

Original Research Article

Functional outcome of surgical management of distal humeral fracture with precontoured anatomical locking plate

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ABSTRACT

Background: Intra-articular distal humeral fractures are among the common fractures seen in adults. The cause of injury most commonly being road traffic accidents. These fractures require fixation methods which are technically difficult to achieve a good functional outcome and to minimize complications. This study was useful to analyse the above factors, to come to conclusion.

Methods: This was a prospective study of 20 cases of supracondylar fracture humerus with intercondylar extension treated surgically and assessed for functional outcome, which were admitted to our hospital between 2015 to 2017. Precontoured distal humerus anatomical locking plates were used for fracture fixation with various standard approaches to elbow. Various clinical and functional outcome were analysed at the end using mayo elbow performance score.

Results: Out of 23 patients, 20 patients were available for final follow up and outcome analysis. There were 15 males and 5 females with an average age of 34.4 year (21-50 years). Average time between admission and surgery was 4 days. Clinical and radiological consolidation of fracture was observed in all cases at an average of 12 weeks (9-14 week). The results obtained using mayo elbow performance score were graded as excellent 10 (50%) patients, fair in 6 (30%), poor in 4 (20%). One case had superficial wound infection and managed with IV and oral antibiotics. One patient had transient ulnar nerve palsy managed conservatively and recovered.

Conclusions: Open reduction and internal fixation with anatomical precontoured locking plate is the treatment of choice in comminuted intercondylar distal humerus fractures. specially in young active adults. It provides stable fixation and thereby facilitating early postoperative rehabilitation. However, the outcome mainly depends on restoring the anatomic nature of articular surface along with minimal soft tissue destruction.

Keywords: ORIF with precontoured locking plate, Elbow stiffness, Ulnar nerve palsy, Heterotrophic ossification

INTRODUCTION

The distal humerus is involved in two joints, the ulno-humeral, which allows for flexion and extension of the elbow and the radiocapitellar, which allows forearm rotation.¹ Distal humeral fractures have an estimated incidence in adults of 5.7 per 100,000 persons per year. These injuries occur in a bimodal distribution, with an early peak in young males, twelve to nineteen years of

age, as a result of high-energy trauma, and a second peak in elderly women, with osteoporotic bone, as a result of falls. Distal humerus fractures will likely increase in incidence as the elderly proportion of the population increases.² Restoration of painless and satisfactory elbow function after a fracture of the distal part of the humerus requires anatomic reconstruction of the articular surface and stable fixation of the fracture fragments to ensure that early motion does not compromise fracture union. These

goals are now widely accepted by the orthopaedic community.³ Distal humeral fractures in adults are complex and technically demanding injuries to manage. Operative intervention is indicated in most cases and is often complicated by difficult exposure, osteoporotic bone and comminution in the metaphyseal and/or articular region. Management of distal humerus fractures continues to challenge orthopedic surgeons. The unique and complex anatomy of the distal humerus, involving the ulno humeral and radio capitellar joints makes anatomic reduction difficult and hardware placement challenging.¹ Historically, distal humeral fractures have earned a reputation for having a propensity for poor clinical outcome after treatment. Prolonged immobilisation of the elbow, while waiting for union predisposes to joint stiffness, muscle atrophy and permanent functional impairment. Therefore, the consensus has shifted towards treating these fractures with open reduction and stable internal fixation so as to restore painless and satisfactory elbow function by early mobilization.⁴

METHODS

This is a prospective study of 20 cases of supracondylar fracture humerus with intercondylar extension treated surgically and assessed for functional outcome. Adult patients with isolated intraarticular distal humerus fracture due to RTA and trauma due to other various reasons attending to casualty and outpatient department were primarily evaluated to exclude neurovascular injury and head and abdomen injury. Finally, fracture was evaluated with radiography and CT scan. Patients are selected for the study depending on the inclusion and exclusion criteria. Surgical fixation of the fracture with pre contoured anatomical locking plate done with various standard approaches. Postoperative evaluation of the patient's clinical and functional outcome regarding pain, fracture union was carried out using the Mayo elbow performance index at 6 weeks, 3 months, 6 months, 12 months intervals and same will be recorded in a specialised case form. In our study we had used 3.5 mm reconstruction plates of appropriate size which were contoured according to the need and appropriate size cortical screws along with Kirschner wires and stainless-steel wires for tension band wiring of osteotomized olecranon in case.

