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## A clinical study of management in proximal humerus fractures in adults with LCP plating

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### Abstract

Proximal humerus fractures account for 4% of all fractures. Most proximal humerus fractures can be managed conservatively, but 3-part and 4-part fractures are unstable and need internal fixation. We are undertaking this study to get a better understanding of the use of operative management of these fractures with LCP plating. 50 cases (32 males, 18 females) with unstable fractures of proximal humerus treated from June 2011 to may 2014 in the mean age 51.5 (25-70) years formed the study group. Indications for surgery were 3-part & 4-part closed proximal humeral fractures, surgical neck fractures with angulation greater than 45 degrees or greater tuberosity fracture with displacement of more than 1 cm. Standard Deltopectoral approach was used. Anatomical reduction and internal fixation with LCP was done in all patients. Patients were assessed clinically, radiologically (Plain X-rays) and functionally (Constant Murley shoulder score) at 1<sup>st</sup>, 2<sup>nd</sup>, 3<sup>rd</sup>, 6<sup>th</sup>, 12<sup>th</sup> and 18 months postoperatively. Patients were followed up for a mean duration of 10.31 months. Mean time to radiological union was 14.06 (6-24) weeks. The mean Constant murley shoulder score was 81.25 points and was categorized good. Complications like stiffness, infection, malunion, were observed. In conclusion locking Compression plate is an advantageous implant in proximal humeral fractures due to angular stability, particularly in comminuted fractures and in Osteoporotic bones in elderly patients, thus allowing early mobilization.

**Keywords:** proximal humerus fracture, locking plate, malunion

### 1. Introduction

Fractures of the proximal humerus represent approximately 4% of all fractures and 26% of humerus fractures<sup>[1]</sup>. These are the second most common upper-extremity fracture and the third most common fracture, after hip and distal radial fractures. The fractures can occur at any age, but the incidence rapidly increases with age. The most common mechanism of injury in proximal humeral fractures in elderly patients is a fall from standing height onto an outstretched upper extremity. In patients aged less than 50 years, the mechanism is often related to high-energy trauma, such as significant falls from height, motor vehicle accidents, or athletic injuries. Neers has classified proximal humeral fractures based on displacement of fracture fragments and vascular supply to humeral head. He defined "a fracture fragment is considered displaced, if there is more than one centimeter of separation or a fragment is angulated more than 45 degrees from the other fragment"<sup>[13, 14]</sup>. Most proximal humerus fractures can be managed conservatively, but 3-part and 4-part fractures are unstable and need internal fixation. Treatment of unstable, displaced, and comminuted fractures of the proximal humerus remains challenging<sup>[2, 3]</sup>. Significant controversy continues regarding the best methods of treating displaced proximal humerus fractures. Various operative procedures are carried out, recent trend in internal fixation has moved on to locking plates. This study conducted to analyse fractures of the proximal humerus that were treated with locking compression plate and document their clinical and functional outcome.

### 2. Materials and Methods

50 cases (32 males, 18 females) with unstable fractures of proximal humerus treated in Mamata General Hospital, from June 2011 to may 2014 were included in study. All patients in this cohort were followed up prospectively. The mean age 51.5 (25-70) years. Standard Deltopectoral approach was used. Anatomical reduction and internal fixation with LCP was done in all patients. Patients were assessed clinically, radiologically (Plain X-rays) and functionally (Constant Murley shoulder score) at 1<sup>st</sup>, 2<sup>nd</sup>, 3<sup>rd</sup>, 6<sup>th</sup>, 12<sup>th</sup> and 18 months postoperatively.

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**2.1 Inclusion Criteria**

All adult patients admitted with proximal humerus fractures. [Neer’s classification: grade 2 to grade 4].

