

## A Study Of Comprehensive Management Of Distal End Humerus Fractures In Adults

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### Abstract

In young adults, most distal humerus fractures occur from high-energy trauma like Sidesweep injuries, motor vehicle accidents, falls from height and gunshot wounds. In elderly persons with more osteoporotic bone; most of these injuries occur from falls. Evolution of management of these fractures have revolutionized over time. Management of distal end of humerus fractures pose a challenge to treating orthopedic surgeon. Choice of implant depends of fracture anatomy and circumstances. In the present study we evaluate modes of management of distal end of humerus fractures in adults.

Thirty six cases of fracture of distal humerus in adults were treated both conservatively and surgically and fixed using various implants in Mamata General Hospital, Khammam from October 2010 to October 2012. The Objectives of the study are to analyze the various methods of management of distal humeral fractures in adults. Most of the cases were males with age ranging between 18 to 65 years. By mayo elbow performance scoring system out of 36 patients, 14 patients (38.9%) had excellent results, 11 patients (30.6%) had good results, 4 patients (11.1%) had fair results and 7 patients (19.4%) had poor results. Reconstruction plates and cannulated cancellous screws offer excellent results in distal humeral fractures in adults. Open reduction and internal fixation with reconstruction plate and cancellous screws can be considered as the treatment of choice. With this method, proper length of the distal humerus, opposition, articular congruency, axial alignment, rotational alignment and stability with good range of motion of elbow can be restored. Hence, Reconstruction plates and cannulated cancellous screws can be considered as first line of management.

**Key words :** Reconstruction plate; cannulated cancellous screws; K-wires; Campbell's approach; Olecranon osteotomy; POP, TBW.

### INTRODUCTION

We live in a society with a growing elderly population and a young population in which extreme sports and high speed motor transportation are popular, therefore the incidence of distal humeral fractures is increased [1,2]. In young adults, most distal humerus fractures occur from high-energy trauma like Sidesweep injuries, motor vehicle accidents, falls from height and gunshot wounds. In elderly persons with more osteoporotic bone; most of these injuries occur from falls [3,4]. So improved understanding of the complex patho-anatomy of unstable distal humerus fractures in adults has prompted a global interest in more precise treatment for this diverse group of injuries [5,6].

Surgeons who treat fracture of the distal humerus frequently have realized the challenges that arise relate to poor bony quality, distal separation of the articular fragment from the columns of the distal humerus and fragmentation of the articular surface in one or more planes [7,8]. Varying patterns of distal humeral fractures are common in adults. Malunion is also common. Even minor irregularities of the joint surface of the elbow usually cause some loss of function [9,10].

Surgical treatment for these fractures has evolved significantly in the last 30 years. In the 1960's and 1970s, most surgeons condemned surgical treatment due to high failure rates with loss of fixation, non union and elbow stiffness [11-14]. In the 1970s, treatment began to shift from casting and the "bag of bones" technique to surgical intervention with limited internal

fixation [15]. Again, results were generally poor due to lack of adequate stabilization for early motion [16]. In the early 1980s, the AO-ASIF group reported good and excellent results in their study with comminuted fractures of the distal humerus [17]. So far these were the best results reported in the treatment of these difficult fractures at that time. This led to an increased enthusiasm for surgical reduction and fixation.

The purpose of this study is to determine the outcome of various methods of treatment of distal humeral fractures in adults and to analyze the complications and causes of failure and to evaluate the most satisfactory method of treatment.

### MATERIALS AND METHODS

This series consists of 36 patients of fracture distal humerus treated by closed reduction / open reduction and internal fixation with K-wires, reconstruction plates and cannulated cancellous screws between October 2010 – October 2012 at Mamata General Hospital, Khammam.

Out of all the above, 21 patients were treated by open reduction and internal fixation with reconstruction plates (3.5mm), cancellous screws, k wires and 9 patients were treated by closed reduction and internal fixation with k wires and 6 patients were treated conservatively by above elbow plaster of paris cast.

According to the AO classification [18] 14 patients belong to Type A, 7 patients Type B and 14 patients Type C (5 Type C1, 6 Type C2 and 3 Type C3).

### Indications for surgery

1. Intra-articular displacement greater than 2 mm.
2. Marked supracondylar comminution and displacement.
3. Open fracture

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4. Neurovascular injury / compartment syndrome
5. Floating elbow
6. Multiple injured patient

The Campbell's posterior approach [19] with or without Olecranon osteotomy was used for all cases of severely comminuted intra articular fractures of distal humerus (for open reduction and internal fixation). Closed reduction under C-arm for K-wire fixation and Open Reduction and Internal Fixation when plating and cancellous screws fixation was done. Elbow function was assessed by using Mayo Elbow Performance Index (MEPI)[20].

## RESULTS

Mean age of the study group was 37.3 years (19-73 years). Table 1 shows distribution of fracture anatomy and table 2 distribution of cases treated by implant. (Fig 1-3). A non-significant association was observed between fracture type and implants used. Conservative treatment had taken least duration for union followed by K wire + recon plate + Can screw and Recon plate alone and maximum duration for union was in the case of Recon plate + can screw + TBW.

A non-significant difference was found in the mean flexion extension values of different implants, though comparatively higher flexion was observed in Recon plate + Can screw implant followed by Recon plate + K wire implant and least flexion was in K wire. K wire had maximum stiffness and conservative treatment too had stiffness. Further, we find that Recon plate as well as combinations with recon plates had least complications. Recon plate as well as combinations with recon

plates had higher MEPI compared to other implants.

## DISCUSSION

Functional elbow is very essential for an individual for social economic thriving. Fractures of the distal humerus may directly affect the functional movement of elbow especially intercondylar (intra-articular) fracture. The relationship of the radio-humeral joint and ulnohumeral joints must be perfect for functional outcome.

