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**Original Research Article**

# Study of clinical outcome in intra articular distal humerus fractures treated with dual plating

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## ABSTRACT

**Background:** In adults, distal humerus fractures are uncommon and intra-articular, oftenly involve both the medial and lateral columns. Open reduction and surgical fixation with plating gives good results. The aim of this study is to evaluate clinical outcome in intra articular distal humerus fractures treated with dual plating.
**Methods:** This is a prospective type of study of 20 cases of supra condylar fracture humerus with inter condylar extension treated surgically with dual plating one on the medial boarder and another on posterior surface of lateral column using standard dorsal approach, olecranon osteotomy.
**Results:** The range of age was between 18-52 years, with mean age of 32.55 years. The maximum incidence was between 18 to 40 years i.e. 16 cases (80%). With road traffic accident (RTA) as major cause of injury. Most of the patients were males 14 (70%) with right upper limb was involved in 12 (60%) cases. According to MEP score clinical outcome was excellent in 4(20%) good in 10(50%) fair in 5(25%) and poor in one (10%).
**Conclusions:** Distal humerus fractures are known for their complex nature and technical difficult in surgical management. Proper anatomical articular reconstruction and stable fixation helps in restoring painless and functional elbow.

**Keywords:** Distal humerus, Double plating, Intercondylar fracture, Internal fixation, Olecranon osteotomy

## INTRODUCTION

Distal humerus fractures make up 0.5 to 2% of all fractures, but up to 30% of fractures involving the elbow. In adults, most distal humerus fractures are intra-articular and involve both the medial and lateral columns. The distribution of distal humerus fractures follows a bimodal age distribution. High energy injuries tend to occur among younger patients, while low-energy injures are more common in older patients. Understanding the anatomy of the distal humerus is critical to effective treatment of distal humerus fractures. Divergent medial and lateral columns of bone support the distal humeral articular surface in an inverted-Y configuration. The traditional classification of distal humerus fractures has centered around the terminal ends, or the condyles of the humerus. When discussing intra-articular fractures of the distal humerus, the term "condyle" is converted to "columns" for the sake of classification. Several classification systems for intra-articular both column fractures of the distal humerus have been pro-posed. Riseborough and Radin1 described 4 types of intercondylar "T-type" distal humerus fractures: Type 1 was a non-displaced fracture, Type 2 was displaced but without rotation of the fragments, Type 3 includes fragment rotation, and Type 4 involved severe comminution. Although initially relevant for its descriptive value, these classifications proved inadequate in reliably describing the fracture and directing treatment as these injuries were more frequently being treated operatively. The Orthopaedic Trauma Association's alpha-numeric system, assigned three main types: Type A

(extra-articular), Type B (partial articular), and Type C (complete articular). The OTA system's clinical application is limited and is hindered by poor inter-observer reliability beyond identification of the basic three types. The indication for non-operative treatment of distal humerus fractures is limited and primarily involves patients with very low demand or in poor health. The risk of fracture displacement, mal union, and non-union is high with non-operative treatment. Due to the characteristic intra articular involvement, displacement, and poor control of fracture fragments with closed treatment, we typically treat these fractures operatively. Different types of implants like K wires, 4mm cancellous screws, 3.5mm recon plates and one third tubular plates are used during operative procedure. Pre-contoured column specific locking plates useful in osteoporotic bone fixation. Several variables are important in successful management of these fractures: restoration of articular congruity, secure bony fixation, achievement of bony healing, maintenance of a functional range of motion, and avoidance of complications such as hypertrophic ossification and ulnar neuropathy. The objective of this study was to evaluate the clinical outcome in intra articular distal humerus fractures treated surgically with dual plates.

## METHODS

This is a prospective type of study of 20 cases of supra condylar fracture humerus with inter condylar extension treated surgically with dual plating which were admitted to NRI Medical College and Hospital, Chinakakani, Andhra Pradesh, between November 2013 to October 2016. All the patients of supra condylar fracture distal humerus with age between 18 to 52 years with medical fitness for surgery were included in the study. Patients medically unfit for surgery and those not willing for surgery, Compound fractures of the distal humerus, distal humerus fractures in children were excluded from study. All the patients who attended to casuality and orthopaedic OPD examined to rule out any associated injuries.

