

Functional and Radiological Outcome Following Surgical Management of AO-Type 13C Distal Humerus Fractures

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ABSTRACT:

Background

Intra articular fractures of the distal humerus are uncommon injuries and present the most difficult challenge among fractures of the distal end of the humerus. Objective of this study is to evaluate the functional and radiological outcome following bicolunar plating of AO-Type 13C distal humerus fractures.

Materials and Methods

A total of 20 intra articular (AO TYPE C) distal humerus fractures were operated within a period of 2 years in KVG medical college and hospital Sullia, Dakshina Kannada were included in the study in which there were 12 males and 8 females. 16 cases were due to RTA, 4 were due to self-fall, Out of 20 cases, 1 (5%) was of AO C1 type of fracture, 16(80%) were of C2 and 3 (15%) were of C3 type of fractures. All the patients were operated with pre-counteracted distal humerus locking plates in orthogonal fashion and functional outcome was measured by Mayo's Elbow Performance Score (MEPS) and Disabilities of the arm, shoulder and hand(DASH) Score.

Results

In our series of 20 cases, the average duration of the radiological union was 16±02 weeks. Excellent results were seen in 10, good in 6 and fair in 3, and poor in 1 According to Mayo's Elbow Performance Score (MEPS) at the end of 12 months follow up. The DASH Score revealed good subjective overall evaluation with a mean of 18.5 +/-10.5 points range.

Conclusion

Open reduction and internal fixation with bicolunar plating is the ideal fixation for AO 13 type C distal humerus fractures. Use of locking plates, stable fixation, along with early elbow mobilization influence the final functional outcome. Bicolunar plating provides better stability, allows early elbow range of motion and prevents elbow stiffness.

Key words: Intra-articular, distal humerus, bicolunar plating, mayo's elbow performance score, DASH Score.

INTRODUCTION

Distal humerus fractures in adults are relatively uncommon injuries involving 2 to 6 % of all fractures and 30 % of all elbow fractures.¹

Distal humerus fractures occur in the younger age group secondary to high energy trauma and in elderly woman due to low energy trauma.²

Treatment outcome of the distal humerus fractures remains complicated because of complex regional anatomy, adjacent neurovascular structures, lack of precontoured locking plates and higher rates of infection.³

Based on fracture pattern and displacement, many methods of surgical fixation like open reduction and internal fixation with Kirschner wires, semitubular plates, dynamic compression plates, reconstruction plates and locking compression plates, were used in the past which resulted in prolonged immobilization, risk of elbow joint stiffness, malunion and nonunion.

Presently, open reduction and internal fixation with two pre contoured anatomical locking compression plates in 90 degrees with one another has become standard technique for distal humerus fractures.^{4,5}

Patients treated with bicolumnar plating shows a greater functional range of motion, restoration of articular congruity, better healing and early rehabilitation.⁶

OBJECTIVE OF THE STUDY

Objective of this study is to Evaluate the “Functional and Radiological Outcome Following Bi-Columnar Plating Of Ao-Type 13C Distal Humerus Fractures”.

MATERIALS AND METHODS

STUDY DESIGN: A Retrospective Study.

STUDY DURATION: January 2019 to January 2021.

STUDY POPULATION : All adults with intra articular (AO TYPE C) distal humerus fractures were operated with open reduction and internal fixation with bicolumnar plating within a period of 2 years in KVG Medical College and Hospital, Sullia were included in the study.

SAMPLING PROCEDURE: Random Sampling.

SAMPLE SIZE: 20

ETHICAL APPROVAL: Institutional ethical committee approval was obtained.

INCLUSION CRITERIA

1. Patients aged 18 years and above.
2. Intra articular (AO TYPE C) distal humerus fractures.
3. Closed fractures.
4. Patients willing for treatment and given informed written consent.

