



## Study of the Role of Plating in Fractures of Distal One-Third of Humerus Via Posterior Approach

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### Abstract

**Introduction:** Distal humerus fracture in adult is very difficult to treat. It is very difficult to achieve alignment, anatomical reduction, rigid fixation, immediate mobilization and fracture union in such patient. The aim of present study was to evaluate the results of open reduction and internal fixation with plating in fractures of distal 1/3rd of humerus via posterior approach.

**Material And Method-** A total of 30 patients of age group 15 and above of either sex with fractures of the distal 1/3rd humerus were fixed with plating using posterior approach. 16 cases were fixed with dual reconstruction plates, 9 cases with single reconstruction plate and other 5 with narrow dynamic compression plate. Data was analyzed both with regards to the clinical and radiological outcome to evaluate the effectiveness, functional outcome and morbidity associated with the procedure.

**Result-** 23 patients were able to achieve  $>100^{\circ}$  arc of motion and 7 patients had in between  $50-100^{\circ}$ . 25 patients were having excellent to good score according to mayo elbow performance index.

**Conclusion-** It was concluded that anatomical reduction and rigid fixation of the fracture with reconstruction of the congruous joint surface can be achieved only with early open reduction and internal fixation and for good open reduction and internal fixation adequate exposure of the fracture is must which is best provided by posterior approach with negligible complications.

**Keywords-** Distal one-third, humerus, posterior approach

### INTRODUCTION

Fractures of distal humerus remain a challenging problem despite advances in technique and implants. These injuries often involve articular surface and many occur in older patients with osteoporosis. Also the complex three dimensional

geometry of distal humerus poses a considerable challenge to reconstruction. Joint function often is compromised because of stiffness, pain, and weakness but outcomes have been improved with advances in implant technology, surgical approaches, and rehabilitation protocols.<sup>1</sup>

As more familiarity is gained with fracture patterns and reduction techniques, a triceps-reflecting or triceps-splitting approach may be selected to reduce complications. The best fracture exposure is provided by the posterior approach by either olecranon osteotomy or triceps splitting approach. With all posterior approaches, the ulnar nerve must be carefully explored without excessive stripping and can be transposed anterior to the medial epicondyle at the end of the procedure.<sup>1,2</sup>

Recent reports have questioned the benefit of nerve transposition, noting that the frequency of ulnar neuritis in patients with ulnar nerve transposition was almost four times that in patients without transposition. The aim of present study was to evaluate the results of open reduction and internal fixation with plating in fractures of distal 1/3rd of humerus via posterior approach.

## MATERIALS AND METHODS

A prospective case series study of 30 cases of age group of 15 and above of either sex with fracture of distal 1/3rd of humerus was done in orthopaedic department of GNDH/Govt. Medical College Amritsar. Institutional ethical committee approval was taken.

The patients were given treatment in the emergency ward in form of back splintage, analgesics, antibiotics, antiseptic dressing and stitching of wound if required. Detailed history of patients including the mode of injury was taken. Patients were investigated completely for operation and anaesthetic purposes. Radiological examination of arm including elbow in

Anteroposterior and lateral planes was done to assess type of fracture and displacement of fragments if any and were classified according to Gustilo Anderson<sup>3</sup> and AO classification<sup>4</sup>. Patients were explained the procedure in his/her language and written consent was taken on the consent form.

All patients under brachial block or GA were operated by posterior approach either by olecranon osteotomy or triceps reflecting approach after exploring and securing the ulnar nerve with a moist tape. Transolecranon osteotomy was done for T shape, Y shape or comminuted fractures. Condyles were reduced and fixed together with transverse 4.5 mm cancellous screws. Fractured medial or lateral ridge was reduced and reassembled condyles were fixed with the help of Y plate, tubular plate or reconstruction plate. Osteotomy was fixed with TBW or 6.5 mm cancellous screw and in case of triceps reflecting, triceps is repaired with drill holes in the olecranon to reduce the risk of postoperative tendon pull-off. Wound irrigated with saline, betadine and stitched in layers over negative suction drain after transposing ulnar nerve anteriorly if required. ASD done and compression bandage applied. Active exercises of elbow was started on the second or third day. Stitches were removed in twelfth post-operative day.

All patients were followed up every 4 weeks. Patient was examined clinic-radiologically for evidence of union, range of movements, complications, if any and were assessed according to Mayo elbow performance index.

**OBSERVATIONS**

A total of 30 cases of fracture distal 1/3rd humerus were studied. The youngest patient had an age of 17 years and oldest had an age of 70 years. Average age was 37.3 years. Males (63%) outnumbered females. Mode of injury was road side accidents in 54% and falls in 43% and railway accident in 3 % of cases. Fractures were closed in 80% of cases and compound grade 1, 2, 3 in 10%, 7%, 3% of cases. C3 complete articular in 47% of cases, C1 in 17% cases and extraarticular A2 in 20% of cases (Table.1).6 patients(19%) had associated fractures. 16 cases(53%) were fixed with dual reconstruction plates, 9 cases(30%) with single reconstruction plate and other 5(17%) with narrow dynamic

compression plate. 22 patients (73%) were operated by transolecranon approach and 8 patients (27%) by triceps reflecting approach. Superficial infection present in 10% of cases. Among delayed complications(Table.2) almost 30% patients had persistent pain, 10% had delayed union, 17% had stiffness of elbow and 13% had wire prominence.90% of patients united by 18 weeks and 10% had delayed union with no case of nonunion.77% of the patients had arc of motion  $>100^{\circ}$ , 23% had in between  $50-100^{\circ}$ (Table.3). Results were evaluated as excellent in 57%, good in 27%, fair in 3%, and poor in 13% of cases according to mayo elbow performance index.(Table.4).

