



CLINICAL OUTCOME OF INTRA-ARTICULAR DISTAL HUMERUS FRACTURE MANAGED WITH PRECONTOURED LOCKING PLATE

Orthopaedics

Dr Anand Kumar Singh

Senior Resident, Department of Orthopaedics, AIIMS Raipur, Chhattisgarh-492099

Dr Barkha Rani*

Assistant Professor, Department of Physiology, Govt. Medical College, Nagpur.
*Corresponding Author

ABSTRACT

BACKGROUND: The aim of the study was to study the clinical outcome of intra-articular distal humerus fracture managed with precontoured locking plate.

METHODS: A prospective study included 25 consented patients with intra-articular distal humeral fractures who underwent osteosynthesis by precontoured locking plate using posterior approach with olecranon osteotomy in a tertiary care hospital.

RESULTS: Present study comprises of total 25 patients, with age ranging from 18 to 70 years with mean age 50.2 ± 13.25 which includes 11 male and 14 female. Right upper limb was involved in 11 (44%) cases and Left upper limb in 14 (56%) cases. Mean final MEPS of 82.2 ± 11.99 was recorded among the study group.

CONCLUSIONS: Open reduction and internal fixation with an anatomically precontoured locking plate is an effective method of treatment for AO type C distal humerus fractures.

KEYWORDS

Distal humerus, Intra-articular fracture, Precontoured locking plate, Olecranon osteotomy

INTRODUCTION:

Intra-articular fractures of the distal humerus constitute 0.5%–7% of all fractures and 30% of elbow fractures^[1]. Distal humeral fracture occurs in the younger age-groups secondary to high-energy trauma and in elderly women as a result of relatively low-energy trauma¹. The chances of functional impairment and deformity are very high following conservative treatment of such distal intra-articular fractures of the humerus, and stable internal fixation may be difficult to achieve due to the complexity of the fracture and associated osteoporosis^[2]. Good anatomical alignment, stabilization, and early mobilization can provide satisfactory results. Severe comminution, bone loss and osteopenia predispose to unsatisfactory results because of inadequate fixation of the fracture.^[2,3]

The complex anatomy of the elbow joint, the adjacent neurovascular architecture and the sparse soft tissue envelop combine to make these fractures difficult to treat^[1,2]

Fractures of distal end of humerus continue to be challenging problem for today's surgeons despite advances in technique and implants.

Prior to the 1970's great emphasis was laid on conservative treatment of these fractures either by the use of plaster or by traction on the olecranon, which led to considerable stiffness and poor functional results.^[4,5]

Restoration of painless and satisfactory elbow function after a fracture of the distal humerus requires anatomic reconstruction of the articular surfaces, restitution of the overall geometry of the distal humerus and stable internal fixation of the fractured fragments to allow early and full rehabilitation.^[6,7]

However with advances in implants and surgical techniques, many surgeons have moved towards surgical reconstruction of these complex fractures⁴. Acceptable results have been reported in a majority of patients treated by Open Reduction and Internal Fixation.^[3,8]

The lack of stability and the complex anatomy of the distal humerus led to the development of anatomically preshaped implants that provide good clinical results, although complication rates remained considerably high.^[9,10]

The introduction of angular-stable implants revolutionized the operative treatment of many fractures at different anatomic sites, particularly in situations with multifragmentary and osteopenic fractures. Using these implants, the stability of the osteosynthesis no longer relies on the friction between the underlying bone and the plate resulting from screw torque but rather uses a single-beam construct that converts shear stress into compressive stress.^[11,12]

Angular-stable reconstruction plate osteosynthesis at the distal humerus was first described by Korner et al. in 2003,^[13] and some biomechanical studies were able to demonstrate the advantages of these implants.^[14,15]

Recently, anatomically precontoured and angular-stable implants with extensive distal screw options for double plate osteosynthesis such as the locking compression plate (LCP) distal humerus plate system were introduced, promising an enhanced stability in complex fractures and an ease in application. Biomechanical studies have proven the advantages of these implants, particularly in reduced bone quality.^[15,16]

Recent studies have shown that Open reduction and internal fixation with a precontoured plating system is an effective treatment method for distal humerus fractures.

The purpose of this study was to evaluate the functional results and complications of AO type C fractures of distal humerus treated with anatomically precontoured Locking plate.

MATERIALS AND METHODS:

The study was conducted in a tertiary care hospital in the department of Orthopaedics. Study comprises of total 25 patients. It includes the patients attending the OPD, Emergency or admitted as Indoor patients in our hospital.