**2.2 Exclusion Criteria**

Skeletally immature patients (below 18 yrs)  
 Pathological fractures,  
 Patients with distal neurovascular deficit,  
 Fractures more than 3 months old,

**Post Operative Evaluation**

All patients are immobilized in shoulder immobiliser. Appropriate antibiotics and analgesics were used. Immediate post-operative radiographs were taken to determine the bone alignment and maintenance of reduction. Pendulum exercises are begun immediately depending on pain. Passive range of motion started at 1st week. The active range of motion with intermittent mobilisation with immobiliser off was started at 2-4 weeks postoperatively, depending on stability of osteosynthesis and pain tolerance of the patient. At the end of 4th to 6th week-immobilization discontinued, Active assisted movements started up to 90 abduction with no forced external Rotation. 6th to 8th week-full range of movements with active exercises started. The patients were examined clinically and

radiologically, assessed for range of motion and bony union and complication. Follow ups were done at at 1<sup>st</sup>, 2<sup>nd</sup> 3<sup>rd</sup>, 6<sup>th</sup>, 12<sup>th</sup> and 18 months postoperatively.

**3. Results**

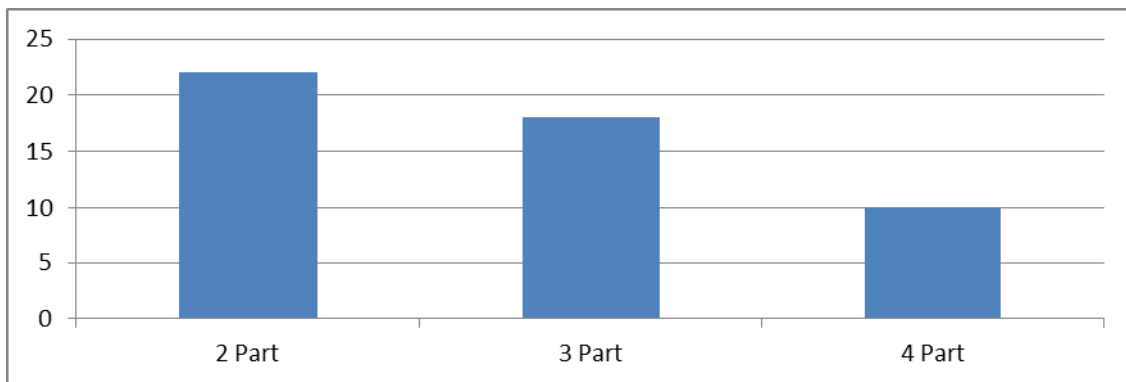
Age distribution

- In our study, ten were in the age group of less than 40 years (20%), sixteen in the age group of 41-50(32%), eighteen in the age group of 51-60(36%), six in the age group of greater than 60 (12%). distribution

Age	No. Of Patients	Percentage
30-40	10	20%
41-50	16	32%
51-60	18	36%
61-70	06	12%
TOTAL	50	

