

Study of the Functional Outcome of Surgical Management of Intercondylar Fracture of Distal Humerus in Adults

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Abstract

Background: Among fractures of the lower end of the humerus, intercondylar fractures of the distal humerus are the most challenging and rare injuries. Fractures of the distal humerus with intra-articular extension are complicated injuries that need to be fixed with care. The idea entails anatomical reduction, complete fixation, and flawless extra-osseous implant stabilization. A significant impact of the early progressive rehabilitative exercise has been seen in the functional outcome. The purpose of this study is to assess the functional outcome of open reduction and internal fixation surgery for adults with distal humeral intercondylar fractures using pre-contoured locking compression plates using a trans-olecranon approach.

Methods: In this prospective study, 20 adult patients who fulfilled the inclusion criteria and were admitted to Usha Hospital, Juran Chhapra, Muzaffarpur, Bihar, between March 2023 to March 2025, had an intercondylar fracture of the distal humerus.

Results: In this study of 20 cases, there were 10 males and 10 females with average of 50.8 years. 12 cases were due to RTA and 8 due to direct fall. There was a predominance of left side (13). Out of 20 Cases, 3 (15%) were of B1 type, 1 (5%) were of type B2, 6 (30%) were of C1, 5 (25%) of C2 and 5 (25%) were of type of C3. Excellent results in 12 (60%), good in 4 (20%), fair in 3 (15%) and poor results in 1 (5%) case, according to MEPS.

Conclusion: Anatomically pre-shaped distal humerus locking plate systems are helpful for early postoperative rehabilitation and stable fixation of complicated distal articular fractures. Good range of motion and a good healing rate are demonstrated by clinical and radiographic outcomes.

Keywords: Intercondylar, ORIF, Pre-contoured LCP, Trans-Olecranon, Distal Humerus.

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Introduction

The elbow is involved in around 7% of all adult fractures, with the distal humerus responsible for about one-third of these cases. Therefore, distal humerus fractures contribute to about 2% of all fractures. Fractures of the distal humerus continue to be one of the most difficult injuries to treat. They have a complicated architecture with few internal fixing options, are frequently multifragmented, and occur in osteopenia bone.

Elbow pain, stiffness, and weakness are frequently related to treatment outcomes. Since the elbow joint enables the hand to do daily tasks, such as eating and personal hygiene, it should be painless, stable, and mobile. Thus, a methodical approach is necessary to begin with a severely traumatized distal humerus and end with a stable, mobile, and pain-free joint. Determining the operating indications, controlling the soft tissues, choosing a

surgical technique, achieving an anatomic articular reduction, and designing a fixation construct that is sufficiently robust to withstand early range of motion all require careful consideration [1]. Inadequate fixation, cast immobilization, and devascularizing exposure were all used in conjunction with surgical treatment in the early and mid-1900s. Elbow discomfort and delayed recovery were common outcomes. In this regard, non-operative therapies were devised as therapy alternatives, such as the so-called "bag-of-bones technique," which involves immobilization for a brief period of time in a collar and cuff or a cast, followed by mobilization as tolerated [2].

Depending upon the frequency of comminution and displacement, open reduction and internal fixation with 1/3 tubular plate, pre-contoured LCP, reconstruction plate, Kirschner wire and double

tension band wiring can be done individually or in combination.

Until the Arbeit gemeinschaft für osteosynthesefragen/ association for the study of internal fixation (AO/ASIF) and others developed better techniques for the fixation of small, articular fractures, the outcome of surgically fixing distal humeral fractures remained uncertain. Fixation using two plates at a 90-degree angle to each other has become the benchmark by which all other treatments are evaluated based on the findings of the more current series. These fractures are still difficult to treat, and surgeons with expertise and experience in skeletal trauma involving the upper extremities are the ideal people to handle them, even with the confidence in operational fixation that supports this change in treatment preference. Even the most experienced surgeons, however, may be intimidated with certain fracture characteristics, including poor bone quality, fractures involving the distal most aspects of the bone columns and fragmentation of articular surface in sagittal and coronal planes. Some have even suggested total elbow arthroplasty as an alternative to operative fixation.

It is necessary to be ready to perform a total elbow arthroplasty if a complex fracture cannot be fixed internally, but it is important to consider the functional limitations and potential failure of this procedure. When a patient with a distal humeral fracture is healthy and active, a surgeon should try their best to preserve and rebuild the distal humerus [3].

The degree of restoration of normal anatomic relationships is correlated with the quality of elbow function after intercondylar fractures. Due to the absence of compensatory motions in nearby joints, residual elbow stiffness is still the most severe consequence of intercondylar fractures and is not well tolerated.