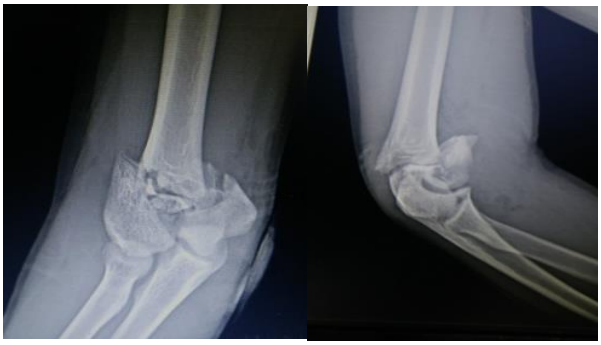

**Figure 1: Pre-operative radiograph**

All the patients subjected for X rays of elbow joint antero posterior and lateral views (Figure 1) to confirm the fracture and above elbow POP slab applied. After surgical profile screening patients were posted for surgery electively.

### *Operative technique*

Brachial block was used in 14 cases and general anesthesia in 6 cases. Pneumatic tourniquet was used in all cases. Scrubbing and draping of injured upper limb done. Tourniquet was inflated and time noted. Elbow was exposed posteriorly through midline incision beginning 8cm proximal to the tip of the olecranon and with slight radial deviation at the olecranon tip and extending distally 6 cm towards fore arm. Skin and subcutaneous tissue dissected to expose the olecranon and triceps tendon. The ulnar nerve is isolated and fascia over the flexor carpi ulnaris is longitudinally split to enhance the nerve mobility, and then gently retracted from its bed with a moist tape. Distal end of the humerus is exposed through transolecranon approach. An intra articular olecranon osteotomy was made in a shallow 'V' or Chevron fashion in the center of the olecranon sulcus that is approximately 2cm from the tip of the olecranon using thin bladed oscillating saw and completed with a thin osteotome. The osteotomized olecranon fragment was elevated proximally along with the triceps tendon. The fracture was exposed fracture fragments were assembled. Reduced condyles were provisionally fixed with K (Kirschner) wire. 4mm cancellous screw was inserted across the reduced condyles. Reduction and temporary stabilization of the medial and lateral columns was done by using crossed K wire. Medial and lateral pillars were reconstructed using pre-contoured 3.5mm reconstruction plate and screws or one third tubular plate along with 3.5 mm screws. To enhance the mechanical strength the plates were placed in 90-90 configuration i.e., one plate on medial boarder and another on posterior surface of lateral column. The stability of the internal fixation was tested by putting the elbow through a range of motion. The olecranon osteotomy was reduced under direct vision and held with reduction clamp and fixed with tension band wiring with obliquely placed K wire. At the completion of the fixation the elbow was again put through a range of motion to test the stability of the internal fixation. The tourniquet was deflated and hemostasis carefully secured. The wound was closed in layers over negative suction drain. Compression bandage was applied and limb immobilized with above elbow plaster of Paris (POP) slab. Post operatively reduction was confirmed by taking antero posterior and lateral views of elbow joint (Figure 2).

Patients were instructed to keep the limb elevated and move their fingers. Suction drain was removed after 48 hours. Intravenous antibiotics given up to 5th post-operative day. Oral antibiotics and analgesics were given to the patient till the time of suture removal. Sutures were removed after the 10th postoperative day depending on wound condition. POP slab continued for two weeks and range of movements started after two weeks.

**Figure 2: Immediate post-operative radiograph**


**Figure 3: 3 months old post-operative radiograph**

Patients were followed post operatively at 6, 10 and 14 weeks thereafter every 3 months up to 1 year (Figure 3).

**Figure 4: Post-operative elbow range of movements**

At follow up detailed clinical examination was done and patients were assessed subjectively for the symptoms like pain, swelling and restriction of joint motion. The functional assessment of the patient was done according to Mayo Elbow Performance (MEP). The MEP score is an elbow centric score that asses the pain, mobility, stability and function of the elbow.

## RESULTS

The present study consists of 20 cases of supracondylar fracture humerus with inter condylar extension treated by open reduction and internal fixation with Dual plating (3.5mm reconstruction plate and 1/3rd tubular plate) from November 2013 to October 2016.