RESULTS

The present study involves 20 cases of distal humerus fracture with intercondylar extension. All were treated by open reduction and internal fixation with distal humerus precontoured anatomical locking plate. Dual plating was carried out to ensure stable fixation of both medial and lateral column.

In our study the age distribution ranges from 22 to 50 years, 5 (25%) patients were between 21-30 years, 10 (50%) were between 31-40 years and 5 (25%) were

between 41-50 years. The mean age was 34.4 years. Maximum incidence of injury occurred between 32-40 years, that is, 10 cases (50%). Sex wise 15 (75%) male and 5 (25%) female patients were seen with male to female ratio 3:1. Laterality wise left elbow involved in 12 (60%) cases compared to right 8 (40%). Mode of injury was RTA and fall from height in equal number of populations, that is, 10 case each (50% each). According to Risborough and Radin classification in our study we didn't had type I fracture. There were 5 (25%) cases of type II fracture, 12 (60%) were type III fracture, 3 (15%) were type IV fracture. All cases were operated on elective basis between 2-4 days.

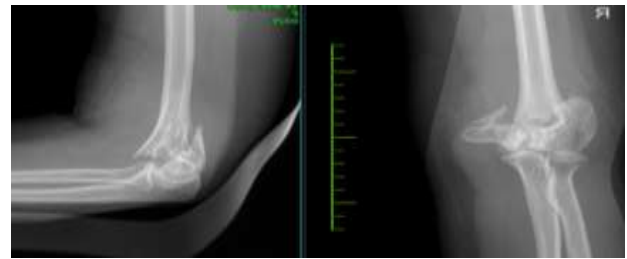


Figure 1: Pre-op (case 1).



Figure 2: Intra-op (case 1).



Figure 3: Post-op (case 1).



Figure 4: Pre-op clinical image (case 2).



Figure 5: Intra-op prone (case 2).



Figure 6: Pre-op (case 2).



Figure 7: Intra-op (case 2).

All cases were treated with ORIF and dual plating. Three type IV fractures were immobilized postoperatively with above elbow plaster of Paris slab for 3 weeks. Early mobilization started for all other cases from 3rd postoperative day. No significant postop complications encountered. Superficial infection of one patient treated with antibiotics in accordance with culture and sensitivity report. One patient had transient ulnar nerve palsy which was managed conservatively and showed full recovery at the end of third week. No case of non-union, no case of implant failures was seen in our study. Clinical and radiological union seen at 24 weeks to 36 weeks. In this study there were no type 1 fractures, 5 cases were type 2

fractures out which 4 had excellent and 1 had fair result, there were 12 cases of type III fractures out of which 5 had excellent, 5 good and 2 poor results. 3 cases were type IV fracture out of which 1 had excellent result and other two showed poor outcome.

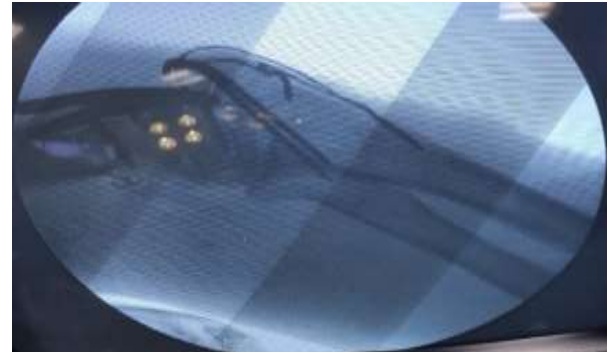


Figure 8: Post-op (case 2).

Table 1: Fracture types with outcome.

