



THE TREATMENT OF DISPLACED PROXIMAL HUMERUS FRACTURES WITH PROXIMAL LOCKING HUMERUS PLATE: RETROSPECTIVE ANALYSIS

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ABSTRACT

Introduction: Fractures of the proximal humerus are common in humans, accounting for 4–5% of all fracture. The management of proximal humerus fracture is always demanding and plate fixation has been standard for stabilization. Owing to the variety and complexity of these fractures, the complication rate is high. In particular, loss of reduction and penetration of the proximal screws is a frequent complication reported in the literature. **Methods:** This retrospective study was carried out in the department of Orthopedics of National Trauma Center, Kathmandu for the duration of 2.5 years. Within this period 36 patients of proximal humerus fracture were selected as per inclusion and exclusion criteria. **Result:** The mean constant score is 67.28(range 38-92) .Out of thirty two patients, 7 had excellent results (22%), 28 had good results (28%), 11 had moderate results (35%) and 5 had poor results. 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 satisfactory functional outcome and low complication rates.

KEYWORDS: proximal humerus fracture, proximal humerus locking plate (PHILOS), constant score, Neer's classification.

INTRODUCTION

Fractures of the proximal humerus comprise nearly 4% of all fractures and 26% of fracture of humerus.^[1] They are the commonest fractures in elderly population, which ranks the third and 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 orthopaedic surgeon because of its osteoporotic quality in the elderly people and the deforming forces of the muscles attached. Most of proximal humerus fractures, in younger as well as in the elderly patients, are stable & slightly or non-displaced, can be treated non operatively.^[3]

These comprise nearly 80% of proximal humerus fractures. The rest of 20% requires surgical fixation either because they needs better shoulder mobility or because their fracture is more severe. 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 type of fractures require stable fixation. There are different types of fixation for proximal humerus fracture

like k-wires, screw fixation, T-buttress plate, conventional plate, locking plate and prosthetic replacement. Every fixation has its own complication.

The proximal humerus with poor cancellous bone quality especially in older patients, results 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 mobilise the fracture thereby to avoid shoulder stiffness. Highly communitied 3 & 4 parts fractures can be reconstructed with rotator cuff sutural ties with plate and thereby enhance the functional outcome. This study enlightens the functional outcome of management of the fracture of humerus involving the proximal part, with PHILOS plate. The aim of study is to analyze the outcomes of patients with proximal humerus fracture with philos plate fixation retrospectively.

MATERIALS AND METHODS

This is a retrospective study, conducted at National Trauma Center in Department of Orthopaedics & Traumatology on those who were admitted with

displaced fracture of Proximal Humerus from March 2017 to September 2019. Thirty six patients were reviewed with displaced fracture of Proximal Humerus treated with proximal humerus plate and involved in this study retrospectively based on the following criteria.

Inclusion criteria

1. Patients with displaced, closed proximal humerus fracture, on basis of Neer's classification.
2. Associated dislocation of shoulder.

Exclusion criteria

1. Metastatic & pathological fractures
2. Children (0-14 yrs)
3. Open and Undisplaced fractures

Intra-operative events, difficulties and complications, post-operative radiological evaluations and bony union, non-union, avascular necrosis were noted. Patients were followed up at 2 weeks, 6 weeks, 3, 6 and 12 months with radio graphical evaluation and clinical examination and outcome. All patients at their final assessment underwent radiological and functional evaluation using the CONSTANT score.

RESULTS

Among the 36 patients, 14 were females and 22 were males. The age distribution was 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.