**Table 1: Age incidence**

| Age (year) | No. of patients | Percentage |
|---|---|---|
| 18-30 | 10 | 50% |
| 30-40 | 6 | 30% |
| 40-52 | 4 | 20% |

In age distribution, 10 (50%) patients were between 18-30 years, 6 (30%) patients were between 31-40 years, 4 (20%) patients were between 41-52 years (Table 1). The range of age was between 18-52 years, with mean age of 32.55 years. The maximum incidence was between 18 to 40 years i.e. 16 cases (80%).

**Table 2: Sex incidence**

| Sex | No. of patients | Percentage |
|---|---|---|
| Male | 14 | 70% |
| Female | 6 | 30% |

In sex distribution, there were 14 (70%) males and 6 (30%) females (Table 2).

**Table 3: Side incidence**

| Side | No. of patients | Percentage |
|---|---|---|
| Right | 12 | 60% |
| Left | 8 | 40% |

Right upper limb was involved in 12 (60%) cases and left upper limb in 8 (40%) cases (Table 3).

**Table 4: Mode of injury**

| Mode of injury | No. of patients | Percentage |
|---|---|---|
| RTA | 14 | 70% |
| Slip and Fall | 6 | 30% |

In mode of injury, 14 cases (70%) were due to road traffic accident (RTA) and 6 cases (30%) were due to direct fall injury (Table 4). All the cases were operated electively on regular operation theatre days. In the post - operative period one patient developed superficial wound infection in which suture removal was delayed. Hard ware protrusion at tension band wiring site in two patients. Heterotropic ossification with elbow stiffness occurred in one patient. Delayed union at osteotomy site identified in one patient. In our study, radiological union was seen at 4 months to 7 months. Average duration radiological union was 16.4 weeks.

**Table 5: Complications**

| Complications | No. of patients | Percentage |
|---|---|---|
| Hard ware protrusion | 2 | 10% |
| Heterortropic ossification with stiffness | 1 | 5 % |
| Delayed union at ulnar osteotomy site | 1 | 5 % |
| Delayed wound healing | 1 | 5 % |

**Table 6: MEP Score**

| Group | MEP Score | No. of cases |
|---|---|---|
| Excellent | 91-100 | 4 |
| Good | 75-90 | 10 |
| Fair | 60-74 | 5 |
| Poor | <60 | 1 |

According to MEP score clinical outcome was excellent in 4 (20%) good in 10 (50%) fair in 5 (25%) and poor in one (10%) (Table 6). Average MEP score was 84.

## DISCUSSION

In adults, most of distal humerus fractures are intra-articular and involve both the medial and lateral columns. Due to the characteristic intra articular involvement, displacement, and poor control of fracture fragments with closed treatment, we typically treat these fractures operatively. The goal of treatment is restoring painless and functional elbow in a fractured distal humerus which requires anatomical reconstruction and stable fixation. Though parallel plating proposed by O'Driscoll SW is more biomechanically stable than perpendicular plating technique, we did perpendicular plating technique because it requires less soft tissue dissection and time duration, technically less demanding and stability achieved by this technique is enough for bone union and early rehabilitation.[2] In our study, we treated all 20 cases with open reduction and internal fixation with dual plating in 90-90 configuration i.e., one plate on medial boarder and another on posterior surface of lateral column.

In our study, there were 14 (70%) males and 6 (30%) females comparable to study by Henley et al and in Wang et al studies showed 60% males and 40% females.[3,4] In our study 14 cases (70%) were due to road traffic accident (RTA) and 6 cases (30%) were due to direct fall injury comparable to Henley et al study showed 61% cases due to RTA and 39% cases due to direct injury.[3] Gabel et al reported 100% cases due to direct injury.[5] In our study incidence of right and left upper limb involvement comparable to other studies by Jupiter et al.[6] Average MEP score was 84, similar to study done by Atalar AC et al evaluating the functional outcome of complex distal humerus fractures in 21patients the mean MEP score to be 86.1.[7]

The complications noted in our study are hard ware protrusion at tension band wiring site in two patients and we managed with early removal of protruding K wires from TBW site after union at osteotomy site. Hypertrophic ossification with elbow stiffness occurred in one patient, managed with regular physiotherapy. Delayed union at osteotomy site identified in one patient.

## CONCLUSION

Distal humerus fractures known for their complex nature and technical difficult in surgical management. Proper anatomical articular reconstruction, stable fixation and early post-operative physiotherapy help in restoring painless and functional elbow.

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