Material and Methods

In this prospective study, 20 adult patients were admitted at Usha Hospital, Juran Chhapra, Muzaffarpur, Bihar, between March 2023 to March 2025, had an intercondylar fracture of the distal humerus.

Patients with intercondylar fracture of the distal end of the humerus who has given their consent for the procedure, age about 18 years and medically fit for surgery were included in this study. Patient's compound fractures of the distal humerus, old fractures of the distal humerus, not willing for surgery and medically unfit for surgery were excluded in this study. The patient was taken for surgery after routine investigations and after obtaining fitness towards surgery from Physician and informed consent. All the patients were put in

lateral position with arm supported and forearm hanging. Pneumatic tourniquet/ Esmarch tourniquet is recommended. Painting and draping of the part was done. The distal end of the humerus was approached using trans-olecranon approach. Elbow was exposed posteriorly through an incision beginning approximately 5cm distal to the tip of the olecranon and extending proximally midline of the arm approximately 8cm above the tip of the olecranon. The skin and subcutaneous tissue were reflected to either side carefully to expose the olecranon and triceps tendon. The ulnar nerve is isolated and fascia over the flexor carpi ulnar is longitudinally split over 5cm to enhance the nerve mobility. Then gently retracted from its bed with a moist tape. Prior to performing the olecranon osteotomy, the proximal ulna was predrilled with 3.2mm drill bit and then partially tapped for a 6.5mm AO cancellous bone screw. 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. The osteotomized olecranon fragment was elevated proximally leaving a margin of the triceps tendon on either side to suture upon completion of the surgery. The fracture hematoma was cautiously removed. 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. Medial and lateral pillars were reconstructed using pre-contoured bi columnar LCP applied at posterolateral and medial aspect of distal humerus. 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. 6.5mm AO cancellous screw was introduced from the tip of the olecranon. Periosteum was stripped from the shaft of the ulna distal to the osteotomy site and transverse hole was drilled approximately 3-5cm distal to osteotomy site. A No.16 stainless steel malleable wire passed through the thin transverse hole and crossed over the posterior surface of the olecranon in a figure of eight manner and then passed behind the triceps tendon and around the neck of the screw and tightened. At the completion of the fixation the elbow was again put through a range of motion to test the security of the internal fixation. The tourniquet was let down and haemostasis carefully secured and over a large suction drain the wound was closed in layers. Pressure bandage was applied and limb immobilized with above elbow plaster of Paris slab.

Results

The range of age was between 22-70 years, with mean age of 50.8 years. The maximum incidence was in the fourth and fifth decade. There were 10

(50%) females and 10 (50%) males with a Male: Female ratio of 1:1. Right upper limb was involved in 7 (35%) cases and Left upper limb in 13 (65%) cases. In this series 8 cases (40%) were due to direct fall injury, 12 cases (60%) were due to road traffic accident. There were 3 (15%) cases of type B1 fractures, 1 (5%) cases of type B2 fractures, 6 (30%) cases of type C1 fractures, 5 (25%) cases of C2 fractures and 5 (25%) cases of type C3 fractures and no cases of type A1, A2, A3 & B3 fractures. 1 case had associated distal end radius fracture of the same side that was treated with Closed Reduction and Below Elbow Cast. 1 patient had associated Ulna fracture of same side that was treated ORIF with DCP. 1 case of elbow dislocation was reduced in emergency OT. One case with radial nerve palsy which was recovered with conservative treatment.

One case of chest trauma was managed conservatively with rib binder. 2 patient had an associated head injury which was treated conservatively after CT Brain was done. There were no cases of intraoperative complications and 2 patient had superficial infection, 1 patient had non-union, 1 had implant failure and 1 had ulnar neuropathy. In the present study there were 12 cases (60%) had excellent result, 4 (20%) had a good result, 3 (15%) had fair and 1(5%) had a poor result as per Mayo Elbow Performance scoring system. In the present study there were no type a fractures, 4 cases were of type B out of which 3 had excellent and 1 had a good result. There were 16 cases of type C fractures, out of which 9 had excellent, 3 had well and 3 had fair results and 1 had a poor result.

