



## ANALYSIS OF FUNCTIONAL OUTCOME OF PROXIMAL HUMERUS FRACTURES TREATED WITH LOCKING COMPRESSION PLATE

### Orthopaedics

**Dr. Pappu Kumar** Senior Resident, Department of Orthopaedics, PMCH, Patna

**Dr. Parimal Bhaskar\*** Senior Resident, Department of Orthopaedics, PMCH, Patna. \*Corresponding Author

**Dr. Priya Ranjan** Senior Resident, Department of Orthopaedics, PMCH, Patna

**Dr. Vijay Kumar** Prof. And Head, Department of Orthopaedics, PMCH, Patna

**Dr. Rajesh Kumar Ranjan** Senior Resident, Department of Orthopaedics, PMCH, Patna

### ABSTRACT

**BACKGROUND:** Fractures of proximal humerus comprise approximately 5% of adult fractures, of which 20% fracture are displaced requiring surgery. In Neers original series of 300 fractures the average age of the patients was 55.6 years<sup>10</sup>. Lind found that three fourths of his patients with proximal humerus fracture were over 60 years. 80-85 % undisplaced or minimally displaced fractures, 15% being displaced. Mayo clinic identified a predominance of proximal humerus fracture in women at ratio of 1.5 : 1.

**MATERIAL AND METHODS:** This is Prospective Study, admitted in Patna medical college and Hospital, Patna, Bihar. Study duration two years. collection of data: The study purpose to include patients with proximal humerus fractures admitted and examined according to protocol, associated injuries noted. Clinical and Radiological evaluation done. Routine investigation carried out to get fitness for surgery. Patients to undergo Open reduction Internal Fixation with Locking Compression Plate for the sustained fracture under general anaesthesia. Post operative physiotherapy followed according to protocol.

**CONCLUSION:** Proximal humerus fractures accounts for 4.5% of all adult fractures. Management option for proximal humerus fractures has expanded in recent year & patients with displaced, unstable proximal humerus fractures have improved outcome if, managed operatively. with PHILOS plate.

### KEYWORDS

Proximal humerus fracture, Internal Fixation, External Rotation. Malunion.

### INTRODUCTION

Fractures of proximal humerus comprise approximately 5% of adult fractures, of which 20% fracture are displaced requiring surgery. In Neer's original series of 300 fractures the average age of the patients was 55.6 years. Lind found that three fourths of his patients with proximal humerus fracture were over 60 years. 80-85 % undisplaced or minimally displaced fractures, 15% being displaced. Fall on a out stretched hand with pronated upper extremity – this is most common cause. Excessive rotation of the arm especially in abducted position. This has been described by Codman. Direct blow to side of shoulders – may result in greater tuberosity fracture with comminution. Most of proximal humerus fractures occur as a result of fall from standing height usually in elderly with osteoporotic bones. In young patients, it results from high energy trauma. On examination there may be extensive ecchymosis and swelling seen but lacerations and open fractures are rare. There may be posterior bulge and anterior sulcus seen in case associated with posterior dislocation. On palpation there will be tenderness around the shoulder and movements may be associated with crepitations. There may be anterior bulge below the coracoid in cases of anterior dislocation. The most important diagnostic tool for proximal humerus fractures is the radiographic evaluation. Incorrect radiographic views or acceptance of poor quality radiographs can lead to errors in prognostic outcome and may allow selection of inappropriate treatment. The initial series selected to evaluate a patient with a possible proximal humerus is the trauma series, which consists of anteroposterior and lateral x-rays in the scapular plane and an axillary view. The scapula sits obliquely to the chest wall. There fore to achieve a true anteroposterior view, the beam of the x-ray must be tilted approximately 40 degrees to the thorax. Similarly the lateral view of the x-ray beam will parallel the scapula spine while the body is tilted 40 degrees. Finally, the axillary view helps to assess tuberosity fragments with anteromedial displacement of the lesser tuberosity and posterior displacement of the greater tuberosity fragment. This view is critical in assessing the greater tuberosity fragment, as superior displacement may be absent and the infraspinatus can be completely avulsed with a posterior displaced fragment. Furthermore, dislocation of the head can be clearly defined on this view. Linear tomograms : Linear tomograms are helpful to assess nonunions of the surgical neck. However, CT scan has now replaced the tomogram.

