

## Outcome of Distal Humerus Extra Articular Fracture Treated by Pre-Contoured Extra-Articular LCP

Nitin Manral<sup>1</sup>, Dharmender<sup>2</sup>, Mohit<sup>3</sup>, Durgesh Kumar Verma<sup>3</sup>, Naman Kandpal<sup>3</sup>

<sup>1</sup>Senior Resident, Department of Orthopaedics, Safdarjung Hospital, New Delhi.

<sup>2</sup>Senior Resident, Department of Orthopaedics, Batra Hospital and Medical Research Centre, Delhi.

<sup>3</sup>Junior Resident, Department of Orthopaedics, Batra Hospital and Medical Research Centre, Delhi.

Corresponding Author: Dharmender

### ABSTRACT

**Aim:** The aim was to evaluate the outcome of distal humerus extra articular fracture treated by pre-contoured extra-articular LCP (Locking Compression Plate).

**Material and method:** This prospective study was conducted among 30 patients having closed extra-articular distal humeral fractures, treated with extra-articular distal humeral locking compression plate and followed up in the Department of Orthopaedics, Batra Hospital and Medical Research Centre, New Delhi from April 2017 to April 2019. Follow-up was carried out at 2,6,9,12,16 and 20 weeks and then at 2 monthly intervals. Union at the fracture site was defined as bridging callus in a minimum of three cortices on antero-posterior and lateral radiographs combined with a lack of tenderness at the fracture site or un-assisted weight bearing. The functional results were evaluated using Mayo Elbow Performance Score (MEPS) and Visual Analogue Scale for pain. The Mayo Elbow Performance Score (MEPS) assesses motion in terms of flexion and extension.

**Results:** The commonest mode of injury was road traffic accident (18 cases, 60%). The mean time of radiological union was 14.56 (12-15 weeks). 28 (93.33%) of the fractures showed union. 29 (96.67%) out of 30 patients had excellent MEPS score and 1 patient had good score. At the 6 months analysis the mean range of motion was 0.50 – 126°.

**Conclusion:** It can be concluded from the results of the present that the Extra-articular Distal Humeral Locking Compression Plate is a useful treatment option for managing extra-articular distal humerus fractures.

**Keywords:** Distal humeral, extra-articular, Postero-lateral, LCP

### INTRODUCTION

Extra-articular distal fracture of the humerus comprises of about 16 per cent of the fracture of the humerus and 3 per cent of all adult fractures<sup>1</sup>. The way these cracks are handled is problematic. There are two think tanks. One community of surgeons prefers non-operational diagnosis with immobilization of plaster cast and practical bracing, while the other favors operational fixation. Sarmiento et al. reported that distal humerus fracture treated with functional bracing could achieve higher union rates with good functional outcome, with fewer complications adding benefits<sup>2</sup>.

The distal humerus' unusual morphology with a change from round to flat cross-section and narrow medullary channel allows locking of intra-medullary nails a remote choice for organizational management. This is also unable to treat radial nerve injury<sup>3</sup>. The bulk of the findings are in favour of using a rigid compression plate with a weak contoured contour of 4.5 mm. The plate will include eight cortices, both in the proximal fragments and distal. But this method of plate fixing doesn't yield good outcomes for the distal humerus fractures. First, the small size of the distal fragment in humerus dia-metaphyseal fractures does not provide sufficient space to accommodate eight cortices and, second,

the distal end of the plate can affect the olecranon fossa<sup>4</sup>.

Levy published promising results in 2005 by using a changed plate that has a 22 degree angular offset<sup>5</sup>. The tension plate for extra-articular distal humeral locking is built to solve all the above issues. The form is pre-contoured, to be positioned proximally and distally over the lateral supracondylar ridge in the middle of humeral diaphysis<sup>6</sup>. This plate has the benefit that it is easy to obtain a purchase of eight cortices distally and there is no impingement on the olecranon fossa also due to the oblique shape. Furthermore, the operating time is relatively shorter, since only one plate is used. Also due to minimum soft tissue dissection, rehabilitation is faster. Hence the present study was planned to evaluate the outcome of distal humerus extra articular fracture treated by pre-contoured extra-articular LCP (Locking Compression Plate).

## **MATERIAL AND METHOD**

This prospective study was conducted on 30 patients with age ranging from 21 to 62 years with closed extra-articular distal humeral fractures. They were treated with extra-articular distal humeral locking compression plate and followed up in the Department of Orthopaedics, Batra Hospital and Medical Research Centre, New Delhi from April 2017 to April 2019. Open fractures and patients with neuro-vascular injuries were excluded from the study. All cases were operated within 7 days following injury.