The restoration of elbow function is dependent on three salient features: exposure, fixation and the post operative rehabilitation, with later two are of primary consideration. Adequate exposure is necessary for visualization of the bone injury and fixation of the fracture fragments. The optimal exposure is provided by posterior approach with extra-articular osteotomy of the olecranon. This allows complete examination of the articular surfaces of trochlea, capitellum, olecranon and radial head. It also gives access to the medial and lateral supracondylar ridges. Full evaluation of the fragments of the fracture and reduction can then be performed. Although non union of the extra articular osteotomy may be regarded as a potential complication of this exposure, TBW of the osteotomy has provided sufficient stability of the olecranon for immediate use of the elbow through a secure range of motion without the occurrence of non-union.

In our series of 36 patients of distal humeral fracture, the correlation we found between the functional results and the type of fracture confirms the prognostic value of AO classification. In our series, elderly patients regained less movement, but none of them had instability. In one case olecranon osteotomy were used for reduction of fracture but we had no complication regarding the

**Table 1: Distribution of fracture anatomy in the study group**

Type of fracture		Age groups (in years)				Total
		18 - 30	30-50	50-70	70+	
Supra condylar	Frequency	6	2	4	1	13
	Percent	35.3%	20.0%	57.1%	50.0%	36.1%
Supra condylar with intercondylar	Frequency	2	6	2	-	10
	Percent	11.8%	60.0%	28.6%	-	27.8%
lateral condyle	Frequency	4	-	-	-	4
	Percent	23.5%	-	-	-	11.1%
Inter condylar	Frequency	3	2	1	1	7
	Percent	17.6%	20.0%	14.3%	50.0%	19.4%
Medial condyle	Frequency	2	-	-	-	2
	Percent	11.8%	-	-	-	5.6%
Total	Frequency	17	10	7	2	36
	Percent	100.0%	100.0%	100.0%	100.0%	100.0%

Table 2: Distribution of cases treated by implant

Implants		COMPLICATIONS					Total
Implants used		Nil	Delayed union	Delayed Union and pin tract infection	Non-union	Stiffness	
K wire	F	4	-	-	-	5	9
K wire	%	44.4%	-	-	-	55.6%	100.0%
K wire+ Can	F	5	1	1	-	-	7
K wire+ Can	%	71.4%	14.3%	14.3%	-	-	100.0%
Conservative	F	5	-	-	-	1	6
Conservative	%	83.3%	-	-	-	16.7%	100.0%
Recon plate +	F	8	-	-	1	-	9
Recon plate + Can	%	88.9%	-	-	11.1%	-	100.0%
Recon plate + K	F	1	-	-	-	-	1
Recon plate + K	%	100.0%	-	-	-	-	100.0%
Recon plate + can	F	-	1	-	-	-	1
Recon plate + can	%	-	100.0%	-	-	-	100.0%
K wire + recon plate + Can screw	F	1	-	-	-	-	1
K wire + recon plate + Can screw	%	100.0%	-	-	-	-	100.0%
Recon plate	F	2	-	-	-	-	2
Recon plate	%	100.0%	-	-	-	-	100.0%
Total	F	26	2	1	1	6	36
Total	%	72.2%	5.6%	2.8%	2.8%	16.7%	100.0%



Pre OP X-ray



Post OP X-ray with K wire

Fig 1: Pre and post op x rays of k wire fixation.



Pre OP X-ray

Post OP X-ray with Recon plate and K wire fixation

**Fig 2: Pre and Post op x rays of recon plating plus k wire fixation**

union by olecranon osteotomy and been fixed by a cancellous screw and TBW. We found tingling in ulnar nerve distribution even after prophylactic anterior transposition. But nerve is returned to its normal course at the end of the operation, but stress and its position must be clearly recorded. So that it can be protected at any later procedure.

In our operated cases, the lateral or radial plate (reconstruction plate) is posterior and therefore at right angles to the medial or ulnar plate, this enhances stability and is possible because the articular surface of the capitellum is entirely anterior and distal.

The postero lateral plate required little contouring, the medial plate often needs to be very heavily contoured in two planes ; for this reason the 'pelvic reconstruction' plate[21-22], though slightly less strong, is often useful. We have not removed implants as a routine, unless their prominence in thin patients causes complaint.

In our study of 36 patients, 30 patients underwent surgical procedures, of which 12 patients were treated with reconstruction plate with cancellous screws and K-wire have shown excellent result when compared and 9 patients who were treated exclusively by k-wires and 7 patients with k-wire and cancellous screws.

In case of reconstruction plate and cannulated cancellous screws. The value of compression is obtaining union is noted. The union occurred between 12-15 weeks with mean of 13 weeks, except one patient who were delayed union, all the patient had union except one patient who had union in 30 weeks (delayed union).

## CONCLUSION

Open reduction and internal fixation can be considered as the treatment of choice if there were no contraindication for this because it is important to maintain length, opposition, axial alignment and rotation alignment if a good range of motion is to be restored. This is achieved in present study. Reconstruction plate and reconstruction plate with cannulated cancellous screws gave optimum fixation and allowed immediate mobilization than K-wires when used exclusively. Excellent results were achieved with it terms of mobility and union without deformity. Under certain circumstances where patients is not fit for open reduction and internal fixation. We considered close reduction and internal fixation with K-wire as line of management. It is a less invasive procedure with short operating time. There is decreased risk of infection, decreased hospital stay and technically easy to perform



Pre OP X-ray

Post OP X-ray with K wire

**Fig 3: pre and post op x ray of y recon plating.**

and an economic procedure. To conclude reconstruction plates and cannulated cancellous screws offers excellent results in distal humeral fracture in adults and to be considered as first line of management.

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