Original Research Article

The Study of Clinical, Functional and Radiological Outcome of Proximal Humerus Fractures Treated With Locking Plates Using UCLA Shoulder Score

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ABSTRACT

Background: Proximal humeral fractures now account for 4 to 5% of all fractures. They are the second most common fractures of upper-extremity. They are also the third most common fracture after fractures around the hip joint and fractures of distal radial, in patients who are older than sixty-five years of age. This frequency increases in relation to Osteoporosis. In younger age group, fractures of proximal humerus occur following high velocity trauma. Majority of proximal humeral fractures which are non-displaced or minimally displaced can be treated with sling immobilization and physical therapy, however approximately 20% of displaced proximal humeral fractures require operative treatment for beneficial outcome. Treatment of unstable, displaced and comminuted fractures of proximal humerus remains a challenge.

Patients and method: After obtaining clearance from hospital ethical board, patients who underwent Locking plate for Proximal Humerus Fracture at a tertiary care center, Mumbai, who have given written and informed consent. Patients fitting into inclusion criteria would form the study group. Sample size was calculated using Post-hoc analysis sample size calculator. Data collected by interviews, observation of clinical and radiological findings and assessment of function done using UCLA shoulder score. Categorical data was analyzed by using Chi-square test and comparison of results done using Paired t test.

Results: The study comprised of 40 patients, with a mean age of 60.97 ± 4.78 years who suffered proximal Humerus fracture and managed by locking compression plate at our centre. There was female predominance in our study. Right side, dominant side was affected more often. Most of the fractures were due to high velocity injury. 2 part fracture were more commonly encountered in our study accounting for 60% of the patients. Majority of patients took 12 weeks for union with mean union time of 11.45 weeks with standard deviation of ± 2.12. Patients were asked to follow up routinely, with post operative follow up ranging from minimum of 20 weeks to 9 months. At final follow up following results obtained according to UCLA shoulder Score, with 67.5% patients had Excellent and Good results.

Conclusions: 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. Also, whereas conventional plating systems depend on compression between the plate under surface and bone for stability, this is not the case for the locking plates. This also allows for a more biological fixation as the underlying periosteum and blood supply

to the fractured regions are much less compressed. The rehabilitation programme plays important role in functional outcome of surgical management of proximal humerus fracture by early mobilization and return to pre operative functional status.

Key Words: Proximal Humerus Fracture; Locking Plate; UCLA, Shoulder Score.

INTRODUCTION

Proximal humeral fractures now account for 4 to 5% of all fractures. [1,2] They are the second most common fractures of upper-extremity. They are also the third most common fracture after fractures around the hip joint and fractures of distal radial, in patients who are older than sixty-five years of age. [3] This frequency increases in relation to Osteoporosis. [4] In younger age group, fractures of proximal humerus occur following high velocity trauma. [2] Majority of proximal humeral fractures which are non-displaced or minimally displaced can be treated with sling immobilization and physical therapy, [5] however approximately 20% of displaced proximal humeral fractures require operative treatment for beneficial outcome. [3] Treatment of unstable, displaced and comminuted fractures of proximal humerus remains a challenge.

Locking plates have been specially designed and preshaped and contoured for proximal humerus. [6] This allows screws to lock to the plate and thus forming a fixed angle construct device. They have been named as "locked internal external fixators". [7] The locked device provides fixed stability and prevents subsidence in the metaphyseal areas. [7] No compression of the plate is required thus reducing the risk of loss of reduction and preservation of blood supply of the bone. Locking the screws into the plate ensures angular as well as axial stability thus reducing the risk of loss of reduction.

