

Clinico Radiological Outcome of intra-articular fractures of the distal humerus.

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Abstract

Background: intra articular fractures of distal humerus continue to be a treatment challenge. Advances in the surgical techniques and implants have led to progressive improvement in the outcome of these difficult fractures.

Method: 164 patients with intra articular fractures of distal humerus were treated in the Department of Orthopedics, Government Medical College Srinagar by open reduction and internal fixation, using trans olecranon approach. Patients were followed for a minimum period of six months. Maximum follow up was 24 months. Results were assessed using scoring system of Caja C.L and Morrani A et. Al

Result: 68 patients (42%) patients were graded as excellent (90 to 100 points), 74 patients (45%) as good (75 to 85 points), 17 (10%) as fair (50 to 65 points) and 5 patients (3%) as poor (less than 50 points). Level of activity was higher in higher range of motion subgroup. Severity of fracture affected the radiological, functional and total score. Patients with higher radiological scores had higher range of motion and higher activity level of activity.

Conclusion: Thorough evaluation of fracture anatomy, meticulous surgical technique, stable fracture fixation and early range of motion are the corner stones to restore the pre fracture function of injured elbow.

Keywords: Intra-articular fractures, distal Humerus, outcome, clinico-radiological

Introduction

The intra- articular fractures of distal end of humerus constitute about 2% of all fractures 1. These fractures are a treatment challenge, to the point of being intimidating and frustrating to the operating surgeon 2,3. When these fractures extend into the elbow joint, there is significant risk of residual pain and functional impairment 4,5. The recommendations for the treatment range from essentially no treatment to open reduction and extensive internal fixation 6,7. Conservative treatment of intra articular fractures of distal humerus usually results in loss of elbow motion and permanent disability 4,7. With the improvement in surgical skills and implants, the outcome of these fractures continues to improve 7. The lack of a widely accepted scoring system makes study of these difficult fractures even more difficult 8. A large number of scoring systems have been proposed for the post operative evaluation of these fractures 1,8,10,11,12,13, 14, but only a few have used clinical and radiological parameters.6,9,10,14. The aim of present study was to evaluate the Clinico Radiological outcome of intra articular fractures of distal end of humerus treated by open reduction internal fixation using trans olecranon approach

and assessed by scoring system of Caja CL and Morani A et. al 8.

Method

From June 2018 to December 2019, 164 patients with intra articular fractures of distal humerus were treated in the Department of Orthopedics, Government Medical College Srinagar University of Kashmir, by open reduction and internal fixation, using trans olecranon approach. There were 69 (42%) male and 95 (58%) female patients; mean age was 53 years, ranging from 14 to 90 years. Mode of injury was falls in 96 (58.5%), Road traffic accidents in 41 (25%) and direct hit in 27 (16.5%) patients. The fractures were classified as per AO classification into C1, C2 and C3 types. There were 72 (44%) type C1, type 60 (36.5%) C2 and 32 (19.5%) type C3 fractures. 96 (58.5%) fractures affected right side and 68 (41.5%) affected left side and 18 (11%) fractures were type 1 compound.

All patients were operated within 5 days of admission using AO technique, exposing the fracture by a dorsal skin incision and olecranon osteotomy. In all cases the fracture was stabilized with two plates and an intercondylar screw or a plate and a screw in addition to the intercondylar screw. All osteotomies were stabilized with a 6.5 or a 4.5 mm cancellous screw reinforced with a dorsal ulnar tension band wire. Post operatively elbow was immobilized in a crammer wire splint. Range of motion exercises were started from the first post operative day. The splint was removed for the day and was re-applied at night, till wound healed and sutures were removed, when splintage was discarded. Patients were followed weekly for one month, bi-weekly for 3 months, then monthly for a maximum period of 24 months (average 18 months). Postoperative radiographs were compared and assessed for adequacy and quality of surgical reduction. Fig 1 & 2

The parameters noted included dimensions of any articular surface step, articular surface diastases, narrowing of distal humeral articular surface, malalignment of AP carrying angle and trochlea-capitellum angle, any Para articular calcification, loosening of implant and progression of union. Range of motion, functional status of patient, pain and complications if any were noted. Final assessment was done at the end of 6 months using scoring system of C L Caja and Moorani A. et al. 1994 8 It is a 100 Point scoring system and considers four parameters: pain (40 points), Range of motion (30 points), level of activity compared to activity prior to injury (10 points) and radiological quality of surgical reduction (20 points).

Results

Average healing time of fractures and osteotomies was 14 weeks (Range 9 to 20 weeks). There were two non unions at supracondylar region which needed a secondary procedure of bone grafting and DCP fixation. Both subsequently united and were graded as good results. In five olecranon osteotomies union was delayed up to 20 weeks, all of which subsequently healed without any secondary intervention. Pain was seen in 42 patients, 17 had pain because of prominent hardware and bursa over olecranon screw, 23 had occasional activity related pain and 2 patients had pain with activities of daily living. Maximum range of motion was gained in 12 weeks, average range of motion was 100o (range 90 to 130). 67 (41%) patients had full range of motion, 83 patients (50%) had range of motion more than functional range of Morrey 15, 14 (9%) patients had range of motion less than functional range.

