

A Comprehensive Study of Functional Outcome in Supracondylar Intercondylar Fracture of Humerus in Adults

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Abstract: **Background:** In adults, distal humerus fractures are uncommon and intra-articular, often 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 and evaluate the intermediate term results (minimum follow up of 6 months) of communitied intra-articular distal humerus fractures treated with bicolunar plating with or without olecranon osteotomy in adult Indian population. **Methods:** This is a prospective type of study of 25 cases of supracondylar fracture humerus with inter condylar extension treated surgically with dual plating which were admitted to Guru GovindGovt.Hospital& M P Shah Medical College,Jamnagar Gujarat, between 2017 to 2019. All the patients of supra condylar fracture distal humerus with age between 17to 70 years with medical fitness for surgery were included in the study. **Results:** The mean age of the patient was 35±2 years, 15(60%) cases were males, and 10(40%) cases were females. Right sided involvement was more frequent in the present study 13(52%) cases. 6(24%) cases sustained fracture due to road traffic accident, 19(76%) cases had a domestic fall. The average duration of the radiological union was 14±06 weeks in 16(60%) cases, 15±04 weeks in 5 (25%) cases, 19±05 weeks in 4 (15%) cases. The outcome was calculated using the MEPS and DASH scores. The Mayo elbow performance score showed excellent in 3 (12%) good in 16 (64%) fair in 4(16%) and 2(8%) poor outcome. **Conclusions:** For good functional results, precise preoperative planning, adequate surgical approach, anatomical inter fragmentary stabilization, medial-posterolateral plating, and early post-operative physiotherapy help in restoring painless and functional elbow for distal humeral intra-articular fractures. This step-by-step approach results in satisfactory functional results.

Keywords: Supracondylar Intercondylar Fracture, Humerus

1. Introduction

Distal humerus fractures make up 0.5 to 2% of all fractures, but up to 30% of fractures involving the elbow [1]. In adults, most distal humerus fractures are intra-articular and involve both the medial and lateral columns [1]. There have been variable reports as regards to functional outcome of open reduction and internal fixation of these fractures. Also, newer literature suggests, total elbow arthroplasty as a reasonable option in these patients barring the cost [2]. Achieving a good functional range of motion at the elbow with stability are the primary objectives in managing a communitied distal humerus fracture. Hence, it is very necessary to determine if fracture fixation is successful in achieving a stable mobile joint [2].

Several classification systems for intra-articular both column fractures of the distal humerus have been pro-posed. The RISEBOROUGH& RADIN classification gives information about displacement & severity of the fracture.

Different types of implants like K wires, 4mm cancellous screws, 3.5mm recon plates and one third tubular plates & locking anatomicalprecontour plate are used during operative procedure.

Pre-contoured column specific locking plates useful in osteoporotic bone fixation [3]. 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 [3].

The aim of the study was to evaluate the intermediate term results (minimum follow up of 6 months) of communitied intra-articular distal humerus fractures treated with bicolunar plating with or without olecranon osteotomy in adult Indian population.

2. Materials and Methods

This is a prospective type of study of 25 cases of supracondylar fracture humerus with inter condylar extension treated surgically mostly with dual plating which were admitted to G.GGovt Hospital & M P Shah Medical College,Jamnagar,Gujarat between 2017 to 2019. All the patients of supracondylar fracture distal humerus with age between 17 to 70 years with medical fitness for surgery were included in the study. Patients medically unfit for surgery and those not willing for surgery is not included in this study. The Inclusion criteria were skeletally matured patients with all distal humerus fractures. Patients with polytrauma and vascular injury patients with prior radial nerve involvement were excluded from the study. All the necessary pre-operative work-up was done in the form of Radiological and hematological investigations. Well written informed consent was taken from all the patients enrolled in the study. Prior ethical committee approval was obtained. The Disabilities of Arm and Shoulder and Hand (DASH) 4-6 score and the Mayo Elbow Performance (MEP) score 80-100 were calculated. The MEP score is an elbow centric score that assesses the pain, mobility, stability and function of the elbow.