PATIENTS AND METHODS

After obtaining clearance from hospital ethical board, patients who underwent Locking plate for proximal humerus fractures at a tertiary care center, Mumbai between April 2016 to May 2017, who have given written and informed consent. Patients with type 2 part, 3 part, 4 part fracture as per Neer's classification, AO type - A (unifocal), type - B (bifocal) and type - C (anatomic neck) proximal humeral fractures in which humeral head preservation is possible, within 10 days of inury, with age more than 25 or equal to 65 years, fit for surgery, willing to participate in study, visit for follow up were included and would form the study group. Patients with head splitting fractures, impression fractures involving > 40 % of the articular cartilage, Undisplaced fractures, Isolated Greater or lesser tuberosity fractures, age above 65 years, unfit for surgery, with associated fracture in the ipsilateral upper limb, compound fractures, pathological fractures, one who not consented for surgery or study, existing neurological deficits and with ongoing chemo or radiotherapy were excluded. Sample size was calculated by using Post-hoc analysis, Percentage decrease and good to excellent results using UCLA shoulder score was taken to calculate the sample size as per Sarukte V [8] et.al it was 72.2% and as per Monteiro G C [9] et.al it was 91.2%. We had to enroll 14 patients with 80% power and 95% significance. But the sample size of 14 was chosen for proposed study and also included consecutive consented total of 40 patients in 14 months. All patients were assessed as per standard pre operative protocol by clinical examination, necessary blood investigations, X rays Shoulder AP, Axillay view and Scapular Y views wherever necessary. All surgeries performed by standard accepted method by a single senior surgeon and standard post operative protocol was followed for all the patients. All patients were assessed clinically, radiologically and functionally by UCLA Shoulder score. Data collected by interviews, observation of clinical and radiological findings and assessment of

function done using UCLA Shoulder score. Categorical data was analyzed by using Chi-square test and comparison of results done using Paired t test.

RESULTS

The study comprised of 40 patients, with a mean age of 60.97± 4.78 years who suffered proximal Humerus fracture (See Fig 1) and managed by locking compression plate (See Fig 2) at our centre. There was female predominance in our study. Right side, dominant side was affected more often.

Most of the fractures were due to high velocity injury. 2 part fracture were more commonly encountered in our study accounting for 60% of the patients. Majority of patients took 12 weeks for union with mean union time of 11.45 weeks (See Fig 3) with standard deviation of ± 2.12. Patients were asked to follow up routinely, with post operative follow up ranging from minimum of 20 weeks to 9 months. At final follow up following results obtained according to UCLA shoulder Score, with 67.5% patients had Excellent and Good results.
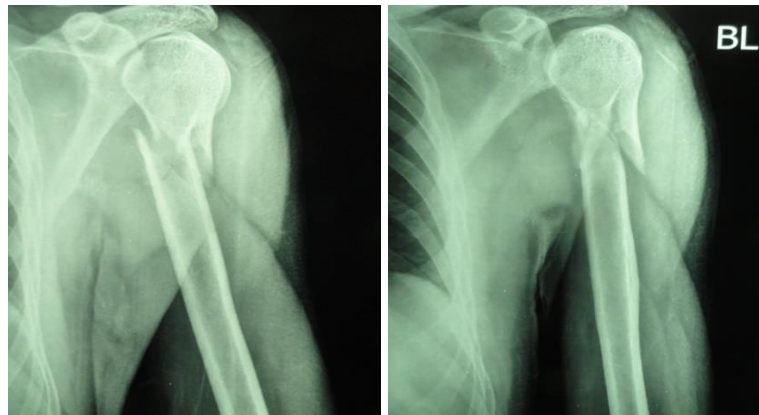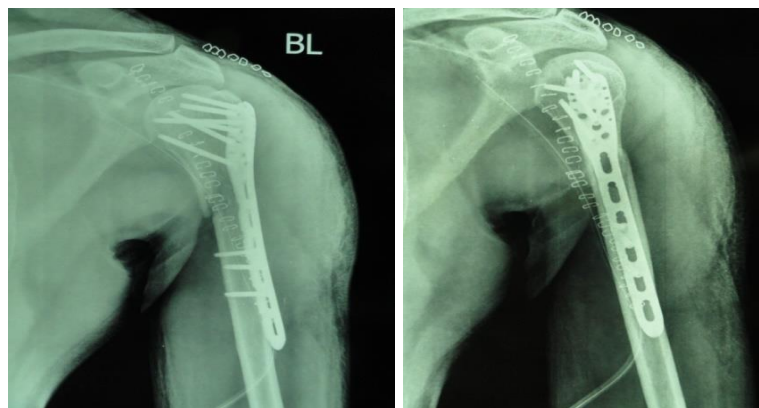

Figure 1: Pre op AP and Lateral view.

