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Research Paper

# A Study of The Results of Double Plating for The Fixation of Fractures of The Lower End of Humerus in Adults.

Medical Science

**KEYWORDS :** DOUBLE PLATING(orthogonal and parallel plating) ,LOWER END HUMERUS,MAYO ELBOW PERFORMENCE SCORE

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## ABSTRACT

*Distal humerus fractures in adults are injuries which are highly demanding, and complex because of metaphyseal comminution in the fracture, articular involvement with small fragments, limited subchondral bone, osteoporosis and difficult anatomy and approach to the joint.*

- *AIMS AND OBJECTIVES*

*study the results of fractures of the lower end of humerus in adults, treated by the double plating technique in terms of the final range of movement of the elbow, the union time , rate of complications.*

- *Materials and method*

*we retrospectively reviewed a series of 24 adults who underwent double plating for the distal humeral fractures at our institute.*

- *Results:results were considered in terms of union ,complication ,mobility , implant used, duration of stay,MAYO elbow performense score,varus valgus stability.*
- *Conclusion: Two established plating techniques (orthogonal and parallel plating) have yielded excellent outcomes after open reduction and internal fixation. We recommend operating the distal humerus fractures in all cases with ORIF by double plating, focusing on the AO principles, even in the presence of osteoporosis.*

## ➢ INTRODUCTION:

Distal humerus fractures in adults are injuries which are highly demanding, technically and complex in nature to manage. They are relatively uncommon injuries amounting to 2 to 6 % of all fractures and 30% of all elbow fractures. Their difficulties are well understood: metaphyseal comminution in the fracture, articular involvement with small fragments, limited subchondral bone, osteoporosis and an inherently difficult anatomy and approach to the joint. The conservative management of such fractures are deemed unacceptable in modern practice and they are operated upon to meet the AO principles.

- **Atraumatic surgical technique**
- Providing an anatomically reduced joint surface
- Stable fixation by the various implants in our arma mentarium.
- And early mobilisation of the elbow to avoid stiffness and arthritis.

## ➢ AIMS AND OBJECTIVES

- To follow up and study the results of fractures of the lower end of humerus in adults, treated by the double plating technique.
- To observe the results of this technique at our setup, and to critically analyse them.
- To measure the final range of movement of the elbow.
- To measure the union time for the fracture treated by this method.
- To measure the rate of complications.

## ➢ CLINICAL ANATOMY

The lower end of the humerus is flattened, transversely expanded and the ends are rounded. The cylindrical diaphysis flattens just above the elbow and the distal humerus is made of two thick bony columns medially and laterally (inverted Y) with a central thinned out weak bone making the coronoid fossa anteriorly and the olecranon fossa posteriorly. Each column has a supracondylar ridge on its outer borders which terminates in a non-articulating epicondyle. The lateral ridge is inclined anteriorly while the medial ridge is straighter, The medial column ends one centimetre proximal to the trochlea, while the lateral column extends to the distal aspect of trochlea and articulates as the rounded capitellum. The distal humerus has the coronoid fossa and the radial fossa on its anterior surface, which is separated by a longitudinal ridge and the lateral lip of trochlea, this forms the anatomic division between the medial and lateral columns. The elbow is a complex joint and is vital in positioning the hand in space. The elbow joint is a hinge joint with rotation along the single axis of the trochlea on the humerus with the semilunar notch on the ulna

## ➢ MATERIALS AND METHODS

In this thesis, we retrospectively reviewed a series of 24 adults who underwent double plating for the distal humeral fractures at our institute. Seventy eight patients underwent distal humerus plating from 2010 to 2013, unfortunately the majority were lost to follow up due to Various reasons. Most had wrong contact details, some migrated and one expired. What remained of patients who were reachable were around 50 of which approximately half turned up for a follow up study.

**These patients were selected accordingly:**

### ➢ Inclusion criteria

1. Patients of or above the age of 18 years at the time of admission.
2. Patient sustained a fracture to the distal humerus operated at our institute.
3. Patients with at least 6 months follow up after surgery.

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➢ **Exclusion criteria**

1. Patients with multiple procedures previously performed on same limb.
2. Patients not operated by the double plating methods.
3. Patients with repeat trauma to same limb after the initial surgery under study.