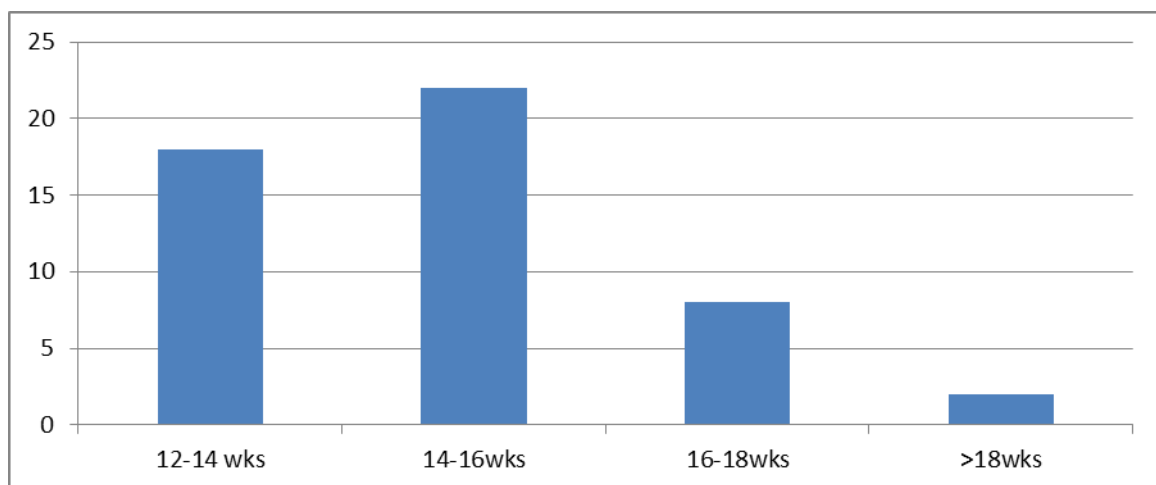
Fracture type

The common type of fracture observed in our study was two part fracture accounting for twenty two patients (44%), along with three-part fracture accounting for eighteen patients (36%), Four-part fracture accounted for ten patients (20%).



Radiological union

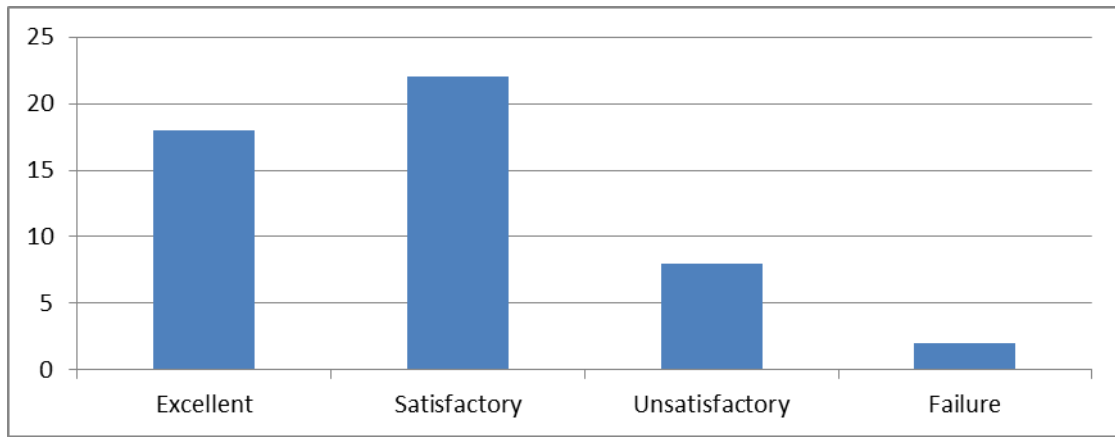
The average time taken for radiological union 14.06 weeks (12-24wks)



Functional results

At the end of clinical and radiological union and full functional recovery the results were evaluated by murley

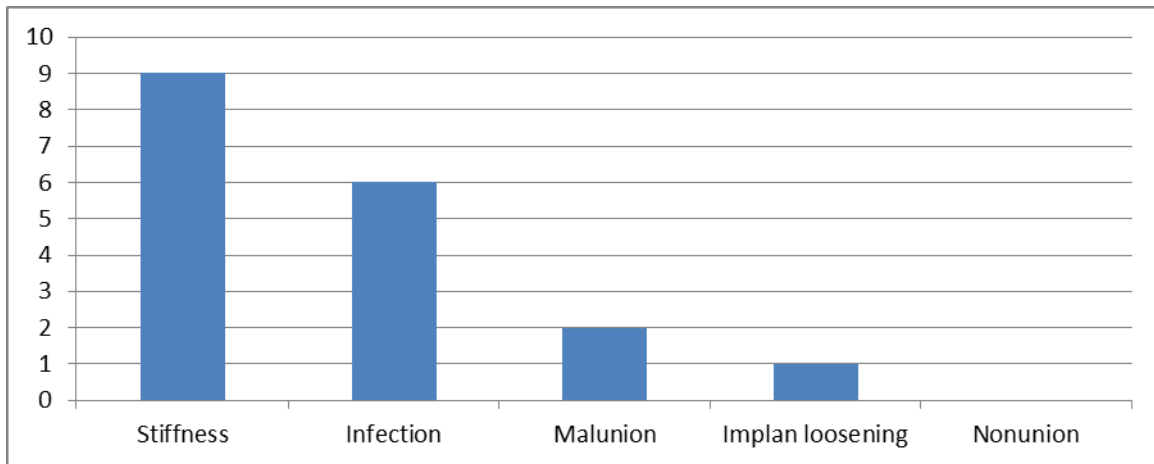
shoulder score. 18 patients (36%) had excellent results, 22 patients (44%) had satisfactory results, 8 patients (16%) had unsatisfactory results and two (4%) had failure outcomes.