INCLUSION CRITERIA:

- Age group : Skeletally matured patients
- Gender : Male and female patients.
- AO/OTA type C distal humerus fractures
- Patients who are willing to participate in the study
- Patients who are fit for surgery

EXCLUSION CRITERIA:

- Skeletally immature patients
- Open fractures
- Undisplaced fractures
- Grossly comminuted fractures (bag of bones)
- Fractures associated with neurovascular deficits
- Patients not willing for surgery
- Pathological fractures

The study is a two year Prospective study. Data was collected in the form of interview/ history taking from patients for knowing their age, mode of trauma. Fractures were classified on the basis of AO classification.

For Radiological evaluation, X-rays were taken at 1st post-operative day and at each follow up day. For Functional outcome, data was recorded and range of motion of the elbow joint was measured

clinically using goniometer. Observations were recorded, evaluated and scored by the Mayo elbow performance Scoring system.

Each patient was observed for any of the associated complications. Patients were followed up at 1st post-operative day, 6 weeks, 3 months and 6 months after the surgery.

Surgical technique:

Under general anaesthesia all the patients were put in lateral decubitus position with arm supported and forearm hanging. Surgery was done under tourniquet control. A transolecranon (Olecranon osteotomy) approach was used.

Reduction and fixation of the condyles was done in the following ways –
 - Condyles were reduced and held with a bone holding clamp -
 - Reduced condyle was provisionally fixed with Kirschner wire. - AO cannulated cancellous screw of 4mm was inserted across the reduced condyles.

Reduction and fixation of the condyles to metaphysis was done in the following ways: Reduction and temporary stabilization of the medial and lateral columns was done by using crossed Kirschner wire, Medial and lateral pillars were reconstructed using anatomically Precontoured 3.5mm distal humerus locking plates and screws.

RESULTS:

The final results were evaluated using the Mayo elbow performance score^[9,17,18]. This system is based on 100 units.

Mayo elbow performance score:

The Mayo elbow performance index (MEPS) is one of the most commonly used physician-based elbow rating systems. This score consists of four parts^[9,17,18].

1. Pain (with a maximum score of 45 points)
2. Range of motion (20 points)
3. Stability (10 points)
4. The ability to perform five functional tasks (25 points).

Present study comprises of total 25 patients, with age ranging from 18 to 70 years with mean age 50.2 ± 13.25 which includes 11 male and 14 female. Right upper limb was involved in 11 (44%) cases and Left upper limb in 14 (56%) cases.

Table: 1 Radiological union achieved shown among the patients

Duration	No. of patients	Percentage
≤ 12 week	15	60%
>12 to 15 week	8	32%
≥ 15 week	2	8%

Radiological union achieved (in weeks) – (Mean $\pm$ s.d) = 12.42 $\pm$ 1.30 weeks

In our study, most of the patients achieved radiological union around 12-13 weeks after fracture fixation.

Graph 01- Showing Radiological union

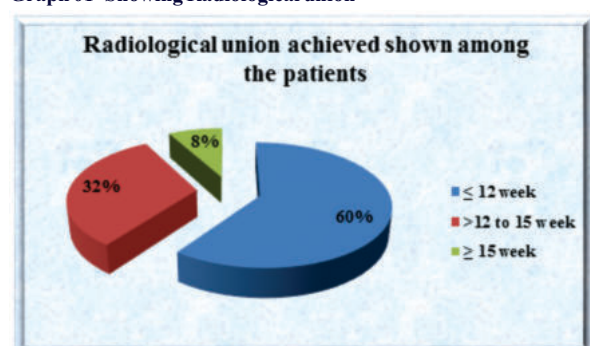


Table no.: 2 Final results shown among the patients

Result	No. of patients	Percentage
Excellent	8	32%
Good	12	48%
Fair	4	16%
Poor	1	4%

Graph 2- Showing final results

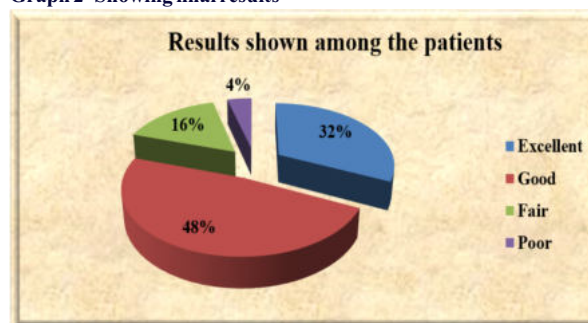
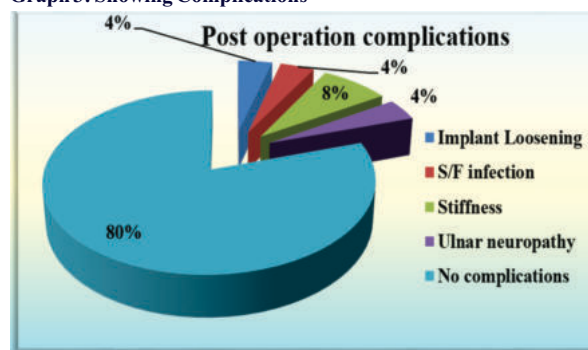