Radin and Risborough fracture type	Mayo elbow performance score and functional outcome		
	Excellent	Fair	Poor
Type I	-	-	-
Type II	4	1	-
Type III	5	5	2
Type IV	1	-	2

DISCUSSION

It is a prospective study in which 20 cases of distal humerus fracture with intercondylar extension were treated with dual plating. The findings, the end results and various other outcome data have been analysed and compared in the following discussion. Age incidence in our study, fractures were commoner in the third to fourth decade with average age being 34.4 years (21-50). Our results are comparable to the study conducted by Jupiter et al, Gabel et al, Henley et al and Wang et al.⁵⁻⁸ In 1985 Jupiter et al found 57 years as the average age in their series.⁵ In 1987 Gabel et al found 45 years as the average in their series.⁶ In 1987 Henley et al found 32 years as the average age in their series.⁷ In 1994 Wang et al found 47 years as the average age in their series.⁸ We found male predominance in our study with 75% male and 25% female patient which were comparable to Wang et al study.⁸ Jupiter et al in his study noted about 47% male and 53% female.⁵ Study conducted by Henley et al reports 52% male and 48% female incidence.⁷ Wang et al noted 60% male and 40% female incidence.⁸ Male predominance is probably due to their increased involvement in outdoor activity level and RTA. In our series 50% of the cases were due to direct fall and 50% of cases had road traffic accident. This equality of fall to RTA can be attributed to manual labourers involved in high risk physical activities like lifting heavy weight, loading and unloading trucks, agricultural activities, tree

cutting. All these activities include a risk of falling from height, whereas Gabel et al accounted 100% of his cases to direct fall.⁶ Henley noted 61% of his cases are due to road traffic accident, 39% due to direct fall.⁷ Wang et al reported 30% of his cases occurred due to direct fall and 70% of the cases due to road traffic accident.⁸ The results of the Henley and our series are comparable.⁷ We accounted about 40% incidence of fractures in right side and 60% of the fracture in left side, which is also in par with other studies. Jupiter et al noted 62% incidence of fractures in left distal end of humerus.⁵ Henley had 55% incidence of fractures in left distal end of humerus.⁷ Left sided predominance is probable due to direct fall injury, while right hand was trying to hold on to support. In our series we used Radin and Risborough classification for descriptive purpose. We had no cases of fractures of RR type I which is undisplaced fracture and rarely needs plating, however 25% fractures can be categorised to RR type II, 60% fractures comes under RR type III and 15% fractures in RR type IV. Various studies depict these fracture patterns with respect to classification such as in Gabel et al series 23% of fractures of RR type I, 15% fractures of RR type II, 31% fractures of RR type III and 23% fractures of RR type IV.⁶ Bradford et al series about 9% of fractures of RR type I, 12% fractures of RR type II, 43% fractures of RR type III and 36% fractures of RR type IV.⁷ In our series final results were categorised and noted along with fracture type as follows. In our series 5 type II cases were present out of which 4 had good and 1 fair results. There were 12 cases of type III cases of which 5 had good, 5 fair, 2 poor results. Our series had 3 type IV cases of which 1 good and 2 poor results were obtained.

No significant complications noted in our study. In comparison to study by Henley et al reported 4% superficial infection 7% of ulnar neuropathy, 5% of implant failure, 2% of non-union and 4% incidence of heterotrophic ossification, we noted one case of superficial infection and one case of transient ulnar palsy.⁷

In our series we had one case of superficial infection, which was managed with culture and sensitivity and resolved with appropriate antibiotics. Uncontrolled diabetes with blood sugar levels more than 200 mg/dl in immediate postoperative period are associated with an increased risk for surgical site infections.

One case of ulnar neuropathy was seen which was managed conservatively with physiotherapy. Patient recovered totally at the end of three week. studies shown that Ulnar Neuropathy can be prevented by anterior transposition of ulnar nerve to prevent possible impingement due to plate around the sulcus.⁸ Hence preoperative ulnar nerve function and routine intraoperative exposure and determination of any visible injuries of the ulnar nerve should be documented. In a

study conducted by Brown et al out of 99 cases 21 cases had ulnar nerve lesion.⁹

CONCLUSION

Intercondylar fracture of distal humerus pose a challenge for orthopaedic surgeon. Complex anatomy of the joint surface makes reduction difficult. Heterogenous ossification and stiffness also adds to the poor outcome. However open reduction and internal fixation with precontoured anatomical locking plate of these fracture confers stability to the elbow allowing early mobilisation resulting in good results.

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Ethical approval: The study was approved by the Institutional Ethics Committee

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