**Complications**

We encountered some complications like infection, shoulder

stiffness, malunion, implant loosening and osteonecrosis.



**CASE OF ORIF WITH LCP PLATING**



**Fig 1:** case of 50yr old female patient with fracture dislocation Right Proximal Humerus



**Fig 2:** Immediate post op X-Ray ORIF with PHILOS plating done

Patients were followed up for a mean duration of 10.31 months. Mean time to radiological union was 14.06 (6-24) weeks. The mean Constant murley shoulder score was 81.25 points. The functional outcome was excellent in 36% of cases, satisfactory in 44% of cases, unsatisfactory in 16% of cases and two cases showing poor results with Constant Murley

Shoulder Scoring system.

**4. Discussion**

Proximal humeral fractures account for almost 4 to 5% of all fractures. These fractures have a dual age distribution occurring either in young people following high energy trauma

or in those older than 50 years with low velocity injuries like simple fall. Earlier these fractures were considered simple and were managed by plaster cast technique, slings and slabs. Still Management of proximal humerus fractures remains a difficult problem for the orthopaedic surgeon. In the setting of displaced fractures, there is no consensus on the best treatment option, with some studies favouring prosthetic replacement<sup>[4, 5]</sup> and other studies favouring reduction and plate fixation<sup>[6, 7, 11]</sup>. The heterogeneity of multiple factors in the literature, including patient population, fracture type, and outcome measures reported, makes it difficult to determine the best treatment option for a given fracture pattern. Successful osteosynthesis of the proximal humerus can be difficult to achieve. The use of locking plates for osteoporotic fractures has increased greatly in the past decade, and has changed management of many fracture types, but particularly in the proximal humerus. The rigid fixation of proximal humerus fractures with locking plates has been suggested to improve mechanical stability and therefore potentially result in better outcomes<sup>9</sup>. Biomechanical evaluation of proximal humeral locking plates has demonstrated better biomechanical characteristics compared with a locked proximal humeral nail in varus bending and torsion<sup>[8]</sup>. Shoulder range of motion following open reduction internal fixation with a proximal humerus locking plate is one of, if not the most important outcomes with regards to post-operative patient function<sup>2,12</sup>. The most common complication seen in this review is shoulder stiffness. Phase wise physiotherapy was started after clinical union was confirmed. Few cases had superficial infection which was subsided by using systemic antibiotics. One patient had deep seated infection which needed implant removal and thorough debridement. Malunion was also observed. Loss of the medial cortical buttress from fracture comminution at this location is the most important risk factor for varus malunion<sup>[10]</sup>. Implant loosening was seen in patients with severe osteoporosis.

## 5. Conclusion

In Proximal humerus locking compression plate system, locking of the threaded heads of the screws in the plate itself provides for a construct with angular and axial stability, eliminating the possibility of screw toggling (windscreen wiper effect), or sliding of the screws in the plate holes. Coupled with a divergent or convergent screw orientation to head of humerus provide improved resistance to pull out and failure of fixation. Results are best when the operative method results in stable fixation. Fixation should be followed by early physiotherapy. The rehabilitation programme plays important role in functional outcome of surgical management of proximal humerus fracture. In conclusion, locking compression plate mechanically and biologically an advantageous implant in proximal humeral fractures particularly in comminuted fracture and in Osteoporotic bones in elderly patients, thus allowing early mobilization.

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