fixation with good functional outcome and low complication rates.

KEY WORDS: Constant Score, Neer's Classification, Proximal Humerus Fracture.

INTRODUCTION

Fractures of the proximal humerus comprise nearly 4% of all fractures and 26% of fracture of humerus.¹ They are the common fractures in elderly population, the first and second being, hip and distal radius fractures respectively. Proximal humerus involves head, greater tuberosity, lesser tuberosity and proximal one fourth of the shaft. The fracture is most common in elderly patients due to osteoporosis and less frequently in young adults due to high energy trauma.² These fractures challenge the treating orthopedic surgeon because of their osteoporotic quality in the elderly people and the deforming forces of the muscles

attached. Most of the stable and undisplaced proximal humerus fractures can be treated non operatively which comprise nearly 80% of proximal humerus fractures. The rest of 20% require fixation.³ Neer's classification distinguishes between the number of displaced fragments with displacement defined as greater than 45 ° of angulation or > 1 cm of separation. These types of fractures require stable fixation. There are different types of fixation for proximal humerus fracture including k-wires, screw fixation, T-butress plate, conventional plate, locking plate and prosthetic replacement. Every fixation has its own complication.

The proximal humerus fractures with poor bone quality especially in elderly, result in high risk of failure of fixation with conventional plating system.^{4,5,6} The Proximal Humerus Internal Locking System (PHILOS) plate has been introduced to reduce these complications especially in older osteoporotic individual. Even minimally displaced fracture can be treated with PHILOS plate to early mobilize the

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fracture thereby to avoid shoulder stiffness. Highly comminuted three & four parts fractures can be reconstructed with rotator cuff suture ties with plate and thereby enhancing the functional outcome.

This retrospective study analysed the functional outcome of management of the fracture of humerus involving the proximal part, with PHILOS plate. The aim of study was to analyze the outcomes of patients with proximal humerus fracture with PHILOS plate fixation retrospectively.

METHOD

This retrospective study was conducted at National Trauma Center from March 2017 to September 2019. Patients were selected under following criteria.

Inclusion criteria

Closed Neer’s 2, 3, and 4 parts fracture with or without dislocation

Exclusion criteria

1. Open and undisplaced fractures
2. Skeletally immature patients
3. Pathological fractures

Intra-operative events, difficulties and complications, post-operative radiological evaluations and bony union, non-union, avascular necrosis were noted. All patients at their final assessment underwent radiological and functional evaluation using the Constant score.

The Constant score assigns points for Pain, Range of movements, Power and Activities of daily living. Muscle strength was measured with use of a 1 kg weight in the patient’s hand and the shoulder in 90° of abduction, or, if 90° could not be reached, in maximum active abduction as described by Constant.⁷

RESULT

Among the 36 patients, 14 were female and 22 were male. The age distribution varied from 18 years to 66 years with an average age of 42 years. All were right handed persons and 22 patients had a fracture of the right proximal humerus and 14 patients had a fracture of the left proximal humerus.