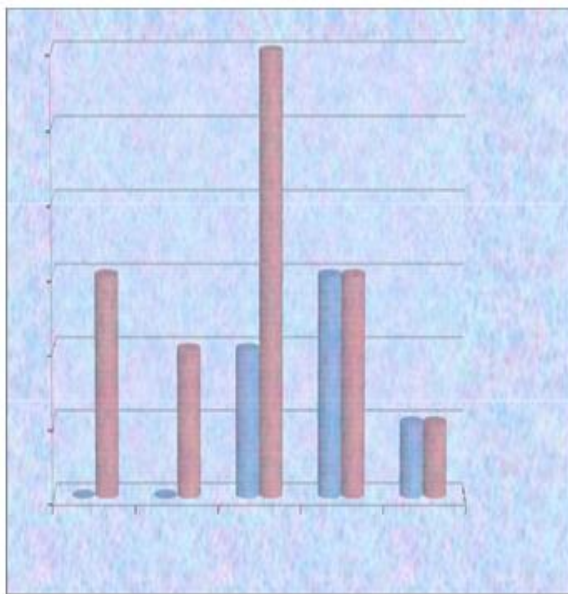


Figure 1. Age Distribution

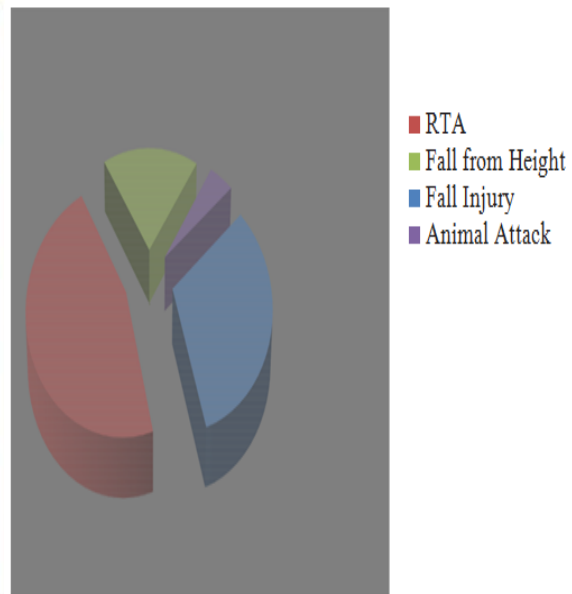


Figure 2. Mode of Injury

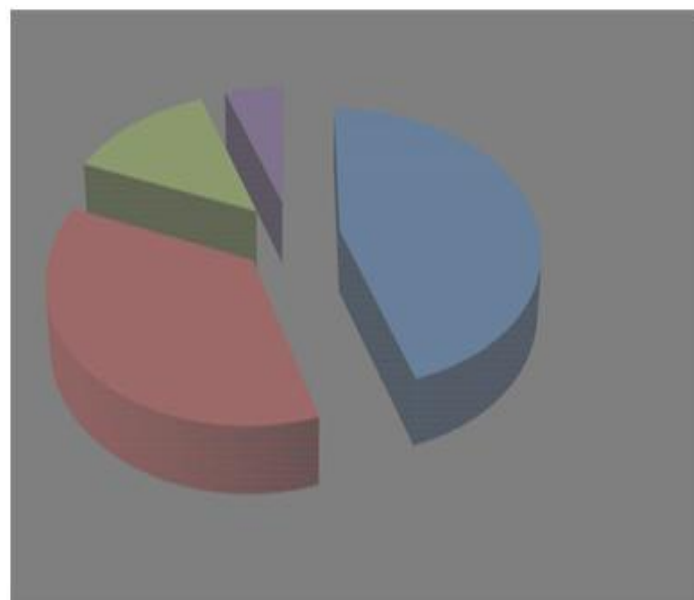


Figure 3: Type of Fracture -Neer's Classification.