We used the 3.5-mm LCP (Locking Compression Plate) extra-articular distal humerus plate. It is an anatomically shaped and angular stable fixation system for extra-articular fractures of the distal humerus. It is a "J" shaped plate. The plate is precontoured to be applied on the posterolateral surface of the distal humerus. It is separate for right and left sides. Proximally, the plate has elongated 3.5mm combination hole system for the humeral shaft. Distally, to avoid the olecranon fossa it curves along the lateral supracondylar ridge of the humerus. There

are five 3.5-mm locking screws distally. The plate is tapered distally to minimize soft tissue irritation. To accommodate larger number of screws distally the screw.

**Surgical Technique:** Tourniquet hasn't been used as it hinders radial nerve contact. All of the operations were carried out by our department's experts. In all cases, the posterolateral approach to paratricepital described by Gerwin M et al was used. The downside of this strategy is that it provides full exposure to the humerus' rear wall. There is no need for procedures such as splitting triceps or additional procedures such as Chevron osteotomy. A simple longitudinal incision was created between the lateral epicondyle of the humerus and the tip of the olecranon 4 cm distal from the elbow joint in the midline of the posterior side of the neck, from 8 cm below the acromion to the olecranon fossa. A radial nerve node labeled the lower lateral brachial cutaneous nerve was identified at the lateral intermuscular septum stage after revealing the triceps and medially representing it. To meet the radial nerve, the nerve was mapped proximally. The septum was incised over the nerve. The lateral and medial triceps heads were subperiosteally raised from lateral to medial orientation. Holding a loop marked and disconnected the radial nerve. Fracture pieces were uncovered, and with the aid of clamps and K tubes, the reduction was temporarily retained. One or two 3.5 mm lag screws were used when required. In all cases, 3.5 mm pre-counted extra distal articular humerus LCP was used. The plate was placed under the artery of the radial nerve and deep brachii, and fastened with locking screws. The lag screw attachment and/or encirclage were used in case of wedge or comminuted fractures. Then post operative sterile dressing was done and arm was kept in an armsling pouch.

**Follow-up:** Passive mobilization of shoulder and elbow was started gently on the 1<sup>st</sup> postoperative day once the patient could tolerate pain. Within the first week active and assisted movements of the arm in the sling were encouraged. Resistive and weight

bearing exercises were allowed only after the radiological progress of bone union. Follow-up was carried out at 2,6,9,12,16 and 20 weeks and then at 2 monthly intervals. Union at the fracture site was defined as bridging callus in a minimum of three cortices on antero-posterior and lateral radiographs combined with a lack of tenderness at the fracture site or un-assisted weight bearing. The functional results were evaluated using Mayo Elbow Performance Score (MEPS) and Visual Analogue Scale for pain. The Mayo Elbow Performance Score (MEPS) assesses motion in terms of flexion and extension.

**Statistical analysis:** Data so collected was tabulated in an excel sheet, under the guidance of statistician. Data was analyzed using IBM SPSS. Statistics Windows, Version 24.0. (Armonk, NY: IBM Corp) for the generation of descriptive and inferential statistics.

## RESULTS

Male outnumbered female by a ratio of 2.75:1 (male-22, female-8). Maximum number of cases was in the age group of 31-40 years (11 cases, 36.67%) with an average age of 40.14 years (table 1).

The commonest mode of injury was road traffic accident (18 cases, 60%), followed by fall (12 cases, 40%). Fracture of the left humerus was slightly more (16 cases, 53.33%) than the right humerus (14 cases, 46.67%) as shown in table 2.

**Table 1: Demographics characteristics of the study population**

Variables	N	%
Gender		
Male	22	73.33
Female	8	26.67
Age Group (in years)		
21-30	6	20
31-40	11	36.67
41-50	9	30
>50	4	13.33

**Table 2: Distribution of injury and fractures**

Variables	N	%
Mode of Injury		
Traffic Accident	18	60
Fall	12	40
Site of Fractures		
Left Humerus	16	53.33
Right Humerus	14	46.67

**Table 3: Post-op characteristics**

Variables	Value
Follow up, Mean (Range)	9.11 (5-11 months)
Radiological Union, Mean (Range)	14.56 (12-15 weeks)
Fracture Union, N (%)	28 (93.33%)
Neuropraxia, N (%)	3 (10%)

