

# Role of bicolunar plating by extensor mechanism sparing paratricipital approach in adult distal humerus trauma

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## Abstract

**Background:** Distal articular humerus fractures are preferably treated by open reduction and internal fixation. To avoid the complications of olecranon osteotomy approach an extensor mechanism sparing paratricipital posterior approach to distal humerus through midline posterior incision is advised. **Aim:** To evaluate the role of bicolunar plating by extensor mechanism sparing paratricipital approach in adult distal humerus trauma. **Material and Methods:** In this prospective study, 30 patients with distal end humerus fracture were treated with open reduction and internal fixation with bicolunar plating by extensor mechanism sparing paratricipital approach were studied for outcome. **Results:** At the end of 6 month follow up as per Mayo Elbow Performance Score, we found excellent result in 26 patients, Good result in 3 patient and Fair result in 1 patient. Using Mayo elbow score we had more than 96% excellent to good results with mean score of 95.46. We did not have any poor results at the end of 6 month follow up. **Conclusion:** Bicolunar Plating by Extensor Mechanism sparing paratricipital approach gives better functional range of motion and therefore better functional outcome and fewer complications.

**Key Word:** Adult distal humerus fracture, bicolunar plating, Mayo Elbow Performance Score, outcome

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## INTRODUCTION

The management of distal humeral fractures has evolved over the years from non-operative treatments, such as the so called bag-of-bones technique to operative treatments.<sup>1</sup> Following the conservative approach chances of incongruous joint, non-union, malunion, and stiff elbow are very high. Therefore, most condemned conservative management in all type of fractures, and advised surgical

management Distal articular humerus fractures are preferably treated by open reduction and internal fixation.<sup>2</sup> To avoid the complications of Olecranon Osteotomy approach an Extensor Mechanism Sparing Paratricipital posterior approach to Distal Humerus through midline posterior incision was suggested by Schildhauer *et al.*<sup>3</sup> The Paratricipital Approach have several advantages, complications of olecranon osteotomy can be avoided, triceps tendon insertion not disrupted, allows early range of motion. This approach also preserves innervations and blood supply of anconeus muscle.<sup>4,5</sup> which provides dynamic postero-lateral stability of elbow. Finally if further exposure require paratricipital approach can be converted to olecranon osteotomy and if further proximal exposure is required for associated fractures shaft humerus, lateral side paratricipital approach can be converted into Gerwin *et al* approach.<sup>6</sup> The disadvantage of paratricipital approach is limited visualization of articular surface of Distal Humerus. Hence, this approach is usually inadequate for fixation of type C3 fractures.

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Several advantages of this approach certainly indicate its use for AO/OTA types A2, A3, B1, B2 and possibly C1 and C2 fractures.<sup>3,7</sup> The purpose of this study was to evaluate the role of bicolumnar plating by extensor mechanism sparing paratricipital approach in adult distal humerus trauma.

## MATERIAL AND METHODS

In this prospective study, 30 patients with distal end humerus fracture were treated with open reduction and internal fixation with bicolumnar plating by extensor mechanism sparing paratricipital approach were studied for outcome. Informed written consent was taken for all patients and approval from Institutional Ethical Committee was obtained prior to the commencement of the study.

### Inclusion Criteria

- Closed fracture of distal humerus
- Mono or polytrauma
- Medically fit for surgery
- Adult patients with age >18years

### Exclusion Criteria

1. Patient <18 years and >75 years of age
2. Open fracture
3. Fracture due to malignancy
4. Medical contraindication to surgery
5. Patients with signs of infection, distal neurovascular deficit