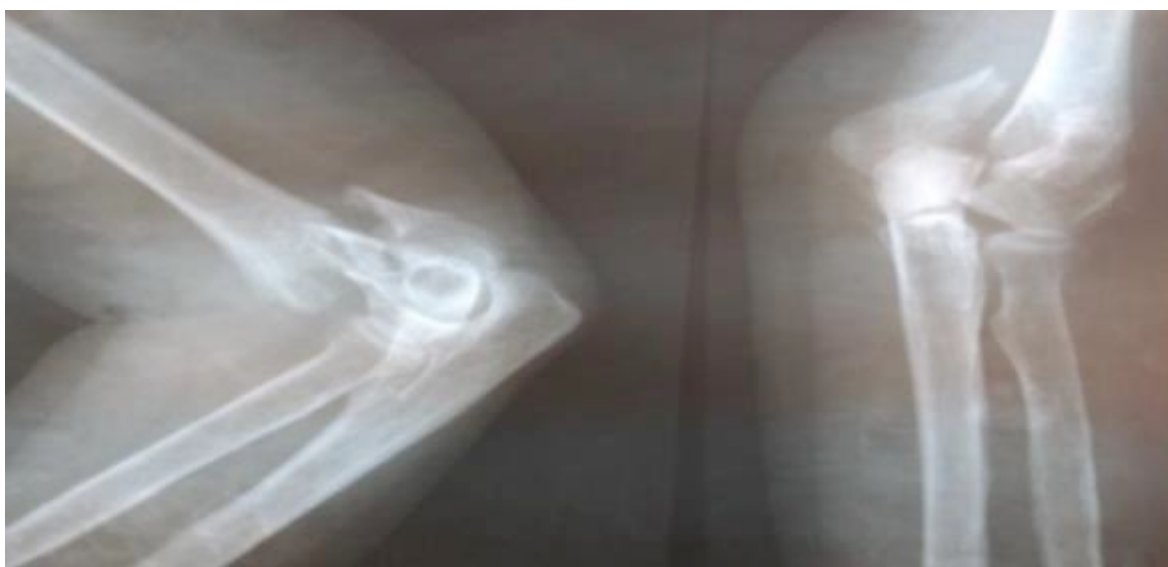


Figure 1: Pre-operative x ray

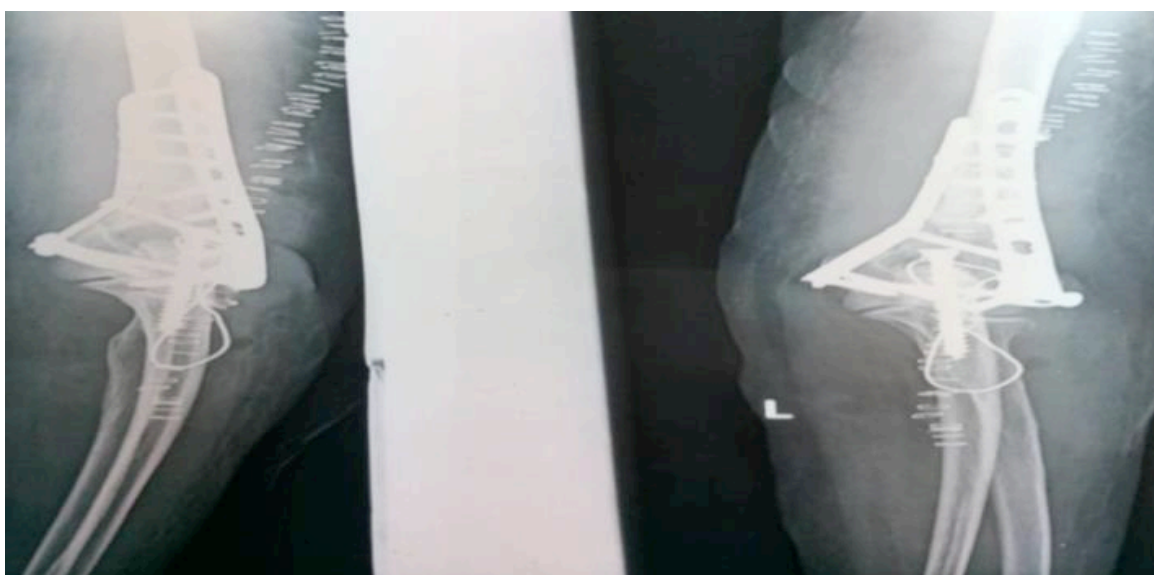


Figure 2: Immediate post op x-rays



Figure 3: Check x ray after 6 month



Figure 4: Check x ray after 12 month

Discussion

Due to the form of the injury and the fact that most surgeons have little expertise with them, treating intercondylar fractures of the distal humerus can be challenging [4,5]. Since the majority of distal humeral intra-articular fractures are frequently displaced, anatomic reduction, stable fixation, and early elbow mobility are necessary for effective therapy [6,7]. Prolonged immobilization inevitably worsens the functional outcome following surgical treatment because the elbow joint does not tolerate immobilization well. Even though they are rare, distal humerus fractures present the most obstacle to absolute anatomical reduction and surgical fixation. Having surgical experience is crucial. With an astute surgical strategy and prompt

rehabilitation, good functional results are anticipated. To restore maximum joint function, elbow joint reconstruction and articular surface restoration are required. Stabilizing fracture fragments using plate osteosynthesis based on joint congruity restoration is a safe way to accomplish this.