**Table 4: MEPS and VAS score among the study subjects at 6 month**

Variables	Value
MEPS Score, Mean (Range)	96.2 (80-100)
Excellent MEPS Score, N (%)	29 (96.67%)
Good MEPS Score, N (%)	1 (3.33%)
Visual Analogue Score, Mean (Range)	0.75 (0-4 cm)
Range of Motion	0.50-126 Degree

The average duration of follow-up was 9.11 months with a range of 5-11 months. The mean time of radiological union was 14.56 (12-15 weeks). 28 (93.33%) of the fractures showed union. Three patients had post-operative neuropraxia (10%), one patient had plate failure and in one patient there was loss of 10 extension. The patients with post-operative neuropraxia recovered during follow up (table 3).

At the end of 6months of follow up the mean Mayo Elbow Performance Score was 96.2, and ranged from 80 to 100. 29 (96.67%) out of 30 patients had excellent MEPS score and 1 patient had good score. The average visual analogue score was 0.75 cm at the end of 6 months and ranged from 0 to 4cm. At the 6 months analysis the mean range of motion was 0.50 – 126<sup>0</sup> (table 4).

## DISCUSSION

Treatment for fracture in the extra-articular distal humerus is a controversial topic. One group of surgeons favors non-operative plaster cast immobilization treatment and functional bracing, while the other favors operational fixation<sup>2</sup>. This study was conducted to examine the short-term results of extra-articular distal humeral fractures fixed with extra-articular distal humeral locking compression plate, particularly early functional results and complications and healing rate. The extra-articular distal humeral locking compression plate has the advantage that it is easy to obtain a purchase of eight cortices distally and there is no impingement on the

olecranon fossa also due to the oblique design. Furthermore, the operating time is relatively shorter, since only one plate is used. Rehabilitation is also swifter because of limited soft tissue dissection<sup>6</sup>.

Most of the fractures involved in our study were the productive age group 30-60 years. The majority of other studies such as Jain et al<sup>7</sup>, and Capo et al<sup>8</sup> showed that the third decade was the most affected, and the third decade was also the most affected in our study.

In our series majority of the patients were males 65%. This could be attributed to our Indian setup where the female population largely work indoor or in agricultural fields and do not travel much. Our findings for sex incidence were comparable to the results in various studies done all over the world. Mostly it was the male sex which was predisposed to high velocity distal humeral fractures due to more active lifestyle.

The average duration of follow-up was 9.11 months with a range of 5-11 months. The mean time of radiological union was 14.56 (12-15 weeks). 28 (93.33%) of the fractures showed union. Three patients had post-operative neuropraxia (10%), one patient had plate failure and in one patient there was loss of 10 extension. The patients with post-operative neuropraxia recovered during follow up. At the end of 6months of follow-up the mean Mayo Elbow Performance Score was 96.2, and ranged from 80 to 100. 29 (96.67%) out of 30 patients had excellent MEPS score and 1 patient had good score. The average visual analogue score was 0.75 cm at the end of 6 months and ranged from 0 to 4cm. At the 6 months analysis the mean range of motion was 0.50 – 126<sup>0</sup>.

The mean Mayo Elbow Performance Score in our study was comparable to the results showed by Jain et al<sup>7</sup> and Butala et al<sup>9</sup>. The mean Visual Analogue Scale was 0.75 cm which is comparable to the results of Scolaro et al<sup>10</sup>. Three patients had post-operative neurapraxia, one patient had plate

failure and in one patient there was loss of 100 extension.

Every research has its own limits. Our analysis was no exception, however. We recognize that the results and observations would have been more accurate and statistically significant with a greater number of cases in this study. It also needs long-term follow-up to see the full functional outcome and long-term complications. In our study this was not possible since the duration of the study was only for twelve months.

## CONCLUSION

It can be concluded from the results of the present that the Extra-articular Distal Humeral Locking Compression Plate is a useful treatment option for managing extra-articular distal humerus fractures. Due to the greater screw hole density of the plate distally and using 3.5-mm screws instead of 4.5 mm allows adequate number of screws to be placed to hold the distal fragment.

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- How to cite this article: Manral N, Dharmender, Mohit et.al. Outcome of distal humerus extra articular fracture treated by pre-contoured extra-articular LCP. International Journal of Research and Review. 2020; 7(1): 566-570.

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