### OBJECTIVES

To achieve radiological union of proximal humerus fractures by open reduction and internal fixation with locking compression plate (PHILOS). To study the functional outcome for internal fixation of fractures of the proximal humerus by locking compression plate.

### Review of Literature

In 1896 Kocher developed an anatomical classification in an attempt to improve diagnosis and treatment but this simplified scheme was not thorough enough and lacked consistency. In 1907 Keen performed first open reduction and internal fixation of an acute fracture of the greater tuberosity but he credited Bardenhaver with having developed the concept in 1886 and Muller with having done first repair of an old fracture in 1898. In 1912, Albee and in 1923 Austin proposed immobilization by casts and splints. In 1932 Roberts SM reported that elaborate apparatus and prolonged immobilization were not beneficial as simpler forms of fixation and early motion. In 1934 Codman made a significant contribution when he divided proximal humeral fractures into four parts.

In 1934 Howard and Eloesser developed a complex theoretical shoulder model that stimulated muscle forces and demonstrated that abduction splint was not beneficial for reduction and control of muscle forces. **Darin et al (2008)** – in their opinion the majority of 3 and 4 part proximal humerus fractures in elderly patients with osteoporosis can be treated successfully with proximal humeral locking plates, yielding a more functional shoulder as long as care is paid to achieving an anatomic reduction and tuberosity fixation as elucidated in recent literature. Hemiarthroplasty may serve as a salvage procedure should ORIF fail, or in the situation where acceptable reduction is not obtainable or maintainable. **Kenmet A.Egol et al (2008)** A retrospective analysis was undertaken of consecutive series of proximal humerus fractures treated with locking plates between Feb 2003 and Jan 2006. 51 patients were included in study with a minimum of 6 months of follow up. Overall 12 patients (24%) developed complication with success rate of 76%. **Muhammad Fazal Haddah (2009)** – did prospective study of 27 patients, who underwent PHILOS plate fixation for displaced proximal humerus fractures. All fractures united with one patient going for complications i.e. Screw penetration which subsequently developed nonunion and AVN. This study concluded that PHILOS fixation provided stable fixation with early range of motion exercises to achieve acceptable

function. Aggarwal S (2010) - A prospective study for 30 months with 56 patients. 47 of these patients were evaluated after one year of fixation with PHILLOS. Outcomes were excellent in 17% , good in 38.5% , moderate in 34 % in poor in 10.5 %. According to constant score results were poor for AO-OTA type 3 fractures as compared to other types. This study showed that PHILLOS Fixation leads to satisfactory outcomes in all the patients with early mobilization & good functional outcome even in osteoporotic fractures in elderly.

#### Locking Screws – Drilling And Fixed With Swrew Driver



**Fracture Fixed With Lcp & Fracture Reduction Confirmed On Image Intensifier**



#### Postoperative management

All patients were immobilized in shoulder immobiliser. Appropriate antibiotics and analgesics were used. Immediate post operative radiographs were taken to determine the bone alignment and maintainance of reduction.

#### MATERIALANDMETHODS

This is prospective study, Total 27 patients , who underwent PHILOS plate fixation for displaced proximal humerus fractures. Depaartment of orthopaedics, at Patna medical college and Hospital, Patna, Bihar. Study on duration two years.

#### Collection Of Data

The study purpose to include patients with proximal humerus fractures admitted and examined according to protocol, associated injuries noted. Clinical and Radiological evaluation done. Fractures classified using Neer s classification. Routine investigation carried out to get fitness for surgery. Patients to undergo Open reduction Internal Fixation with Locking Compression Plate for the sustained fracture under general anaesthesia. Post operative physiotherapy followed according to protocol. To evaluate the functional outcome a minimum of 20 cases will be studied without any sampling procedure.

#### Inclusion Criteria:

Two part, three part, four part proximal humeral fractures . Previously failed procedure of proximal humerus fixed by tension band wiring or treated by non compression plates, who were treated conservatively and have complications like non union or malunion of the proximal humeral shaft and now being treated with LCP.

#### Exclusion Criteria:

Associated humerus shaft fracture, Associated neurovascular injury. The general condition of the patient and the vital signs were recorded. Methodical examination was done to rule out fractures at other sides.

The local examination of injured shoulder was done for swelling, deformity, loss of function and altered attitude. Any nerve injury was also looked for and noted.