**Table 1.** Showing Type Of Fractures According To A.O Classification

	Type Of Fractures	No. Of Cases	Percentage
Extraarticular	A1	0	0
	A2	6	20
	A3	1	3
Partial Articular	B1	0	0
	B2	1	3
	B3	0	0
Complete Articular	C1	5	17
	C2	3	10
	C3	14	47
	Total	30	100

**Table 2.** Showing Late Postoperative Complications

Complications	No.Of Patients	Percentage
Persistent Pain	9	30
Delayed Union	3	10
Nonunion	0	0
Wire Prominence	4	13
Elbow Stiffness	5	17

**Table 3** Showing Arc Of Motion At Elbow Joint

Arc Of Motion In Degrees	No. Of Cases	Percentage
>100	23	77
50-100	7	23
<50	0	0
	30	100

**Table 4** Showing Grading Of Results(According To The Mayo Elbow Performance Index)

Grade	Points	No.Of Patients	Percentage
Excellent	>90	17	57
Good	75-89	8	27
Fair	60-74	1	3
Poor	<60	4	13

**CASE NO. 1**

- a.) showing intercondylar fracture involving both condyles  
 b.) postoperative xray showing fracture fixed with 2 reconstruction plates  
 c.) follow up xray showing complete union

## CASE NO. 2



a.) showing intercondylar fracture involving both condyles

b.) postoperative xray showing fracture fixed with 2 reconstruction plates

c.) follow up xray showing complete union

## DISCUSSION

Fractures of the distal end humerus are increasing due to rapid industrialization and rise in automobile accidents. If not managed appropriately by an experienced surgeon, it may not only cause prolonged morbidity, but

sometimes even permanent stiffness of the elbow joint.

Maximum patients were in the age group of 3rd to 4th decade and males more than females in our study which was comparable to the study of Bradford Henly<sup>5</sup> and Bjorkenheim<sup>6</sup>. The patients with less than 15 age was not included in our

study because screws and plates may damage the epiphyseal plate. The higher incidence in younger age group and males more than females can be attributed to more active lifestyle in young males. The most common mode of injury was road side accidents (54%), falls (43%) and 1 railway accident(3%). Similar trends were found in the series of Bradley Henley et al<sup>5</sup> and Jupiter et al<sup>7</sup>. this may be attributed to fast tract life style of the people making road side accidents remain the major cause.

In the study of 30 cases, 80% were closed fractures, 3 were compound grade 1, 2 had grade 2, 1 case had grade 3 injury as per Gustilo Anderson classification. 14 patients (47%) were C3, 3 patients(10%) were C2, 5 (17%) were C1, 1(3%) was A3 and 6(20%) were A2 as per AO classification. Similiar trends found in study by Jupiter et al<sup>7</sup> and Yang et al<sup>8</sup> more number of cases of C variety is due to high energy trauma in road side accidents. Grade 3 fracture was initially fixed with external fixator and later by open reduction and internal fixation.

20% of cases had associated injuries which may be attributed to high velocity trauma and is comparable to other series.

In our study implants used were dual reconstruction plate in 53%, single reconstruction plate in 30% and NDCP in 17% cases. additional K wires and screws in 33% and 63% cases respectively. Olecranon osteotomy in 63% cases fixed with tension band wiring and with 6.5mm screw in 10%. Triceps reflecting approach in 27% of cases. It was found that single plate fixation for unicondylar and dual plate fixation for bicondylar

fractures. Similar conclusion was drawn in studies by Gabel et al<sup>9</sup>, Talha et al<sup>10</sup>, Soon et al<sup>11</sup> and Huang et al<sup>12</sup>.

Triceps reflecting approach was used for either the supracondylar fractures or single condylar fractures and transcondylar approach was used for T shape, Y shape or comminuted fractures. It was found that transolecranon approach provides complete posterior visualization and access to the distal humerus.

In our study, there was no case of nonunion, malunion, instability or avascular necrosis.both delayed union and elbow stiffness were seen in highly comminuted and compound fractures. This trend has been observed in other studies too.<sup>12</sup>

It was concluded that for functional recovery in case of intraarticular fractures of the distal humerus, along with the anatomical reduction and rigid fixation, early start of the postoperative mobilization is very crucial.

Mean time of union is 13 weeks with no significant effect of age, sex, type of implant, associated injury and side of injury was seen.

Good range of motion and better functional results were associated with closed, less comminuted fractures, rigid fixation and early start of the postoperative exercises. All the poor results were seen in highly comminuted (type C) and in grade 3 compound fracture. Comparable results in study by Jasse et al<sup>13</sup>, Talha et al<sup>10</sup>, Brain J Holdworth<sup>5</sup> and Wang KC<sup>14</sup>.

## CONCLUSION

It was concluded that anatomical reduction and rigid fixation of the fracture with reconstruction of

the congruous joint surface can be achieved only with early open reduction and internal fixation and for good open reduction and internal fixation adequate exposure of the fracture is must which is best provided by posterior approach with negligible complications.

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