The medial and lateral columns were rebuilt in this study using locking compression plates because they offer a fixed plate screw build with several screw alternatives for simple application in distal complicated fractures, hence giving angular stability. Whether parallel or orthogonal plating is better for fixing is up for debate [8]. We chose orthogonal plating because, despite the fact that it necessitates more thorough soft tissue dissection, it

offers superior mechanical stability. In this study, fractures were commoner in the fourth and fifth decade with average age being 50.8 years (22-70) compared with the studies conducted by Muhammad Noman Iqbal et al. [9] i.e. 37 years, Abhilekh Mishra et al. [10] i.e. 38 years, Nasir Muzaffar et al. [11] i.e. 39.68 years, Imran Mangi et al. [11] i.e. 35 years.

In this study had a male with 50% and 50% female patient, compared with other studies as Muhammad Noman Iqbal et al. [9] i.e. 56% male and 44% female, 62.96% male and 37.03% female, Abhilekh Mishra et al. [10] i.e. 68.18% male and 31.81% female, Nasir Muzaffar et al. [11] i.e. 60% male and 40% female, Imran Mangi et al. [12] i.e. 52% male and 48% female.

This study accounted about 35% incidence of fractures on right side and 65% of the fracture on left side, compared with other studies like Muhammad Noman Iqbal et al. [9] i.e. 68% right and 32% left, 40.74% right and 59.25% left, Abhilekh Mishra et al. [10] i.e. 40% right and 60% left, Nasir Muzaffar et al. [11] i.e. 24% right and 76% left, Imran Mangi et al. [12] i.e. 52% right and 48% left.

In this study, 40% of the cases were due to direct fall and 60% of cases had road traffic accident compared to Muhammad Noman Iqbal et al. [9] i.e. 16% of direct fall and 84% of RTA, 59.25% of direct fall and 40.74% of RTA, Abhilekh Mishra et al. [10] i.e. 93.33% of direct fall and 6.67% of RTA, Nasir Muzaffar et al. [11] i.e. 44% of direct fall and 56% of RTA.

In this study, functional outcome was based upon Mayo Elbow Performance Score. It was excellent in 12 patients (60%), good in 4 patients (20%), fair in 3 patients (10%), and poor in 1 patient (5%). Our study is compared with other like Singh v et al. [10] i.e. Excellent (4 patients), Good (13 patients), Abhilekh Mishra et al. [10] i.e. Excellent (15 patients), Good (3 patients), Nasir Muzaffar et al. [11] i.e. 22 patient in excellent and good.

In this study, there were no intra-operative complication. There were two cases of superficial infection of surgical site, which resolved with appropriate antibiotics and did not require debridement. One case of ulnar neuropathy was seen which resolved spontaneously in 8 weeks after conservative treatment.

One patient had a non-union, in which bone grafting was done. One patient had Implant failure in which there was back-out of 6.5mm AO cannulated screw in TBW of olecranon Osteotomy. Our study was compared with studies conducted by Muhammad Noman Iqbal et al. [9] i.e. 1 patient (4%) Ulnar neuropathy, Abhilekh Mishra et al. [10] i.e. 1 patient (5%) with superficial infection,

Nasir Muzaffar et al. [11] i.e. 4(16%) superficial infection, 1(4%) deep infection, 1(4%) ulnar neuropathy, 2(8%) implant failure, 2(8%) metal prominence & Imran Mangi et al. [12] i.e. 1(4%) ulnar neuropathy and 1(4%) stiffness, 3(12%) metal prominence.

Conclusion

Careful assessment, fracture type classification, and preoperative planning are necessary for intercondylar fractures. The earliest possible open reduction internal fixation should be performed. Delay in open reduction internal fixation with extensive soft tissue dissection leads to higher likelihood of elbow stiffness due to periarticular fibrosis. The anatomical characteristics of the articular surface should be prioritized during open reduction internal fixation. A distal humerus locking plate system that is anatomically pre-shaped can help with early postoperative rehabilitation and stable repair of complicated distal articular fractures.

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