EXCLUSION CRITERIA

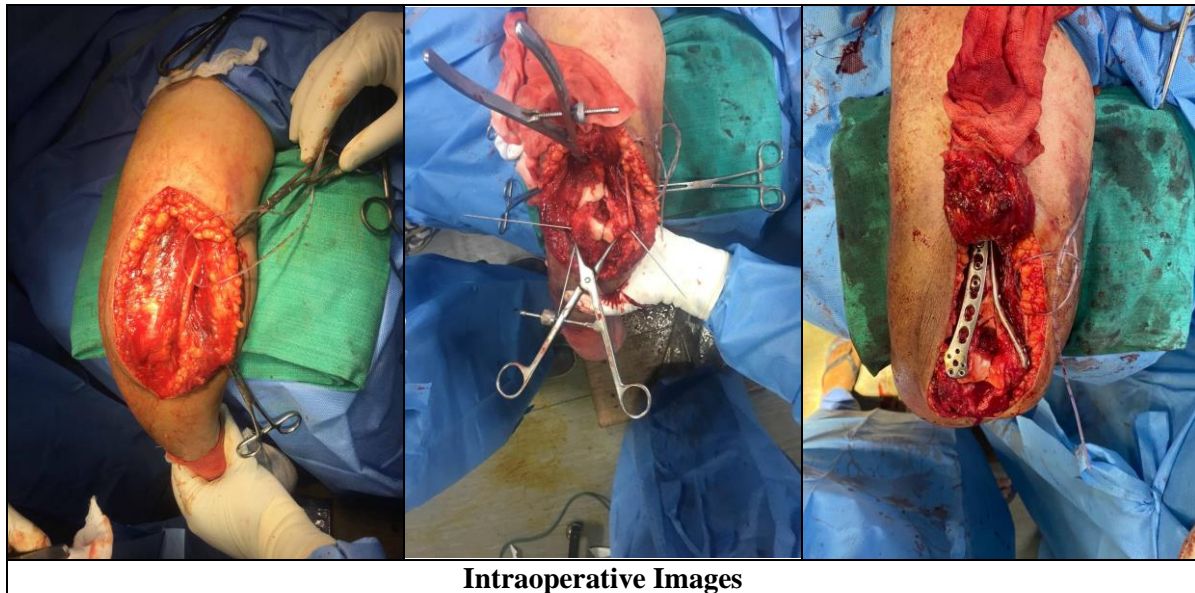
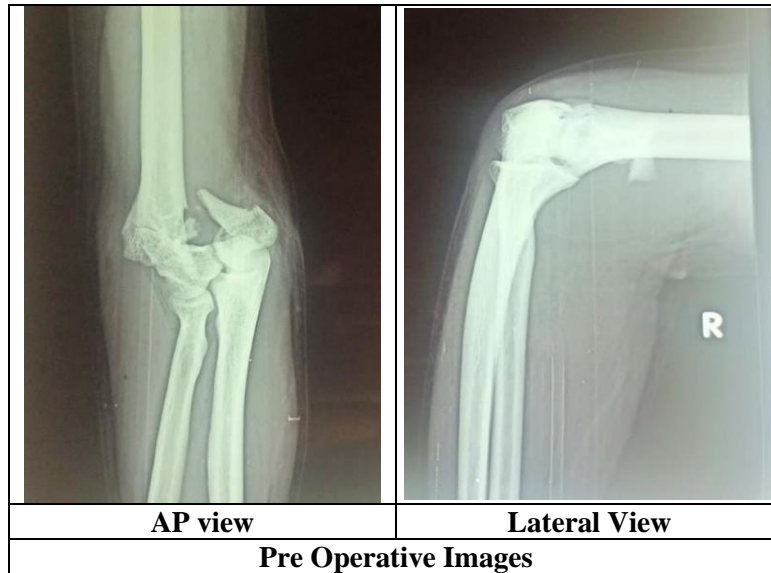
1. Open fractures.
2. Pathological fractures.
3. Patients who lost for follow-up.
4. AO TYPE 13A and 13B distal humerus fractures.
5. Poly-trauma
6. Concomitant neurovascular injury in the ipsilateral lower limb