126 (77%) patients had activity level as prior to injury; it was diminished in 30 (18%) and restricted in 8 (5%).

There were two ulnar nerve palsies, one because one backed out screw was pressing upon the nerve, which resolved once backed out screw was removed. In other

patient ulnar nerve palsy improved only after anterior transposition after 12 weeks of surgery. Superficial wound infection was seen in 18 patients. There was no deep infection.

68 patients (42%) patients were graded as excellent (90 to 100 points), 74 patients (45%) were graded as good (75 to 85 points), 17 (10%) as fair (50 to 65 points) and 5 patients (3%) as poor (less than 50 points). Level of activity was higher in higher range of motion subgroup. Severity of fracture affected the radiological, functional and total score. Patients with higher radiological scores had higher range of motion and higher activity level. Minor complications occurred in some patients. The radiological criteria which were difficult to maintain , were articular surface step more than 1 mm in 37 (38%) fractures, anterior trochlea-capitellum angle, malalignment of more than 100 was seen in 34 (35%) cases. Para articular calcification of more than 10mm developed in 29 (30%) cases, articular surface diastases of more than 1mm and malalignment of AP carrying angle of more than 100 was observed in 6 (6%) and 11(11.5%) cases respectively (Table1) .

Severity of fracture affected radiological, functional and total score. Patients with higher radiological score had higher functional outcome. Intra articular step more than 2mm was the most important determinant of poor outcome.

Discussion and Conclusion

The intra-articular fractures of distal humerus are difficult to treat because of the nature of injury and intricate anatomy of the region 1, 14. The recommendations for treatment range widely from essentially no treatment to open reduction and extensive internal fixation 11,12. The aim of operative treatment of intra-articular fractures of distal humeral is anatomic reduction, rigid fixation to allow early range of motion and finally to restore the pre

fracture function^{5,13}. The quality of elbow function, after fracture of distal humerus has been related to the degree to which to which normal anatomic relations are restored 1,10,12,14. Elbow mobility is hindered by loss of normal anterior tilt of distal humeral articular surface, narrowing or distraction of distal articular surface or by obstruction of coronoid and olecranon fossae. Pain has been related to failure of fracture to unite, restricted motion, ulno humeral arthrosis or instability and compression of ulnar nerve. 2,9.

The anatomic reduction of articular fragments is made difficult by poor visualization because of extensor mechanism and intact olecranon process which is hooked over the trochlea. Direct visualization of fracture is enhanced by mobilizing extensor mechanism which is further enhanced by osteotomising the olecranon process.^{1,5,6,9}

The studies of outcome of these difficult fractures are made even more difficult because of relative rarity; substantial variability among different case series in terms of type of fracture included, operative techniques and type of implants used and method of rating results. Lack of a universally accepted scoring system further compounds the problem 1,7,12,13,14,. Large number of scoring systems have been proposed by numerous authors based either on the post operative range of motion of the elbow 11,12,13 or on the postoperative range of motion, pain and disability 1,8,,13. Few authors considered the quality of the surgical reduction as one of the criteria in evaluation of results of these difficult fractures 6,,11,14 however there was no attempt to quantify them. Caja CL and Morani A developed a comprehensive 100 point scoring system with an attempt to quantitate the quality of the surgical reduction and the functional outcome of the patients. This scoring system considers four parameters: pain 40 points, range of motion 30 points, radiological

quality of surgical reduction 20 points and post operative activity level 10 points. The aim of present study was to assess outcome of these fractures using the evaluation criteria of Caja CL and Morani A. 8

Severity of fracture affected radiological, functional and total score.

Patients with higher radiological score had higher functional outcome. Intra articular step more than 2mm was the most important determinant of poor outcome.

Further research research is needed to asses the effect of individual radiological parameter on the clinical outcome of intaarticular fractures of the distal humerus.

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Legends Figure

Table: 1

Parameter	No. of patients (%)
A. Pain	
No Pain	104 (67%)
Occasional pain	23(30%)
Activity related mild pain	19 (3%)
B. Range of motion (ROM)	
Full ROM	67 (41%)
ROM more than functional range	83 (50%)
ROM less than functional range	14 (9%)
C. Activity Level	
As prior to trauma	126 (90%)
Diminished	30 (7%)
Interrupted	8 (3%)
D. Radiological quality of surgical reduction.	
Articular surface step more than 1 mm	38 (24%)
Articular surface diastases more than 1mm	11 (7%)
AP carrying angle malalignment less than 10°	6 (4%)
Heterotrophic ossification less than 10 mm	29(18%)
anterior capitellum- trochlea angulation malalignment more than 10°	34(20%)
E. Complications	
Superficial wound infection	8 (5%)
Ulnar nerve palsy	2 (1%)
Prominent olecranon screw	23 (14%)
Painful Bursa over screw head	17 (6%)
Secondary procedure for removal of symptomatic osteotomy fixation	29 (18%)
Delayed union	5 (3%)
Non union	2 (1%)
(ROM= Range of motion)	

Fig.1 : Type C2 Fracture



Fig 1A Fig 1B Fig 1 C
Pre operative Radiograph Immediate post operative After 6 months

Fig. 2: Type C1Fracture



Fig 2A Fig 2B Fig 2C
Pre operative Radiograph Immediate post operative After 6 months

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