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3. Surgical Technique

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 forearm. 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 3.5 mm reconstruction plate and screws or one third tubular plate along with 3.5 mm screws. Adequacy and anatomical reduction was checked in both the orthogonal views at every important step. Meticulous wound closure was done and arm pouch was given post-operatively in another Triceps tongue approach. A tongue shaped incision kept over triceps sheath with apex proximally and base at olecranon. It is then turned down and remaining fibres of the triceps retracted medially and laterally with "C" retractor. **Advantages** : Olecranon can be used as a template against which the fracture fragments can be reconstructed. It saves the additional operative time for making osteotomy and fixation of osteotomy. With a good repair of triceps, early motion can be started as soon as the wound heal.

Patients were instructed to keep the limb elevated and move their fingers. 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. An arm pouch was given to all the patients post-operatively for 2 weeks. Mobility in the form of elbow and shoulder exercises was started from post-operative day 1.

4. Results

The present study consists of 25 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) & k wires. The mean age of the patient was 35±2 years, 15(60%) cases were males, and 10(40%) cases were females. Right sided involvement was more frequent in the present study 13(52%) cases. 6(24%) cases sustained fracture due to road traffic accident, 19(76%) cases had a domestic fall. The average duration of the radiological union was 14±06 weeks in 16(60%) cases, 15±04 weeks in 5 (25%) cases, 19±05 weeks in 4 (15%) cases. In RISEBOROUGH & RADIN

classification In type IV fracture, fair and poor results were because of articular and supracondylar comminution causing poor fixation, more soft tissue injury, require more immobilization, lack of active mobilization exercise and infection. In type III fracture, good results were due to less soft tissue injury, immediate operation, less soft tissue dissection, rigid fixation, early active mobilization of elbow. The outcome was calculated using the MEPS and DASH scores. The Mayo elbow performance score showed excellent in 3 (12%) good in 16 (64%) fair in 4(16%) and 2(8%) poor outcome. There was ulnar nerve palsy seen in 2 cases, Heterotropic ossification with stiffness in 1, There were 7 cases of superficial or deep infection encountered in the present study. 2 cases of nonunion or malunion were observed. All the patients were followed-up at 1, 3 and 6 months respectively.

5. Discussion

Treatment of distal humerus fractures mainly the intra articular types is a challenging task. These fractures may be compounded by many problems such as significant comminution and multiple intra-articular fracture lines [4].

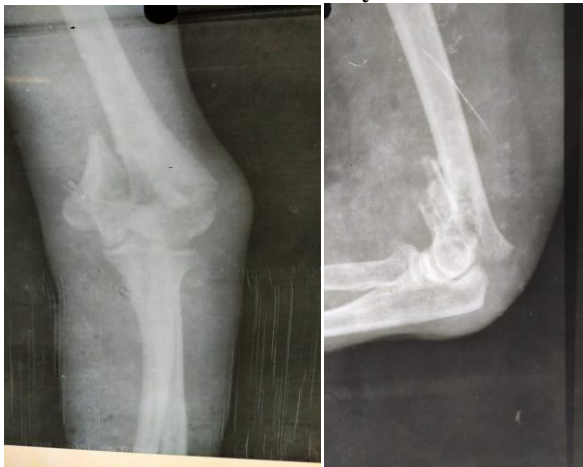
In adults, most of distal humerus fractures are intra-articular and involve both the medial and lateral columns [2]. The goal of treatment is restoring painless and functional elbow in a fractured distal humerus which requires anatomical reconstruction and stable fixation [3]. In our study most of distal humerus fractures are intra articular and involve both the medial and lateral columns. The decision to offer operative intervention for distal humerus fractures is based on many factors, including fracture type, intra articular involvement, fragment displacement, bone quality, joint stability, and soft-tissue quality and coverage [6]. In addition, individual factors, such as patient age, overall health condition, functional extremity demands, and patient compliance, are all considered. Preoperatively, patients must understand outcome expectations and the importance of rehabilitation [6]. Primary goals for operative intervention are to restore articular congruity and elbow stability [7]. Another goal is to decrease the possibility of posttraumatic arthritis and elbow stiffness [6]. Studies have supported the notion that distal humerus fractures in adults are optimally treated with open anatomic reduction and stable fixation to allow early anatomic restoration and upper-extremity ROM. Although operative intervention is not without complications, the risk can be reduced by paying detailed attention to anatomic reduction, soft-tissue handling and preservation, stable fixation, and early mobilization. For articular fractures and unstable nonarticular fractures, operative treatment with direct visualization of the joint surface and anatomic reduction and stabilization can prevent accelerated arthritis associated with articular incongruity [8].