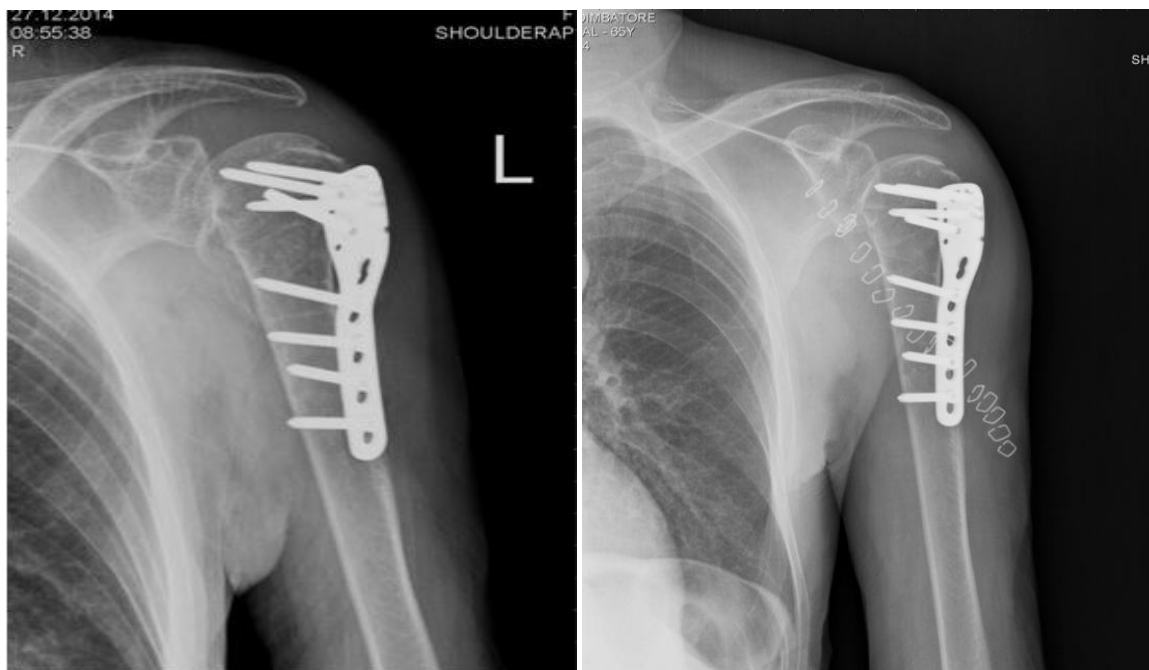


Figure 4: Post -Operative X-ray.

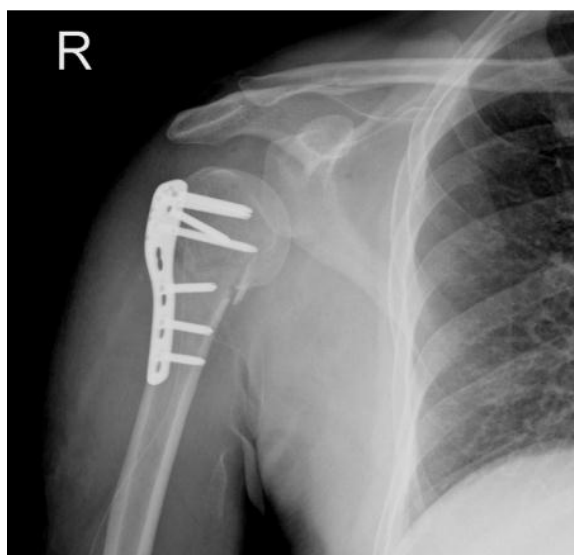


Figure 5: X ray 2weeks - 4 part fracture



Figure 6: X-ray 24 weeks -4 part Fracture

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] The Constant score was graded as

Poor	(0 to 55 points),
Moderate	(56 to 70 points),
Good	(71 to 85 points),
Excellent	(86 to 100 points).

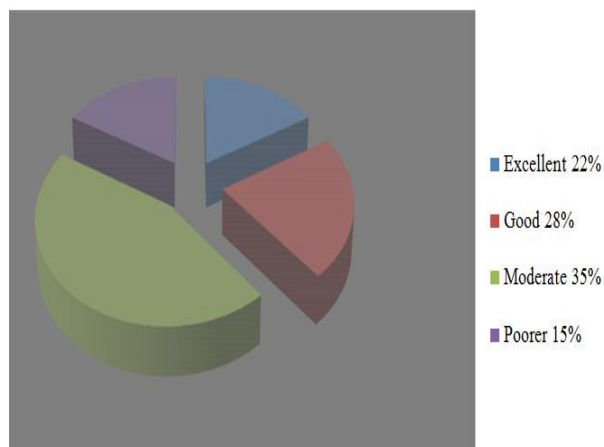
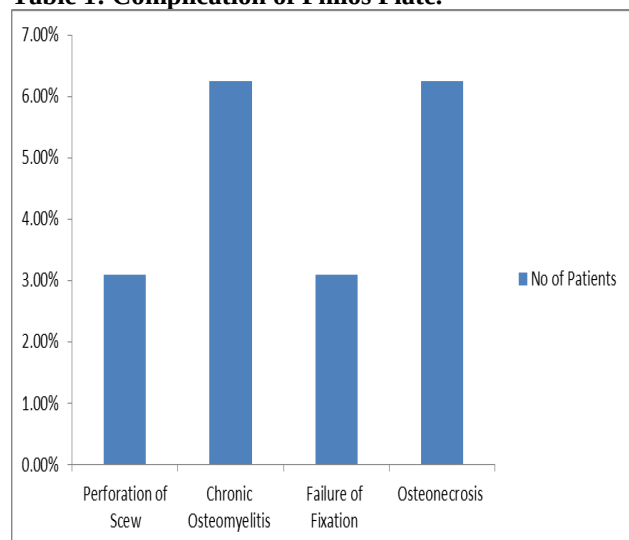


Figure 7: outcome.