Table no.: 3 Post operation complications shown among the patients

Complications	No. of patients	Percentage
Implant Loosening	1	4%
S/F infection	1	4%
Stiffness	2	8%
Ulnar neuropathy	1	4%
No complications	20	80%

Graph 3: Showing Complications



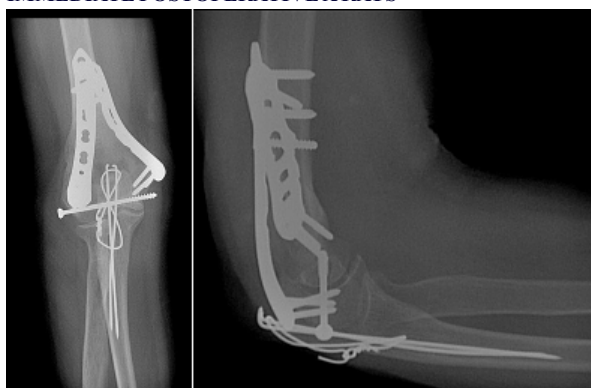
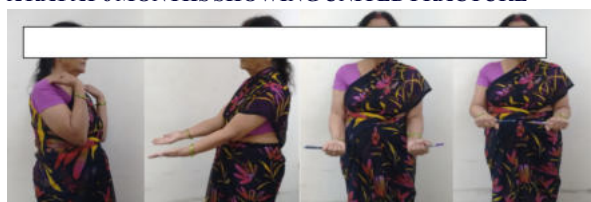
In our study none of the cases developed intraoperative complications. Postoperative complications:

- Superficial infection: One patient (Patient 20) developed superficial infection, which was controlled with appropriate antibiotics after culture and sensitivity report.
- Ulnar neuropathy: One patient (Patient 5) developed ulnar neuropathy which recovered gradually over 8-10 weeks.
- Elbow Stiffness: Two patients (Patient 6 and 25) developed elbow stiffness for which aggressive physiotherapy was performed.
- Implant loosening: One patient had intercondylar screw back out which was removed when fracture union was visible.

EXAMPLE:

51 years old female patient having distal humerus fracture.



Photo 1: X Ray Right Elbow-Ap And Lateral View**Immediate Postoperative X Rays****IMMEDIATE POSTOPERATIVE X RAYS****X RAY AT 6 MONTHS SHOWING UNITED FRACTURE****RANGE OF MOTION AT 6 MONTHS- FLEXION, EXTENSION, SUPINATION AND PRONATION****PHOTO 9: SHOWING HEALED SCAR MARK****DISCUSSION:**

Management of fractures of the distal humerus, especially those which are intra-articular, is always difficult for surgeon to manage with good functional outcome. Many clinical and experimental studies have been performed in order to find an effective method of fixation for these fractures which finally lead to a stable, painless and functional elbow.

In this study, 25 cases of intercondylar fractures of distal humerus were treated with anatomically precontoured distal humerus locking compression plates.

8 patient have AO type C1 # with a mean MEPS of 88.13, 12 patients have AO type C2 # with a mean MEPS of 81.67 and 5 patients have AO type C3 # with a mean MEPS of 74.

All the patients were operated via transolecranon approach and fracture was fixed with bicolumnar precontoured distal humerus locking plates.

Fracture union was achieved in all the patients with a mean duration of 12.42 weeks.

All the cases were followed up as per protocol and findings were recorded. Results were analysed according to Mayo Elbow Performance scoring system^[9,18]. Excellent results were achieved in 8(32%), good results in 12 (48%), fair results in 4 (16%) and poor result in 1(4%) of the cases.

A mean arc of motion of 1080 ± 12.540 , mean supination of 80.40 ± 5.390 and mean pronation of 77.60 ± 8.050 were reported at final follow up.

Mean final MEPS of 82.2 ± 11.99 was recorded among the study group. There were statistically no significant differences between the two age groups with respect to final MEPS ($p > 0.05$).

Few complications like; elbow stiffness, ulnar nerve neuropathy, superficial infection and screws back out were reported among the patients. None of the patient had delayed or non union of the fracture site or of the olecranon osteotomy site. Despite these complications the overall functional result was good; suggesting that open reduction and internal fixation with precontoured distal humerus locking plate is an effective treatment modality in these fractures.

CONCLUSION:

Open reduction and internal fixation with an anatomically precontoured locking plate is an effective method of treatment for AO type C distal humerus fractures. Stable fixation allows early, active and aggressive postoperative mobilisation. This implant yields excellent or good results in majority of patients, even in C3 fractures because of improved biomechanics. Trans-olecranon approach provides adequate visualisation of articular surface and is an extensile approach. During open reduction internal fixation, articular reduction should be given primary importance. Vigorous, early, active rehabilitation is a must for good results.

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