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Original Research Article

Functional Outcome of Distal Humerus Intercondylar Fractures Treated with Dual Plating

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Conflict of interest: Nil

Abstract:

Background: Intercondylar fracture of the distal humerus is common injuries and present one of the most difficult challenges of fracture of lower end of humerus. The aim of this study to assess the functional outcome of humerus intercondylar fracture treated by dual plating using Mayo elbow performance score.

Methods: This study was conducted at the Departments of Orthopaedics, Sri Krishna Medical College and Hospital, Muzaffarpur, Bihar from April 2019 to October 2021. Patients who had distal humerus fracture of AO classes 13C1, 13C2 and 13C3 were included in the study. Patients with polytrauma, the extremes of age (< 18 years and> 65 years) and those with pre-existing pathologies were excluded from the study. Intraoperative, 4.5mm partially threaded cancellous screws were used to establish articular congruity. Reconstruction with distal humerus locking plates were applied in 90 – 90 fashion on both columns and tension band wiring for olecranon osteotomy. Functional outcome was assessed at six months using Mayo elbow performance score.

Results: Out of 43 patients, 22 were males and 21 females. Thirteen patients had 13C1 distal humerus fractures, 19 had 13C2 while 11 had 13C3 fractures. Mean Mayo elbow performance score was 78.5 ± 11.5. Excellent to good results were observed in 79% of cases as perMayo elbow performance score. We noted that 32% patients had no pain at 6 months, 42% had mild pain and 21% had moderate pain. Stability and function results were also satisfactory.

Conclusion: Based on this study, early open reduction and rigid internal fixation with plates in 90-90 fashion followed by early post-operative mobilization showed a good outcome in distal humeral intercondylar fractures.

Keywords: Distal humerus, intercondylar fracture, dual plating, trauma.

Introduction

Every year approximately 5.7 adults out of 100,000 have distal humeral fractures. Out of those, 30% are humerus fractures and 2% of all the fractures. [1] These injuries occur in a bimodal distribution, with an early peak in young males, 12 – 19 years of age, and a second peak in elderly women, with osteoporotic bone. [2] One of the most common causes is a simple fall in the forward direction. In young adults, high energy injuries are the cause and are due to motor vehicle accidents, sports, fall from height, and industrial accidents.

Intercondylar fractures of the distal humerus present one of the most difficult challenges of fractures of lower end of humerus. The combination of complex shape of the elbow joint, the adjacent neurovascular structures, and the sparse soft tissue envelope make these fractures difficult to treat. Both before and after any manipulation, a complete neurovascular examination of the radial, median, ulnar, and anterior and posterior interosseous nerves should be completed. [3] Better fixation techniques and improved surgical approaches allow early return to active motion, which in turn decreases the rate of soft tissue complications. [4]

Open reduction and internal fixation has been the gold standard making conservative management almost obsolete. Plates are to be applied on both the columns in type C fractures. [5] For distal humerus, now pre-contoured plates with extensive distal screw options are available. They promise enhanced stability and an ease in application. [6] Assessing the functional outcome of humerusintercondylar fracture using Mayo elbow performance score in our hospital was the aim of our study.

Material and Methods

This prospective study was conducted in the Department of Orthopedics Sri Krishna Medical Col-

lege and Hospital, Muzaffarpur, Bihar from April 2019 to October 2021. The inclusion criteria were all patients who had a distal humerus fracture of AO classes 13C1, 13C2 and 13C3. Patients who had other fractures requiring open fixation, or associated injuries requiring intervention by other surgical specialties were excluded from the study.

Patients were thoroughly examined and plain radiograph AP and lateral were taken. 3D CT ordered in order to establish the exact geometry of fracture. After baseline investigations and detailed anesthesia examination, patients were operated in lateral position using a posterior incision and an olecranon osteotomy during approach. Ulnar nerve was identified and dissected. Intercondylar fragments were converted to single fragment using 4.5mm partially threaded cancellous screws. After achieving the articular congruity, shaft was reduced to condyles and maintaining medial and lateral columns. Reconstruction or distal humerus locking plates were applied in 90 – 90 fashion on both columns and tension band wiring for olecranon osteotomy. Postoperatively, splint was applied for two weeks and active range of motion exercises started. Regular follow up at three weeks and then at six weeks interval for six months were done. At each follow up visit, clinical examination was done and physiotherapy advised. Any complications were documented and managed. Functional outcome was assessed at the six months follow up using Mayo elbow performance score (Table 1).

The analysis was performed through SPSS version 20.