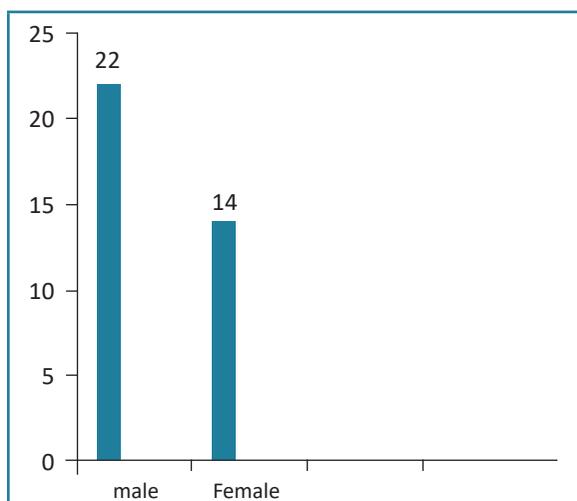


Figure 1: Sex distribution

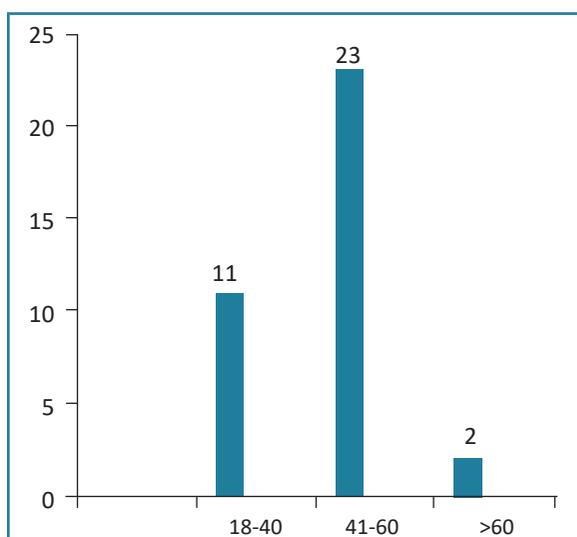


Figure 2: Age distribution

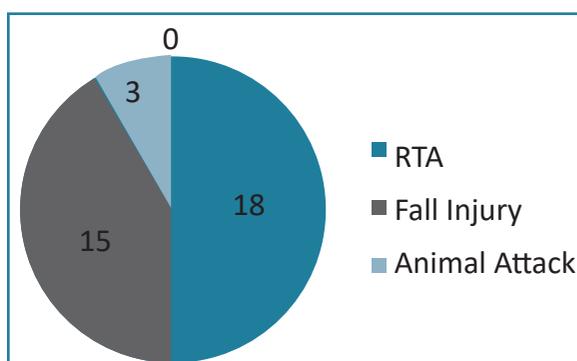


Figure 3: Mode of Injury distribution

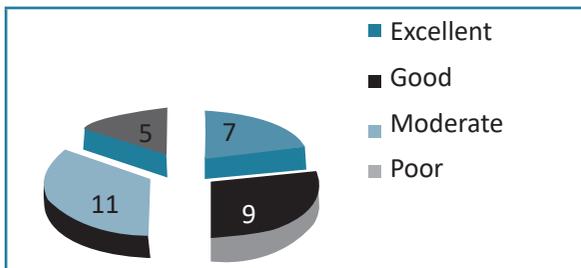


Figure 4: Treatment outcome

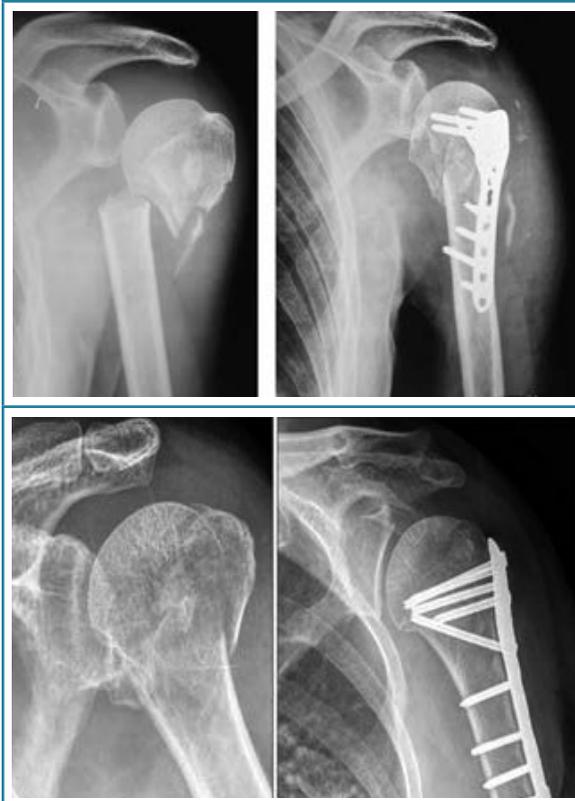


Figure 5: Preoperative and post-operative X- rays

The Constant Murley Score (max 100 points) were graded as

- a) Pain (max 15 points)
- b) Activities of daily living (max 20 points)
- c) Movement (max 40 points)
- d) Strength (max 25 points)

Table 1: Constant score and final outcome (N=32)		
Constant score	Outcome	No of patients
0-55	Poor	5
56-70	Moderate	11
71-85	Good	9
86-100	Excellent	7

Out of 32 patients, 7 had excellent scores, 9 had good scores, 11 had moderate scores, 5 had poor scores and 4 lost follow up. Mean Constant score was 67.28 (range 38-92 points). Mean Constant score for Neer’s two parts fracture was 75 (range 56-92). For Neer’s three parts fracture, it was 66.71 (range 38-91) and for Neer’s four parts fracture, it was 60.14 (range 40-81). Thirty patients out of thirty two had shown union at around 9 weeks follow up (93%), except those complicated by screw pull out, osteonecrosis and fixation failure.