**All the routines investigations were done and after radiographic evaluation according AO/OTA classification**

· AP SCAPULAR VIEW
· LATERAL VIEW

➢ **OPERATIVE TECHNIQUES**

**1. Posterior triceps-on approach (triceps sparing or paratricipital).**

- This approach is preferred when there is no intraarticular involvement or there are larger intraarticular fragments easy to manipulate and reduce
- The triceps is elevated off the posterior humerus, but its insertion is not disturbed.

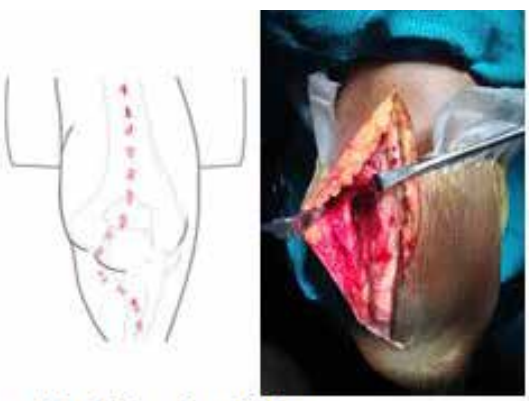

*fig 12 : incision*

**2.Transolecranon approach**

- There are 2-3 types of osteotomies described. A chevron with apex proximal, apex distal and a straight osteotomy.
- We preferred the chevron with apex distal type intra articular osteotomy
- The implants available
- 3.5mm reconstruction plates (RCP), simple and locking.
- 3.5mm dynamic compression plates (DCP), simple and locking.
- 3.5mm Limited contact DCP (LCDCP) simple and locking.
- 1/3 tubular plates.
- Precontoured anatomical plates with both 3.5mm and 2.7mm screws with locking system.
- Both locking and simple cortical screws and cancellous screws.

➢ **RESULTS, ANALYSIS AND DISCUSSION**

A total of 24 patients were evaluated in our study. Their demographics, pre-operative data, operative and clinical results are as follows.

I. Age

| Age | Number | Sex | |
|---|---|---|---|
| | | Male | Female |
| 15 - 30 | 5 [20.8%] | 4 [16.7%] | 1 [4.2%] |
| 31-50 | 12 [50%] | 10 [41.7%] | 2 [8.3%] |
| >50 | 7 [29.2%] | 5 [20.8%] | 2 [8.3%] |
| Total | 24 [100%] | 19 [79.2%] | 5 [20.8%] |

The youngest patient was 15 years old boy ,the oldest patient was a 68 year old man ,the average age of the group being 43 years.

**II SEX/SIDE**

FEMALE 5
R 5

MALE 19
R 10
L 9

**III MODE OF INJURY**

FALL 8
RTA 16

**IV TYPES OF FRACTURES**

| FRACTURE | A2 | A3 | C1 | C2 | C3 | TOT |
|---|---|---|---|---|---|---|
| CLOSED | 2 | 1 | 10 | 5 | 3 | 21 |
| OG1 | | | | 2 | 1 | 3 |
| TOTAL | | | | 7 | 4 | 24 |

**V COMORBIDITIES**

| | AGE | | | | | |
|---|---|---|---|---|---|---|
| COMORBIDITY | 46 | 50 | 52 | 56 | 68 | T |
| CLAVIVLE # | | 1 | | | | 1 |
| DM | | | | | 1 | 1 |
| GALEZZI # | 1 | | | | | 1 |
| HEAD INJURY | | | | 1 | | 1 |
| VASCULAR INJURY | | | 1 | | | 1 |
| TOTAL | 1 | 1 | 1 | 1 | 1 | 5 |

**VI SURGICAL APPROACH**

| SX APPROACH | A2 | A3 | C1 | C2 | C3 | T |
|---|---|---|---|---|---|---|
| OLECRANON OSTEOTOMY | | 1 | 5 | 3 | 4 | 13 |
| TRICEPS SPARING | 2 | | 4 | 2 | | 8 |
| TRICEPS SPLIT | | | 1 | 2 | | 3 |
| TOTAL | 2 | 1 | 10 | 7 | 4 | 24 |