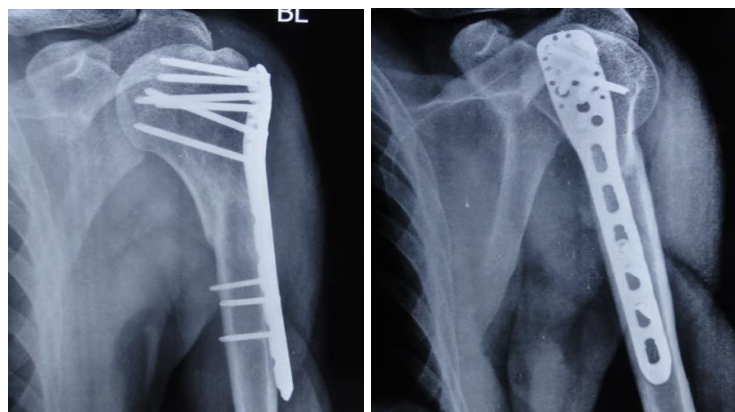**Figure 2 Post op AP and Lateral view.**

Figure 3: At final follow up, 12 months, AP and Lateral view.

DISCUSSION

The incidence of proximal humerus fractures has increased in last few years due to changes in life style and increase in road traffic accidents. The best management in these injuries is still uncertain. Most of the proximal humerus fracture which are un-displaced can be treated conservatively. Even if the injury is thoroughly analyzed and the literature is understood, treatment of displaced fracture or fracture dislocation is difficult. Many studies have shown that the displaced fracture of the proximal humerus have a poor functional prognosis when left untreated because of severe displacement of fragments. [1,2] However, with the aim of getting anatomically accurate reductions, rapid healing and early restoration of function, which is a demand of today's life, open reduction and internal fixation, is the preferred modality of treatment.

In the present study, the mean age of the patients was 60.97±4.78 years. P value of 0.001 on comparing with results of other series, found to be statistically significant. This was similar to Sameer Aggarwal and Kamal Bali [10] et al study. Majority of the patients were females and P value is 0.0001 on comparing with results of other series found to be statistically significant. This was similar to C. Gerber, C. and M. L. Werner [11] et al study. Mean duration of radiological union was 11.45 weeks (See Fig 1,2 and 3) with standard deviation of 2.12 with a P value of 0.01 on comparing with results of other series found statistically significant. It was similar to Leonard M [12] et al study.

In our study, we estimated the patient functional outcomes following Locking compression plates in proximal humerus fracture using UCLA shoulder and we found good and excellent outcome in 67.50%. It was similar to Vijay Sarukte et al. [8] Our study shows complication of varus collapse in 1 patient accounted for 2.5%, which was similar to Felix Brunner [13] et al study. Subacromial impingement in 1 patient accounted for 2.5% which was similar Felix Brunner [13] et al study. Loss of range of motion in 6 patient accounted for 15%. Which was higher compared to all studies existing in the literature.

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.

Also, whereas conventional plating systems depend on compression between the plate under surface and bone for stability, this is not the case for the locking plates. This also allows for a more biological fixation as the underlying periosteum and blood supply to the fractured regions are much less compressed.

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, thus allowing early mobilization and return to pre operative functional status.

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UCLA SHOULDER SCORE [14]

PAIN

1) Present all of the time and unbearable; strong medication

Frequently 1

2) Present all of the time but bearable; strong medication

Occasionally 2

3) None or little at rest, present during light activities

Salicylates frequently 4

4) Present during heavy or particular activities only; salicylates

Occasionally 6

5) Occasional and slight 8

6) None 10

FUNCTION

1) Unable to use limb 1

2) Only light activities possible 2

3) Able to do light housework or most activities of daily living 4

4) Most housework, shopping, and driving possible; able to do hair and dress and undress, including fastening brassiere 6

5) Slight restriction only; able to work above

Shoulder level 8

6) Normal activities 10

ACTIVE FORWARD FLEXION

1) 150 degrees or more 5

2) 120 to 150 degrees 4

3) 90 to 120 degrees 3

4) 45 to 90 degrees 2

5) 30 to 45 degrees 1

6) Less than 30 degrees 0

STRENGTH OF FORWARD FLEXION

(MANUAL MUSCLE-TESTING)

1) Grade 5 (normal) 5

2) Grade 4 (good) 4

3) Grade 3 (fair) 3

4) Grade 2 (poor) 2

5) Grade 1 (muscle contraction) 1

6) Grade 0 (nothing) 0

SATISFACTION OF THE PATIENT

1) Satisfied and better 5

2) Not satisfied and worse 0

INTERPRETATION OF SCORE

Maximum Score = 35 points

Excellent = 34–35 points

Good = 28–33 points

Fair = 21–27 points

Poor = 0–20 points

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