Two patients, one with Neer’s two parts fracture later developed to osteonecrosis of the humeral head and one patient with 4 parts fracture encountered backing out of screw with failure of fixation and finally had osteonecrosis who underwent implant removal and was planned for hemiarthroplasty of shoulder. Two patients with Neer’s four parts open fractures were infected, for which intra venous antibiotic followed by oral antibiotic was given according to culture & sensitivity.

DISCUSSION

The treatment of complex humeral 3- or 4-part fractures always pose challenges to the Orthopaedic surgeon. The surgeon must obtain an exact anatomical reduction and stable fixation, and at the same time minimise the iatrogenic risk of screw penetration and avascular necrosis of humeral head by protection of the periarticular soft tissues. Poor results in these complex fractures are due to inadequate fracture reduction especially medial cortex, unstable fixation, and incorrect positioning of the fixation devices.

The common complications after fixation of fractures of proximal humerus are restricted movements, restrictive pain, wound infection, failure of fixation, avascular necrosis of humeral head and late rupture of the rotator cuff ^{8,9}.

There is consensus in the literature that, regardless of the procedure and the implant choice, a good functional outcome depends mainly on anatomical reduction of the fracture combined with a stable fixation, and early initiation of functional rehabilitation of the shoulder. In recent decade, rigid internal fixations of fracture have been increasingly used in the operative care of proximal humeral fracture. In the very old age group with osteoporosis, functional outcome after conventional plate osteosynthesis was poor.⁸ In order to obtain

better and reproducible results, Arbeitsgemeinschaft für Osteosynthesefragen/Association for the Study of Internal Fixation (AO/ASIF) has developed a special locking compression plate named proximal humerus internal locking system (PHILOS) for fractures of the proximal humerus.⁹ Patients with good bone quality have previously been treated successfully with the conventional plate osteosynthesis.¹⁰ In this study, most of the patients (i.e. 24 out of 34) lie in the group of 41-60 years, a group prone for osteoporosis. Due to multidirectional nature of screws in the locking plate, which spans through sphericity of head and not the centre alone, reduces the failure of fixation and

collapse of head of humerus. The average clinical result obtained in our study, with a mean Constant score of 67.28 points was satisfactory. Comparable studies of internal fixation of proximal humerus fractures demonstrated similar short term results. Although the follow-up period of our series was short, studies have shown that early function was comparable to final long term outcome. The outcome seemed to correlate with fracture severity, anatomic reduction, etiology, bone quality, length of time elapsed from injury to surgery, concomitant injuries and the exact positioning and fixation of the implant.¹¹

Table 2: Constant score of different treatment options

Study group	Types of fixation	Constant score	Neer's classification
Wijgman ¹⁰	Classic T plate and cerclage wires	80.0	3 & 4 parts fracture
Kuchle ¹⁴	Cloverleaf plate	72.4	2,3 & 4 parts fracture
Ketler ¹⁵	Angle stable humerus plate	70	2,3 & 4 parts fracture
Lill ¹⁶	Angle stable humerus plate	72.5	2, 3 & 4 parts fracture
Kolig ¹⁷	T plate, screw and k wires	72.1	3 & 4 parts fracture
Jost ¹⁸	Internal Fixation	78.0	2, 3 & 4 parts fracture
Hessman ¹⁹	T plate	69	2, 3 & 4 parts fracture
Our study	Locking plate	67.28	2, 3 & 4 parts fracture

In our study, 5 cases (15%) with poor outcome scores included 2 cases of osteonecrosis of humeral head, 1 case of screw perforation and 2 cases of shoulder stiffness due to delay in surgery. There was no significant poorer result in perforation of screws in joint and in chronic infection.

The 6.25% (2/32 patients) infection rate in our series was comparable to other studies.^{12,13} The development of osteonecrosis of humeral head in 2 patients significantly affected the clinical result; these patients achieved a mean Constant score of 45.0 only. Early rigid internal fixation and exact anatomical reduction of the fracture fragments were associated with a significantly better functional result.

CONCLUSION

Accurate anatomical reduction and early stable fracture fixation using proximal humerus locking plate is acceptable treatment of choice for displaced proximal humerus fracture. There was not much difference in functional outcomes among Neer's 2, 3 and 4 parts fracture managed with PHILOS plate.

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