General examination, physical examination of the corresponding shoulder, elbow and wrist joints was carried

out. Investigations were done in the form of elbow X-rays (AP and lateral views; both oblique views if required) and were evaluated. Fractures were classified based on the AO classification. Primary management was done and fracture immobilization in above elbow slab up to mid-arm level and the patient was shifted to ward with elevation of the affected upper limb. Patients included in the study were treated with open reduction and internal fixation with bicolumnar plating by Extensor Mechanism sparing paratricipital approach, and were assessed intra-operatively for blood loss, fracture reduction and articular continuity under the image intensifier (C-arm). Post-operatively, patients were followed up post-operatively at 1 month, 2 months, 6 months after treatment, and were evaluated clinically by Mayo Elbow Performance Score at each follow-up visit, along with X-rays (AP and lateral views). Secondary outcome measures used consisted of Elbow pain, Active and passive ROM (flexion, extension) of both elbow joints using a universal goniometer, Disability in performing daily activity. Complications such as infection, neurovascular compromise, stiffness, subsequent or secondary intervention, arthritis were looked. X-rays (antero-posterior and lateral views) were evaluated on every follow up for the signs of fracture healing and hardware failure or any other complications. Union was defined as the presence of bridging callus or the disappearance of the fracture line on three of four cortices seen on the anteroposterior and lateral radiographs.

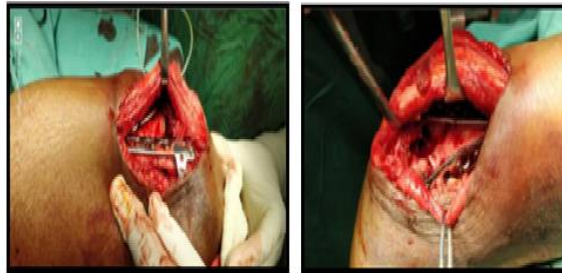


Figure 1: The lateral and medial column plates

## RESULTS

In present study, out of the 30 cases, majority of case i.e. 17 (56.67%) were in the age group of >30 years. The minimum age of 13 years and maximum of 72 years with mean age of 38.77 years. Out of 30 patients 17 patients (56.67 %) were males and 13 patients (43.33 %) were females in our study. The common fracture type (AO classification) we accounted in our study were Type A2 which was in 9 patients (30 %) and Type A3 which was also in 6 patients (20 %), Type B1 in 3 patients (10%), Type B2 in 3 patients (10%), Type B3 in 4 patients (13.33%), Type C1 in 2 patients (6.67%) and Type C2 in 3 patients (10%). By using ANOVA test we found no

significant difference between mean ROM with respect to AO fracture type. In our study we used Mayo elbow score for functional outcome. At the end of 6 month follow up as per Mayo Elbow Performance Score, we found excellent result in 26 patients, Good result in 3 patient and Fair result in 1 patient. Using Mayo elbow score we had more than 96% excellent to good results with mean score of 95.46. We did not have any poor results at the end of 6 month follow up. Since we could achieve good reduction, stable fracture construct, early rehabilitation we were able to get functional range of motion of 94-166 degrees in most of the patients, and thus our functional outcome measures were also good.

**Table 1:** Mayo elbow performance score

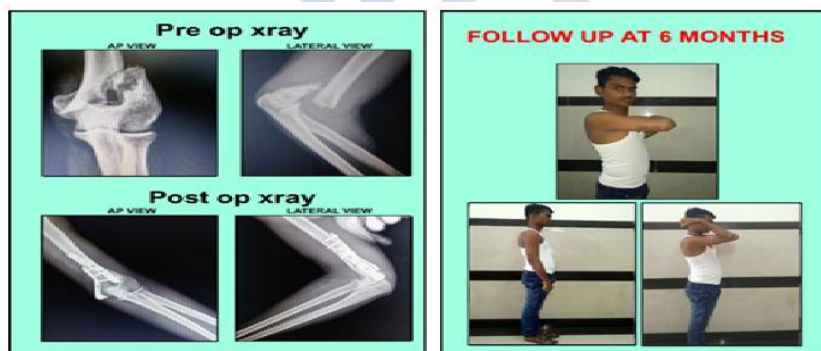
| MEPS Score at | MEPS Score |      |      |      | Total |
|---------------|------------|------|------|------|-------|
|               | Excellent  | Good | Fair | Poor |       |
| POD 1         | 00         | 00   | 07   | 23   | 30    |
| 1 month       | 00         | 17   | 12   | 01   | 30    |
| 2 month       | 07         | 18   | 05   | 00   | 30    |
| 6 month       | 26         | 03   | 01   | 00   | 30    |

In present study, complications occurred in 6 patients (20%). 3 patients had stiffness (elbow ROM <1000) but all had functional range of motion, so no intervention was done. 2 patients had superficial infection which was subsided with oral antibiotics within 14 days. One patient had screw loosening and back out which became palpable under the skin, the screw was removed under short General anesthesia and patient became pain free again. Apart from these no other complications were observed in our study.