#### RESULTS

##### Age Distribution

Minimum age in my study being 20 yrs and maximum age was 80 years. A mean age of 37.2 was calculated showing that proximal humerus fractures are now occurring in the younger age group population.

|     | N  | Minimum | Maximum | Mean | Std. Deviation |
|-----|----|---------|---------|------|----------------|
| AGE | 20 | 20      | 80      | 37.2 | 14.35          |

| Age     | Frequency | Percent |
|---------|-----------|---------|
| < 30    | 6         | 30.0    |
| 30 - 40 | 7         | 35.0    |
| 40 - 50 | 4         | 20.0    |
| > 50    | 3         | 15.0    |
| Total   | 20        | 100.0   |

##### Sex Distribution

This table shows the sex incidence in my study. Male subjects were 14 making up 70% and female subjects were 6 which was 30 %. Males had increased incidence of proximal humerus fractures compared to females

| SEX    | Frequency | Percent |
|--------|-----------|---------|
| FEMALE | 6         | 30.0    |
| MALE   | 14        | 70.0    |
| Total  | 20        | 100.0   |

##### Complications Encountered

This table and graft indicates that 2 patients had impingement of the plate during abduction was treated with physiotherapy and improved . They had a satisfactory outcome according to Neer ,s scoring system. The patient who developed infection had to undergo a second procedure to remove implant and external fixator was applied. One more developed varus malunion but had a good range of movement at the end of one year follow up, A total of 4 patients had developed complications as depicted below from my study

| COMPLICATIONS  | Frequency |
|----------------|-----------|
| IMPRINGEMENT   | 2         |
| INFECTED       | 1         |
| VARUS MALUNION | 1         |
| Total          | 20        |

**External Rotation** – This table and graph indicates the percentage of patients with a good range of external rotation. About 12 patients (60%) who had a range of 30 -60 degrees fell in the satisfactory group. One patient had less than 30 degrees accounting for (5%)

| External Rotation | Frequency | Percent |
|-------------------|-----------|---------|
| < 30              | 1         | 5.0     |
| 30 - 60           | 12        | 60.0    |
| 60 - 90           | 7         | 35.0    |
| Total             | 20        | 100.0   |

**Internal Rotation** – the table and graph below indicates an equal outcome of internal rotation range of movements in the study group. 30 – 60 degrees movement achieved in 10 patients ( 50%) . 60 – 90 degrees achieved in 10 patients . No patients had less than 30 degrees movement

| Internal Rotation | Frequency | Percent |
|-------------------|-----------|---------|
| < 30              | 0         | 0.0     |
| 30 - 60           | 10        | 50.0    |
| 60 - 90           | 10        | 50.0    |
| Total             | 20        | 100.0   |

##### Outcome Of This Study

This table below depicts the distribution of patients after follow up of 3 months , 6 months and 1 year. It indicates the overall success rate .As shown in the pie chart success includes the (excellent + fair + satisfactory) group of patients making up 90 % ,The poor group of patients accounting for 10%. This indicates that proximal humerus fractures fixed with PHILOS yields a good functional outcome.

| RESULT       | Frequency | Percent |
|--------------|-----------|---------|
| EXCELLENT    | 4         | 20.0    |
| FAIR         | 3         | 15.0    |
| POOR         | 2         | 10.0    |
| SATISFACTORY | 11        | 55.0    |
| Total        | 20        | 100.0   |