Newer, minimally invasive, percutaneously inserted bridge plates also have been described and have been used to avoid extensive dissection and potential nerve injury [9, 10].

In our study, we treated all 25 cases with open reduction and internal fixation with dual plating in 90-90 configuration & k wire. i. e. one plate on medial & another on posterior surface of lateral column, were 15(60%) males and 10(40%)

females. In which 6 cases (24%) were due to road traffic accident (RTA) and 19 cases (76%) were due to direct fall injury comparable to other studies by Jupiter et al.(12).All patients achieved fracture union with mean MEP scores excellent in 3(12%) good in 16(64%) fair in 4(16%) and poor outcome in 2(8%).In conclusion, for good functional results, precise preoperative planning, adequate surgical approach, anatomical interfragmentary stabilization, medial-posterolateral plating, and early post-operative physiotherapy help in restoring painless and functional elbow for distal humeral intra-articular fractures. This step-by-step approach gives satisfactory functional results.

Pre OP X Ray



Post OP X-Ray



Approach used for Operation

Approach	Cases	Percentage
Posterior Trans olecranonosteotomy	9	36%
Tricep tongue approach	14	56%
Posterior Percutaneous pinning	2	8%
Total	25	100%

Table shows that in 36% patients we had done ORIF through transolecranon approach and 56% of patients ORIF done through posterior Tricep tongue approach and 8% posterior percutaneous approach for K wire in our series.

Range of elbow motion at last follow up

	Range of elbow movements		Cases	Percentage
	Flexion Deformity	Further flexion		
Excellent	0 - 15°	> 130°	3	12%
Good	15 - 30°	120 - 130°	16	64%
Fair	30 - 40°	90 - 120°	4	16%
Poor	40 - 50°	< 90°	2	8%
Total			25	100%

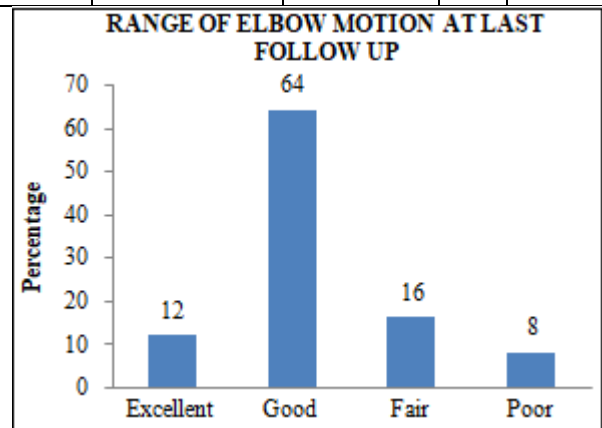


Table shows that range of motion gained after operation were excellent in 3 patients (12%), Good ROM achieved in 16 patients (64%) and fair amount of ROM achieved in 4 patients (16%) poor ROM achieved in 2 patients. Results of operative open reduction and internal fixation of supra condylar and intercondylar fractures of lower end humerus in 25 patients. Results were 12% excellent, 64% good, 16% fair and 8% poor. In our series patients get adequate rehabilitation and with the help of physiotherapy, the range of movement achieved adequately even after immobilising for more than 3 wks.

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