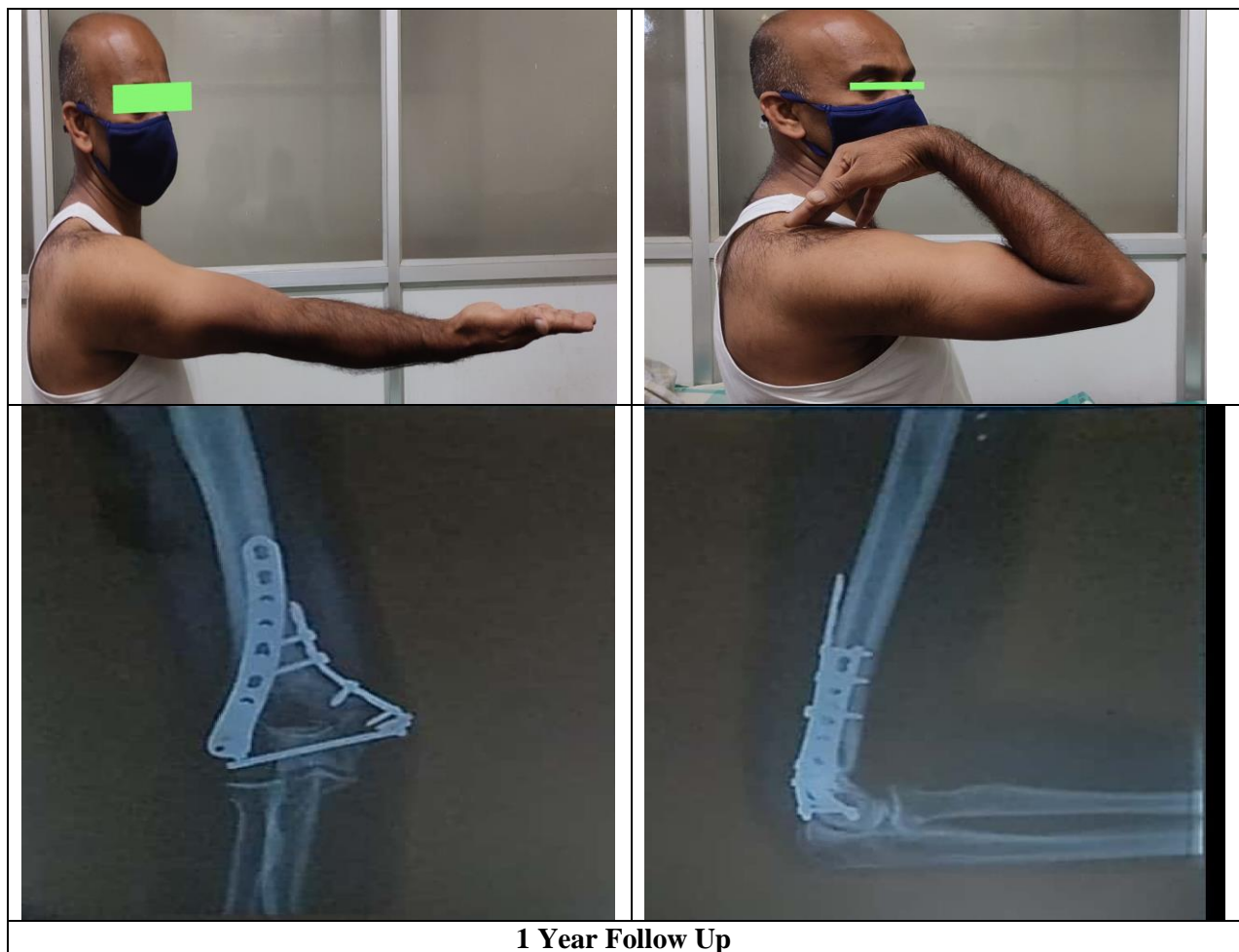
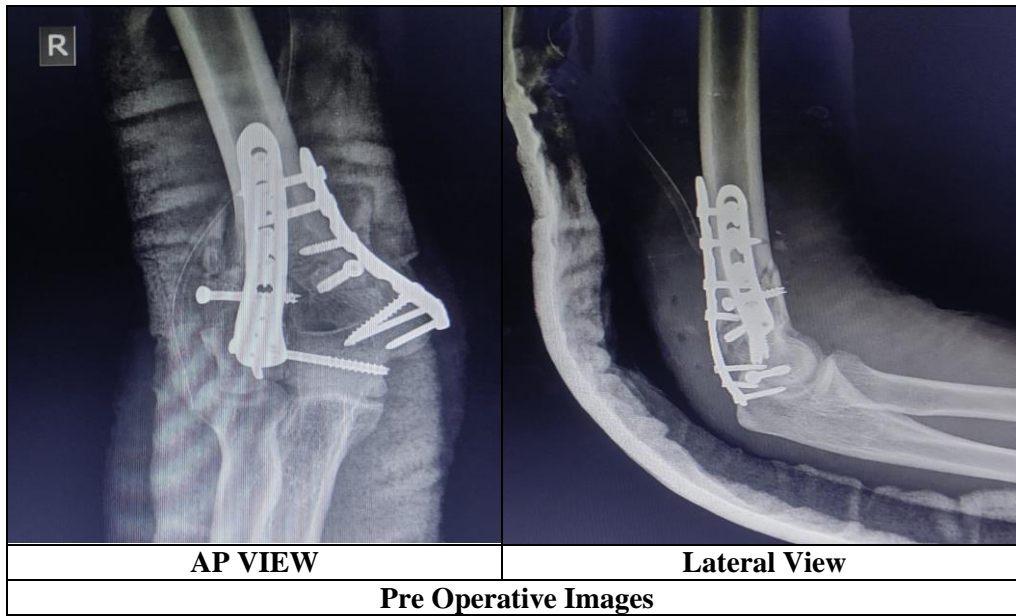
TREATMENT PROTOCOL