**VII IMPLANTS USED**

| PLATES | OLECRANON OSTEOTOMY | TRICEPS SPARING | TRICEPS SPLIT | T |
|---|---|---|---|---|
| 5 HOLE ANATOMICAL PLATEX2 | 1 | | | 1 |
| 6 HOLE RCP+6 HOLE ANATOMICAL PLATE | 1 | | | 1 |
| 7 HOLE +5 HOLE ANATOMICAL PLATE | | 1 | | 1 |
| 7 HOLE R+7 HOLE ANATOMICAL PLATE | | 1 | | 1 |
| 7 HOLE RCP+5 HOLE ANATOMICAL PLATE | 2 | | | 2 |
| 7 HOLE RCP+5 HOLE ANATOMICAL PLATE +1 CCS | 1 | | | 1 |
| 7 HOLE RCP+7 HOLE ANATOMICAL PLATE +1 CCS | | | 1 | 1 |
| TOTAL | 5 | 2 | 1 | |

**V111 DURATION OF SURGERY**

| HOURS | NUMBER |
|---|---|
| 2 | 42 |
| 2.5 | 3 |
| 3 | 13 |
| 3.5 | 1 |
| 4 | 2 |
| 4.5 | 1 |
| TOTAL | 24 |

**IIX MOBILISATION**

| DURATION | NUMBER |
|---|---|
| 1 MONTH | 4 |
| 1 WEEK | 3 |
| 1.5 MONH | 2 |
| 2 MONTH | 1 |
| 2 WEEK | 4 |
| 3 WEEKS | 10 |
| TOTAL | 24 |

**X COMPLICATIONS**

| COMPLICATION | PAIN NIL | OCCASIONAL PAIN | PAIN | T |
|---|---|---|---|---|
| HETEROTROPHIC OSSIFICATION | | | 1 | |
| SCREW LOOSENING, AVN LATERAL EPICONDYLE | | 1 | | 1 |
| SCREW LOOSENING ,NON UNION TROCHLEA | | | 1 | 1 |
| NONE | 16 | | 5 | 21 |
| TOTAL | 16 | 1 | 5 | 24 |

| RESULT | |
|---|---|
| GOOD | 9 |
| 85 | 7 |
| 75 | 1 |
| 80 | 1 |
| FAIR | 1 |
| 70 | 1 |
| EXCELLENT | 14 |
| 100 | 11 |
| 95 | 2 |
| 90 | 1 |
| GRAND TOTAL | 24 |

**MAYO ELBOW PERFORMANCE SCORE**

## ➢ CONCLUSION

- Distal humerus fractures continue to be a complex fracture for the surgeons to treat.
- Two established plating techniques (orthogonal and parallel plating) exist that can be utilized to tackle these difficult fractures.
- They have yielded excellent outcomes after open reduction and internal fixation, yet complications do exist.
- Use of parallel plating or orthogonal plating will depend on surgeon preference and the fracture pattern present.
- Parallel plating may be the preferred technique utilized for very distal fracture patterns since more stability can be obtained by providing additional screws in the distal fragment.
- Orthogonal plating has been time tested and has its established role in all fracture types.
- Traditional implants with on table contouring prove equally good if done with finesse.
- The key to successful treatment of these fractures is
  - o Obtaining anatomic reduction
  - o With stable fixation
  - o To allow early range of motion.
- Minimizing soft tissue trauma will lead to improved patient outcomes while reducing the complication rates.
- We recommend operating the distal humerus fractures in all cases with ORIF by double plating, focusing on the AO principles, even in the presence of osteoporosis.

Thus in conclusion, irrespective of the fracture pattern or the implants used, anatomical articular alignment with rigid fixation of both the columns with minimal soft tissue trauma and early mobilisation gives gratifying results.

**1. Case 1**

- 52 / M
- Serviceman
- RTA
- Left side type C2 closed distal humerus fracture with brachial artery injury
- Embolectomy and upper limb ex-fix in 1st stage
- Bicolumnar orthogonal plating through olecranon osteotomy approach in 2nd stage
- Radial pulse absent, Valgus – Varus moderate instability present
- MEPS 100 = excellent result.

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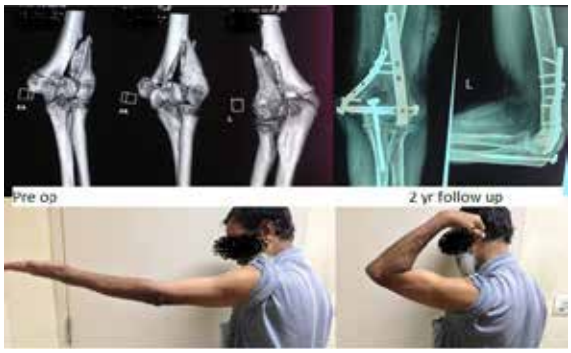


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