**PRE OP XRAY      IMMEDIATE POST OP XRAY      FOLLOW UP XAYS**

## DISCUSSION

Fractures of proximal humerus is a common & frequently encountered fracture particularly due to road traffic accidents. In my study men of mean age group 30 – 40 yrs suffered proximal humerus fractures more due to high energy trauma (RTA). In contrast majority of studies in western literature has shown proximal humerus fracture to be more common in elderly age group due to low energy falls. In my study of proximal humerus fractures 2 part, 3 part & 4 part (80%) of fractures were due to RTA. Advent of locking compression plate (PHILOS) that can be used with minimal invasive technique - It permits indirect fracture reduction thus lowering the possibility of AVN & reducing the need for prolonged immobilization time. Helps diminish the possibility of frozen shoulder. It is a low profile plate with the proximal fixed angle screws thus making it a fixation device with a high stability even in osteoporotic bones. In my study of 20 cases I have encountered 1 patients with infection wherein the implant was removed and external fixator was applied and union was achieved after 3 months, one patient with non union & 2 patients with shoulder impingement, Overall management of proximal humerus fractures with locking compression plate in view of its proximity to the shoulder joint requires meticulous reduction & stabilization with good surgeon experience to achieve a good functional outcome. From the above table it proves that proximal humerus fractures are more common around 50 yrs of age. All of the studies are prospective studies. My study also consistent with the above finding. The Following tables below compare my study to other similar studies on proximal humerus fractures fixed with PHILOS plate. RTA (high velocity injuries) was the most common cause 80% individuals compared with individuals (20%) who had a fall from height. RTA is the most common cause in our country compared to western countries where osteoporosis and fall is more common as shown in other journals and studies.

## CONCLUSION

Fractures of proximal humerus are frequently encountered, fracture particularly due to road traffic accidents and other methods of injury, This is aggravated by preexisting osteoporosis and the type of fractures. Managing this type of fractures in view of its proximity to the shoulder joint requires meticulous reduction and stabilization with an implant that would meet the above criteria. Advent of locking compression plate has made the results of the management by LCP in these fractures successful.

## REFERENCES

- 1) Kirk L ,Wong and Gerald R.Williams 2000 Two part and three part fractures ,Management of proximal and distal humerus fractures.Orthop clin North America , January 31 (1);1-21.
- 2) Anthony F. Depalma and Richards Cautilli, Fractures of the upper end of the Humerus. Clin.ortho20,1971;73-94.
- 3) Neer CS and Rockwood CA, Fractures and dislocations of the shoulder- Rockwood and Green – Fractures in Adults, Philadelphia, PA,Lippincott,1984;675-721.
- 4) Scott.E Powell, Robert W. chandler , Fractures of the proximal Humerus , chapter 11. Text book of operative techniques in upper extremity sports injuries. Ed.Frank, W Jobe, Mosby,1995;pages 313 to340.
- 5) Zyto K. ,Non operative treatment of comminuted fracture of proximal humerus in elderly patients. 1998;29chapter 349-352.
- 6) Campbell's operative orthopaedics , Fracture about proximal humerus inadults , 11 th Ed, Vol – 3;2990 – 2994.
- 7) Lous , Bigiliani,and Charles Rockwood, Frederick A, chapter 9 The Shoulder, vol 1 ed Fractures of proximal humerus WB. Saunders, 1990 ; pages 278 -334.
- 8) Neer CS. Displaced Proximal Humerus fracture; part 1 ; Classificationand evaluation.J Bone Surg 1970;52A; 1077- 1089.
- 9) Neer CS. Displaced Proximal Humerus fracture; part 2; Treatment of three part and four part displacement, J. Bone Surg1970;52 A 1090 – 1103.
- 10) Paavolainen , SlatiP, Bjorkenheim JM,Paukku P. ,Operative Treatment of severe Proximal Hum=erus fractures. Acta Orthop Scand,1983; 54; pages 374-379.
- 11) Siebler G, Kuner EH, Late results following the surgical treatment of proximal humerus fractures in adults, 1985;11[ 3] 119-127.
- 12) Christensen SW and Kristiansen B , Plate fixation of proximal humerus fractures Acta orthop Scand ,1986; 57 chapter 320-32
- 13) Mourdian WH.Displaced Proximal Humeral Fractures Clin orthop 1986;212;209-218.
- 14) Rizwan Shahid et al, proximal humerus fracture treated with locking compression plate.Acta orthop 2008,74 602-608

- 15) Kenneth A Egol, Michael Walshet al ,Early complication of proximal humerus fractures treated with locking plates, J. orthop trauma2008 22;159-164
- 16) Felix Brunner, Christian Bahrs et al , open reduction and internal fixation of proximal humerus fractures using a proximal humeral locking plate. A Prospective multicentre analysis. J Orthop trauma2009;23;163-172.
- 17) Evan L.F ,Fractures of the proximal humerus chp 25, in Textbook of Rockwood and Green's fracturesin adults. Vol1 Lippincott ,Willimas and Wilkins,2001 ;pages 997-1035.
- 18) Zukerman J et al ,Axillary artery injury as complication of proximal humerus fractures.Clin Orthop 1984; 189- 234.