Patient brought to the Department Of Emergency with history of injury to the Arm and Elbow. All the fractures were managed and stabilized initially with above elbow POP slab. Analgesics were given. Radiographs were done in antero-posterior and true lateral views. Fractures were classified according to AO classification for distal humerus.

Patients were selected based on inclusion and exclusion criteria. Based on Random sampling 20 cases included in the study in which there were 12 males and 8 females. 16 cases were due to RTA, 4 were due to self-fall, Out of 20 cases, 1 (5%) was of AO C1 type of fracture, 16(80%) were of C2 and 3 (15%) were of C3 type of fractures. All surgical procedures were performed by experienced orthopaedic

surgeons. All the patients were operated with posterior approach, 10 cases operated through olecranon osteotomy⁷, 10 cases operated with posterior triceps sparing approach based on surgeon preference. All the patients were operated with pre-counteracted distal humerus locking plates in orthogonal fashion (one on medial aspect and other on postero-lateral aspect). Functional outcome was measured by Mayo's Elbow Performance Score (MEPS)⁸ and Disabilities of the arm, shoulder and Hand (DASH) Score.





RESULTS

Patients were clinically and radiologically (MEPS, DASH Score, elbow AP and lateral view) assessed at 6, 12 weeks and 1 year.

In our series of 20 cases, the average duration of the radiological union was 16 ± 02 weeks. There were no cases of primary mal-position or secondary dislocation.

The DASH Score revealed good subjective overall evaluation with a mean of 18.5 ± 10.5 points range with 0 points as best possible score result and 100 points as worst possible score result.

According to MAYO'S ELBOW PERFORMANCE SCORE.

CLASSIFICATION OF TOTAL SCORE

- 1 Excellent (90- 100) - seen in 10 cases
 - 2 Good (75- 89) - seen in 6 cases
 - 3 Fair (60-74) - seen in 3 cases
 - 4 Poor (<60) - seen in 1 case
- Mean score according to MEPS is 91.75.