Out of the 36 patients, 7 patients had excellent scores, 9 had good scores, 11 had moderate scores, 5 had poor outcome Scores and 4 were lost during follow up. Mean constant score is 67.28 (range 38-92 points). Mean constant score for Neer two part fracture was 75 (range 56 – 92), for Neer's three parts fracture was 66.71(range 38 – 91) and for Neer's four parts fracture was 60.14 (range 40 – 81). Mean constant score for middle age group (18-40) was 79.5 (range 75 – 92), for old age group(41-60) was 62.91(range 38 – 91) and for very old age group(>60) was 60.0 (one case- 60). Thirty two patients out of thirty six patients have gone for union at around 9 weeks follow up (88%), except those complicated by screw pull out, osteonecrosis and fixation failure.

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] Two patients, one with Neer 2 part fracture later leads to osteonecrosis of the humeral head. One who with 4 part fracture encountered backing out of screw with failure of fixation and finally leads to Osteonecrosis who undergone implant exit and planned for hemiarthroplasty of shoulder. two patient with Neer 4 parts open fracture leads to chronic osteomyelitis for which iv antibiotic followed by oral antibiotic according to culture & sensitivity, waited till bone union and finally undergone for implant exit.

Table 1: Complication of Philos Plate.



DISCUSSION

The treatment of complex humeral 3- or 4-part fractures represents a challenge. 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 maximal protection of the periarticular soft tissues.

Poor results in these complex fractures are due to following causes:

1. Inadequate fracture reduction especially medial cortex
2. Unstable fixation
3. Incorrect positioning of the fixation devices.

There is consensus in the literature that, regardless of the procedure and the implant chosen, a good functional final result 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. Despite of an early and secure functional postoperative therapy, it was believed that this implant would reduce the risk of secondary reduction loss in osteoporotic patients. In the very old age group with osteoporosis, functional outcome after conventional plate osteosynthesis was poor.^[10] In order to obtain better and reproducible results, the AO/ASIF has developed a special locking compression plate (Philos) for fractures of the proximal humerus.^[11] Patients with good bone quality have previously been treated successfully with the conventional plate osteosynthesis.^[12] In this study, most of the patients (i.e; 24 out of 36) lie in the group of 41- 60 years, a group highly 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 in fixation and collapse of head of humerus. The average clinical result obtained in our study, with a mean Constant-Murley score of 67.28 points is satisfactory. Comparable studies of internal fixation of Proximal humerus fractures demonstrate similar short term results. Although the follow-up period of our series was short, studies have shown that early function is comparable to final long term outcome. The outcome seems 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.^[13]

Table 2: Functional scores achieved with different treatment options for proximal humeral fractures in the current literature.^[14-20]

Study	Type of fixation	Constant score	Neer's classification
Kuchle et al (2006)	Cloverleaf plate	72.4	2,3& 4 part fracture
Ketter et al (2006)	Angle stable humerus plate	70.0	2,3&4 part fracture
Lill et al (2003)	Angle stable humerus plate	72.5	2,3&4 part fracture
Kollig et al (2003)	T palte, screws & k wires	72.1	3 & 4 part fracture
Wijgman et al (2002)	Classic T Plate cerclage	80.0	3 & 4 part fracture
Gerber et al	Internal fixation	78	2,3,& 4 part fracture
Hessman et al	T plate	69	2,3,& 4 part fracture
Our study	Locking plate	67.28	2,3,& 4 part fracture

In our study, five cases (15%) with poor outcome scores include two case of osteonecrosis of humeral head, one case screw perforation, one case of shoulder stiffness due to delay in surgery. There is 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 is comparable to the 4.8% (2/41 patients) patients of Paavolainen et al (1983). The development of aseptic humerus head necrosis (2 patients or 6.25%) significantly affected the clinical result; these patients only achieved a mean Constant-Murley score of 45.0. In the literature the rate of necrosis for 3-and 4-part fractures has been between 0% and 50%, depending on the osteosynthesis procedure. The rate of aseptc necrosis (9%) in the study is acceptable and is as same as other literature. Early fixation, exact anatomical repositioning of the fracture fragments and rigid internal fixation was associated with a significantly better functional result.

CONCLUSION

Accurate anatomical reduction and early fracture fixation with the proximal humerus plate is accepted choice for the complex humerus fracture. There is no much difference among 2, 3 & 4 parts of fracture with locking plate. All are nearly more or less with good function outcome. In general, 2- and 3-part fractures can be treated with open reduction and internal fixation (a plate with screws is the choice). Four-part fractures in the younger, active patient also can be treated successfully with open reduction and internal fixation.

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