**Case 1**



**Case 2**



**DISCUSSION**

Elbow is one of most important joint in the body as it is essential for most of the daily activities. Fracture of the distal humerus directly affects the movement of the elbow and therefore management of distal humerus fracture was more emphasizes to regain normal functional outcome. In our study we used Mayo elbow score for functional outcome. At the end of 6 month follow up as per Mayo Elbow Performance Score, we found excellent result in 26 patients, Good result in 3 patient and Fair result in one patient. Using Mayo elbow score we had more than 96% excellent to good results with mean score of 95.46. We did not have any poor results at the end of 6 month follow up. Since, we could achieve good reduction, stable fracture construct, early rehabilitation we were able to get functional range of motion of 94-166 degrees in most of the patients, and thus our functional outcome measures were also good.

**Table 2:** Functional outcome in studies by other Authors

| Study by                          | Mayo scoring grades |           |          |         | Total cases |
|-----------------------------------|---------------------|-----------|----------|---------|-------------|
|                                   | Excellent           | Good      | Fair     | Poor    |             |
| Present Study                     | 26(86.67%)          | 3(10%)    | 1(3.33%) | -       | 30          |
| Ali <i>et al</i> <sup>8</sup>     | 13(59.2%)           | 6(27.3%)  | 2(9%)    | 1(4.5%) | 22          |
| Patel <i>et al</i> <sup>9</sup>   | 7(17.5%)            | 28(70%)   | 5(12.5%) | -       | 40          |
| Yadav <i>et al</i> <sup>10</sup>  | 17(68%)             | 5(20%)    | 3(12%)   | -       | 25          |
| Mondal <i>et al</i> <sup>11</sup> | 20(66.67%)          | 7(23.33%) | 3(10%)   | -       | 30          |

At the end of 6 month follow up in our study, the mean range of motion of elbow was 141.5 degree (94-166°). In our study we found that there is significant difference between mean ROM at POD 1 to 1 month, 1 month to 2 month and 2 month to 6 month follow up. In the study of Mondal *et al*,<sup>11</sup> the median arc of elbow motion was 115 degrees (range 70 to 140 degrees) with standard deviation of 1.33. Arc of motion >120 degrees seen in 66.66% of patients, arc 90-120 degrees present in 23.33% of cases, arc <90 degrees seen in 10% of cases. In the study of Patel *et al*,<sup>9</sup> 24 (60%) patients could move their elbow with an arc of 50-100 degrees and 4(10%) patients could move their elbow with an arc of less than 50 degrees, 12(30%) patients could move their elbow with an arc of more than 100 degrees. In the study of Yadav *et all*, mean motion arc was 114.92°(range 65°-140°). Stiffness was a common complication of fractures of the distal humerus and was most often caused by inadequate post-operative rehabilitation. Early active motion permitted by this approach, as continuity of the triceps was maintained, could minimized formation of intraarticular adhesions and periarticular fibrosis that may negatively affect the range of elbow motion.

**Limitations of the study:** There were certain limitations of this study as well. A larger sample population needed to be studied to reduce the "type II" or beta error of the study. A better method of randomization should have been adopted. The patients could not be followed up for a longer period.

## CONCLUSION

Extensor Mechanism sparing paratricipital approach is a better alternative for Fracture of Distal Humerus in adults but still Gold Standard for AO type C3 is olecranon osteotomy. Paratricipital approach preserves triceps and extensor mechanism therefore, it helps in early mobilization. Bicolumnar Plating by Extensor Mechanism sparing paratricipital approach gives better functional

range of motion and therefore better functional outcome and fewer complications.

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