Results

There were a total of 43 patients in our study, from which 22 were male and 21 were female. The age range was 18 to 65 years (mean 34.9 ± 11.3). The etiology of injury was fall from a height for 23 patients, road traffic accidents for 17, while the remainder had injury due to other blunt force trauma. Thirteen patients had 13C1 distal humerus fractures, 19 patients had 13C2 while 11 patients had 13C3 fractures. The patients were operated upon after a mean of 5.3 ± 2.1 days.Five patients scored excellent, 29 scored good, 6 had fair and 3 poor results as measured by Mayo elbow performance scoring method.

Table 1: Mayo elbow performance score

Function	Points	Definition	Points
Pain	45	None, Mild, Mod, Severe	45, 30, 15, 0
Motion	20	> 100, 50 – 100, < 50	20, 15, 5
Stability	10	Stable, moderate, gross instability	10, 5, 0
Function	25	Comb hair, feed, hygiene, wear shirt and shoes	5 each

In terms of co morbid conditions, 6 patients were hypertensive and diabetic, and 3 were hypertensive. In terms of pain, 32% patients had no pain at 6 months, 42% had mild pain and 21% had moderate pain. Only two patients complained of severe pain. 47% patients had an arc of motion greater than 100, while 37% had a range between 50 and 100 degrees. Stability and function results were also satisfactory.