MAYO'S ELBOW PERFORMANCE SCORE (MEPS)			
FUNCTION	DEFINITION	NO OF ELBOW	MEAN SCORE
PAIN (45 points)	None (45)	16	40.5
	Mild (30)	2	
	Moderate (15)	2	
	Severe (0)		
MOTION (20 points)	Arc >100° (20)	16	18.5
	Arc 50°-100°(15)	3	
	Arc <50° (5)	1	
STABILITY (10 points)	Stable (10)	20	10
	Moderate		
	Instability (5)		
	Gross instability (0)		
FUNCTION (25 points) (5 points each)	Comb hair	15(25 points)	22.75
	Feed self	3 (20 points)	
	Hygeine	2 (10 points)	
	Can do shirt		
	Can do shoes		
TOTAL	100		91.75

DISCUSSION

Primary aim of fixation of inter-condylar distal humerus fractures is to achieve stable and mobile elbow joint. Previous treatment methods of closed reduction with bracing have caused significant functional impairment with loss of movements. Hence, surgical fixation is the ideal method of treatment.⁹

Among different approaches posterior approach has been used most commonly because it exposes articular surface of distal humerus sufficiently.¹⁰ Open reduction and internal fixation with bi-columnar locking compression plate is the gold standard treatment for distal humerus AO type 13C fractures. Traditional concept was to place the plates in an orthogonal fashion and this had been challenged by parallel plating technique.

Jacobson et al. concluded that orthogonal plating provided better stability to the construct.¹¹

We studied 20 cases of distal humerus fractures of AO TYPE 13 C over a period of 2 years. In this study, common causes of injury were RTA and fall. Robinson observed a bimodal age distribution.¹²

Out of 20 cases 14 patients aged 18-39 years and 6 patients more than 40 years. In our study all 20 patients were operated with bi-columnar plating in orthogonal fashion.

We evaluated their functional outcome. At mean follow up of 1 year, the mean MEPS was 91.75 with mean elbow flexion of 120 ° is comparable to S. Greiner et al.¹³

Average time required for radiological union was 16+/- 2 weeks is comparable to Horne G et al.¹⁴

Reising K et al.¹⁵ in their study of 46 consecutive patients. They concluded that open reduction and internal fixation with the DHP system provides reliable, stable fixation allowing early functional mobilization of the elbow joint, even in complex fractures and impaired bone quality, resulting in good outcomes for the majority of patients.

In our study patients treated with bi-columnar plating technique provided overall good functional outcome, with full range of motion in 16 patients out of 20 cases, allowing early functional mobilization of elbow. In our study the olecranon osteotomy is preferably fixed by two parallel k-wires passed obliquely into the proximal ulnar anterior cortex below coronoid and fixed by tension band wiring. No non-union reported in those cases. Almost all patients in our study had certain degree of elbow stiffness, 17 of them had a full range of motion, is comparable to Jupiter JB et al.¹⁶

In our study no complications were noted with respect to fixation of implants and retention of fragments in anatomical position. We observed ulnar neuropraxia in 2 cases which were spontaneously resolved, similar to Ojha and Singh study¹⁷, where it resolved in 3 months.

Non-union was seen in 2 cases. Helfet et al,¹⁸ observed nonunion in 2-10% of patients treated with ORIF and it is common in patients with severe comminution, bone loss and inadequate fixation.

Superficial infection was seen in 4 open fractures. Soon JI et al,¹⁹ studied as it is one of the complication observed in post-operative period. Two clinically predominant hardware were noted without causing any discomfort to the patient. Revision surgery was not required in any of the above complications.

Limitation of our study is small number of cases and short term follow up.

CONCLUSION

Open reduction and internal fixation with bicolumnar plating is the ideal fixation for AO 13 type C distal humerus fractures. Use of locking plates, stable fixation, along with early elbow mobilization influence the final functional outcome. Bicolumnar plating provides better stability, allows early elbow range of motion and prevents elbow stiffness.

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