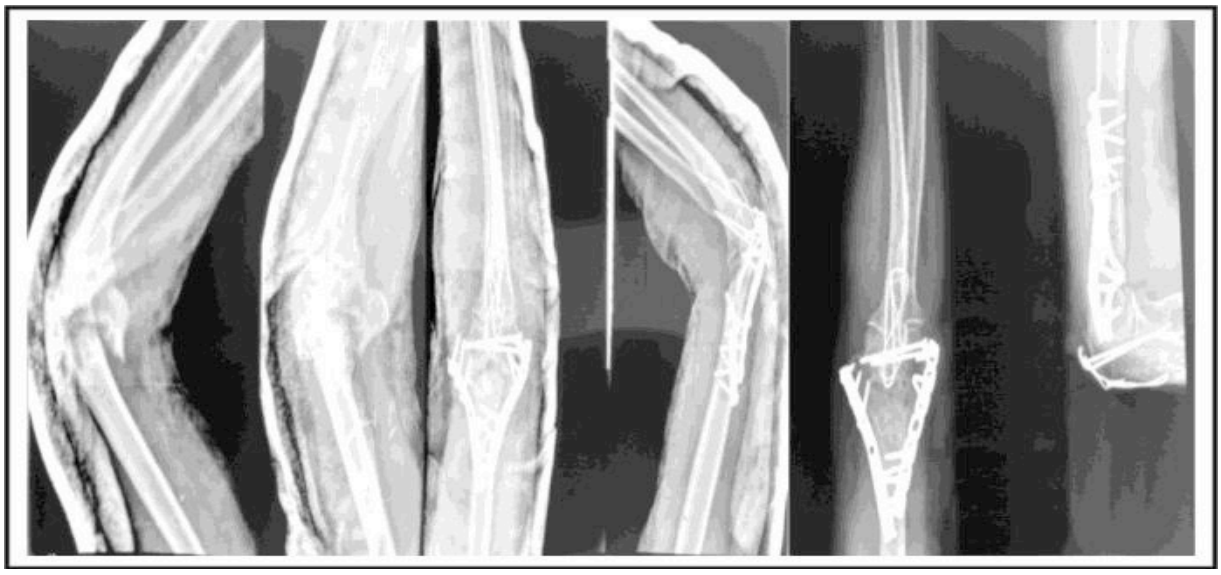

Figure 1: Preoperative X-ray andimmediate postoperative X-ray

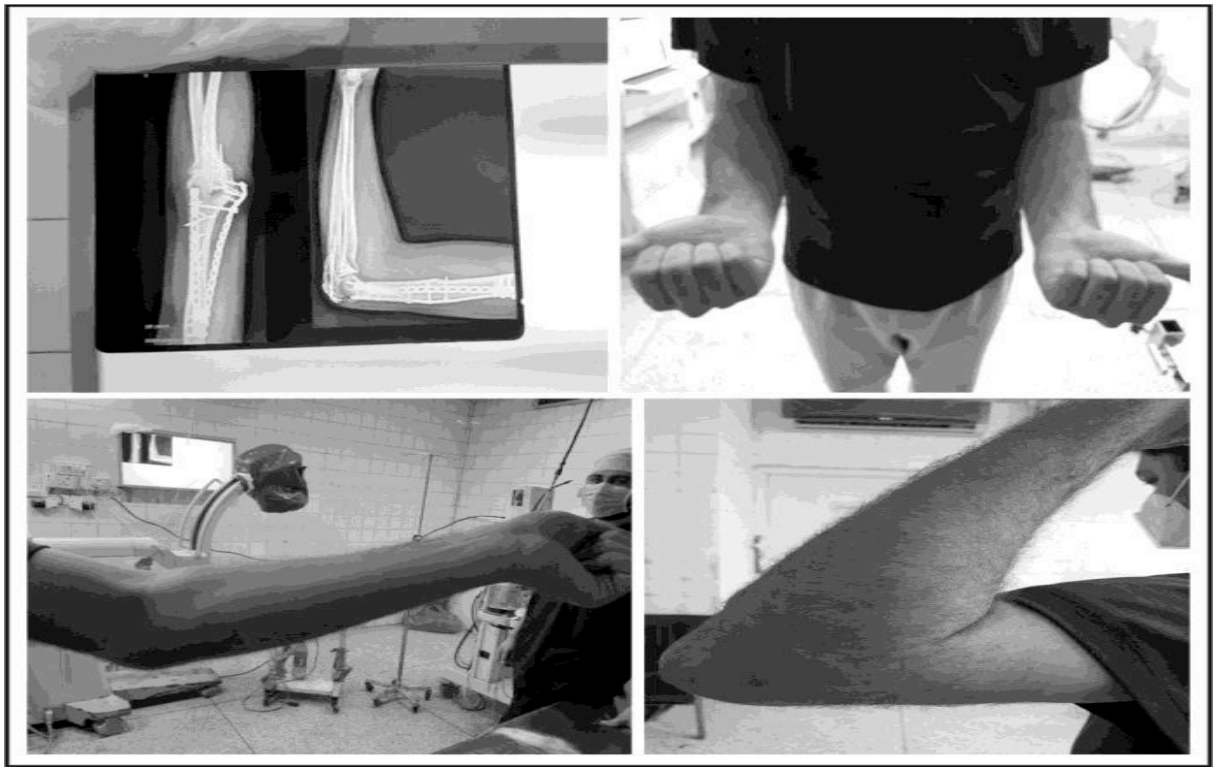

Figure 2: Six months follow-up

There was no correlation between the AO type of injury and Mayo score (p = 0.360) and mechanism of injury with Mayo score (p = 0.288). Time to surgery was also found to be insignificant to outcome (p = 0.176). A younger age had a significant correlation with improved Mayo score (P = 0.047). Two patients presented with deep infection as a postoperative complication and one with elbow stiffness (functional range of movement less than 40 degrees). There were no other postoperative complications.

Discussion

Distal intraarticular fractures of the humerus are notoriously difficult fractures to treat for a variety of reasons, including limited subchondral bone, complex anatomy of the elbow joint, difficult exposures and small fragments. [7]

The objective of plate osteosynthesis is to achieve anatomical reduction of the joint with rigid fixation with restoration of the columns, which would allow early mobilization and physiotherapy leading to early restoration of good range of motion. [8-10]In the distal humerus, biomechanically stiffer constructs are considered better for healing. [11]

A stiffer implant leads to reduced fragment movements, which must be restricted to less than 2% of the size of the fracture gap in order to prevent callus and facilitate earlier stability to achieve range of motion. [2] Ongoing biomaterial research along with clinical studies on various implant designs has shown that the most stable configuration for fracture fixation is the dual plate osteosynthesis. The configuration of these plates has been found to be more significant that the actual plate type. [13-15]

90 – 90 plating with a posterior plate on radial column and a medial plate on the ulnar column is currently in favor by many authors. Radial column plating on the lateral surface, which was previously in vogue has shown to be inferior in the restoration of the anatomical angles of the distal humerus. [16,17] Other determinant factors include the angular stability of the implant affecting the cutout strength [18] and the presence of metaphyseal comminution leading to defects. [19]

With regards to 90 – 90 plates, Korner et al found greater stability as compared to parallel plates for these fractures. [20] Our study was able to achieve stability with 4.5mm partially threaded cancellous screws, reconstruction or distal humerus locking plates, applied in 90 – 90 fashion on both columns and tension band wiring for olecranon osteotomy.

Greiner et al reported good to excellent results with a mean score or 91 using locking plates. [21] Standard recon plates, if used, have the prerequisite of good quality of bone, with intact blood supply and good cortical contact between fragments. In humeri with osteopenic bone or metaphysical comminution, distal humerus locking screws are to be preferred.

We had two cases of deep infection, which required debridement and removal of implant. Infection subsided and the patients could return to their routine

activities. One patient had elbow stiffness, which is a relatively common complication given the nature of the joint. Reported complications in literature include lasting pain, stiffness and reduced range of motion, infection, implant loosening, nerve injury, heterotrophic ossification and nonunions. [22] Our sample size was small and we were only able to use 90 – 90 plates. So, a valid comparison with other techniques wasn't done, and further studies may be required to establish superiority of this configuration.

Conclusion

Dual plating in 90 – 90 fashion of distal humerus intercondylar fractures with anatomical reduction and rigid fixation which allows early mobilization has good functional outcomes with an acceptable complication rate.

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